I drink milk and breathe air and drink water. The problem with the mega farm is the manure. A small farm can use manure as a fertilizer. How many mortalities are on mega farms.

Will Daily Farms be asked to use solar power and wind turbines?

If the farms fail who does the clean up.

Sent from Mail for Windows 10
How many people would really understand this info and be able to debunk any of the estimates and calculated potential?

What we should all know is this amount of animals in any small area as this, is poisonous and hazardous. This does not take a scientist or pages of so called studies to figure this out.

As an average person living in that area, MN, or the US, who would want our land, air, or water subjected to this concentration of animals?

Are we short of food or milk in this country to take a chance allowing something like this to ruin our climate?

Do we need jobs created of this kind in the US where we are short of workers in the first place?

What is the purpose of being this large of a farm, greed? Do we allow someone to ruin where others have built their homes, lived for generations, and now have to put up with this kind of polluted air, the stench in the air they breath, the polluted water they will need to drink and use to live, In the name of greed by someone who probably doesn't even live on the farm and possibly only has investments in the farm and works in the city?

There is way more at stake here than just the figures you give in this report. Think of the all around good of our country for a change, instead of greed and wealth. Aren't we past this yet?

If you continue to close your eyes and go along with greed, those who allow this kind of thing will some day have to answer and pay the price for the consequences of our actions.

Marilyn Schumer
St. Stephen, MN
Ms. Grosenheider, I am emailing you today to ask the MPCA to require an EIS for the Daley Farms. This expansion has too many cows for our environment and will pollute our land and air and water. Do the right thing and have an EIS done on this farm. Thank you, Karen Swanson Lanesboro MN

Sent from my iPhone
I am commenting on the expansion of the Daley dairy operation in Winona County. I am unable to attend the public hearing on February 4. I want to be on the record stating that I believe the MPCA was negligent in its duties when it did not consider the greenhouse-gas emissions from this expansion. Furthermore, as an agency that is supposed to protect the public it failed its mission by not ordering an EIS when this farm would be a major producer in Winona County which has karst geography and is thus, more environmentally fragile than most areas. An EIS needs to be done before this major expansion is allowed in our county.

Thank you very much
Deborah Niebuhr
571 East Howard St
Winona, MN  55987
I lived on a dairy farm, run-off and leaching of nitrate into the soil happens no matter how plans are made to avoid it. That will be someone’s drinking water!!!!!!!

I oppose the granting of any permits to expand numbers of cattle.

Require the EIS for the expansion of numbers of cattle.
Due to sensitive Karst geology and greenhouse-gas emissions, Daley Farm’s massive industrial scale expansion must complete an in-depth Environmental Impact Statement.

John Fisher-Merritt
2614 County Rd. 1
Wrenshall, MN 55797
218-384-3356
Dear Commissioner Laura Bishop,

Please don't let Minnesota become another Flint, Michigan.

I urge you to please order an Environmental Impact Statement for the proposed Daley Farms' expansion in Winona County.

Minnesotans expect the MPCA to use the power given to you through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) or deny permitting on an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1).

This gigantic operation is proposed in an already polluted, sensitive area. Throughout Winona County and southeastern Minnesota nitrate levels have been and continue to be especially high. One neighbor living on the edge of Lewiston about a mile from Daley Farms' operation received a July 2019 report from the Winona County Soil and Water Conservation District that their well tested at a level of 13.33 milligrams per liter (mg/L). This is way over the U.S. drinking water standard of 10 mg/L, the level at which the public is advised to find alternate sources of drinking water.

Thank you.

Sincerely,

Jane Burnett
4029 10th Av So
Minneapolis 55407
Please use the power given to you through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) or deny permitting on an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area.

Thank you.

Sincerely,
Mark M Giese
1520 Bryn Mawr Ave
Racine, WI 53403

Urologist Tells Men To "Fix" Their ED With This New Trick!
Med Journal
http://thirdpartyoffers.juno.com/TGL3142/5e2fa0c26c9b320c26414st01duc
it is clear an in-depth Environmental Impact Statement (EIS) is needed or a permit should be denied for an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area. Thank you for considering this perspective, John Paul Roy, 55406

"Non-violence leads to the highest ethics, which is the goal of all evolution. Until we stop harming all other living beings, we are still savages." - Thomas Edison
Good Morning Kim:

I am writing today to express my disappointment concerning the staff review of this proposal. I was Regional Manager for the MPCA S.E. Region from 1977 to 2014. During that time many proposals for potentially environmentally damaging facilities were denied including: the Ironwood Landfill proposal to become a Hazardous Waste Disposal Site, The Bluffview Labs mega hog farm proposal near Elgin, MN and others. The groundwater resources of S.E. MN are very fragile and easily severely impacted by poorly designed and/or operated facilities. Examples of system failures include the Wastewater Stabilization Pond System failures at Altura and Lewiston. Even when waste storage systems are properly designed and constructed the waste is itself a threat to the groundwater.

This is especially true with animal waste storage systems. The amount of waste generated is huge. Standard practice for the disposal/utilization of this manure is to land apply it at agronomic rates. This requires a substantial number of acres of cropland for the amount that would be generated by a facility the size of the proposed Daley Facility. Over application of animal manure to cropland has been a significant factor in the build up of Nitrates in the groundwater in this region of MN. In some areas, the uppermost aquifer is so heavily polluted the water is unfit for human consumption and nitrate levels continue to rise.

S.E. MN consists of "layer cake" sedimentary geological formations that are interconnected. Pollution in the uppermost aquifer can and does impact the deeper aquifers. All communities in S.E. MN utilize groundwater for their drinking water. This groundwater resource must be protected. The citizens of S.E. MN certainly recognize this and have done many things to try to ensure that this precious resource is protected. I expect the MPCA to show a like amount of concern as is required by statute.
Dear MPCA Commissioner Bishop,

I am begging you and the environmental review staff to use the power that has been given to you through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) for the Daley Farms mega-dairy expansion. As a Minnesotan, I would expect all industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1) to be denied. This is ESPECIALLY critical when it is proposed in an already polluted, sensitive area.

Previous legal and procedural errors were made under the former MPCA commissioner Stine’s reign during the environmental review of this mega-dairy expansion application. When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It is also recognizing the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. If Daley Farms was allowed to go ahead with its expansion, it would be the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas emissions when it conducted its environmental review. As the court noted, the MPCA routinely considers greenhouse-gas emissions in its environmental reviews of other projects.

I think this continued “green light” mentality for mega expansions—whether dairy or hogs—is reprehensible and has so many negative ramifications for our environment that are just common sense to deny. This continued support for large operations continues to force small dairy and hog farms out of business because the state continues to support such disastrous operations through their lack of concern for the welfare of our great state and lack of tough regulations.

Finally, the court’s decision shines the spotlight on a critical issue: MPCA staff have never recommended an EIS on a large factory farm. One was ordered by the now disbanded MPCA Citizen’s Board over staff objections. And two have been ordered through court orders. The testimony and documentation related to the review of Daley Farms’ proposal yet again proves that not only did the MPCA fail to fulfill its mission as a...
environmental agency when it did not consider greenhouse-gas emissions, but it also failed to serve the public good when it declined, yet again, to order an EIS on a major producer of liquid manure in an environmentally fragile area.

**PLEASE DO THE RIGHT THING - IT MATTERS!!**

-

Sincerely,

Elizabeth Olson
62191 190th Ave
Dodge Center, MN 55927
Given the state of our waters here in Minnesota, especially southern Minnesota, I wonder where the MPCA is half the time! Are you in someone’s pocket? Why is our water worse than it’s ever been? Please do your job before we are Iowa!

Minnesotans expect you to use the power given to you through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) or deny permitting on an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area.

As interpreted by Siri
Kim Grosenheider,

Minnesotans expect MPCA Commissioner Laura Bishop and environmental review staff to use the power given to them through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) or deny permitting an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area. There is no Plan(et)B. Clean water is a right,

Julius Salinas
Hello,

I want to go on record to insist that any proposed factory farm, including Daley's, must at minimum do a full EIS--and that the MPCA do its job to protect our land and water, and our future!

So many bad effects of such places:

- Swarms of black flies keeping children indoors.
- Animals languishing in filthy, cramped cages, crates, pens, and sheds.
- Families cancelling Sunday picnics due to wide-ranging stench.
- Property values falling when factory farms are close to homes.
- Asthma, headaches, sore throats, diarrhea, and burning eyes.
- Our land, air, and water polluted by manure, chemicals, and toxins.
- Workers put at risk.
- Farmers forced into corporate contracts or out of business altogether.

Please read some of these articles and understand that an EIS is the minimum that should be done---

https://sraproject.org/factory-farms-destroy-communities/
https://www.farmsanctuary.org/learn/factory-farming/factory-farmings-effect-on-rural-communities/
https://www.motherjones.com/food/2018/12/factory-farms-no-longer-have-to-report-their-air-emissions-that-could-be-dangerous-for-their-neighbors/

Thank you for your attention to this matter.

Sincerely,

Kathryn Hong
Bloomington, MN
Dear Ms. Grosenheider,

Please be sure that you and others doing the decision making about Daley's and any other factory farms visit some of those places first, and talk to the neighbors...

Thank you,

Kathryn Hong

Bloomington, MN
I agree that we do not want or need a dairy farm of this size. Are you familiar with the Haubenschild farm near Princeton, MN. I have not been there but I have discussed the dairy farm with a brother (I believe) of the family. You can find much more information here:
https://www.google.com/search?q=haubenschild+farm+dairy+inc&rlz=1CAMWDF_enUS728US729&oq=haubenschild+farm+dairy+inc&aqs=chrome..69i57.1928j0j9&sourceid=chrome&ie=UTF-8

Rather than working to get bigger, we should be working to get smarter - use the precautionary principle. The Haubenschild farm is pointing us into the right direction. This type of progress will benefit the whole community.

Jim Mickelson
Rochester, MN
Dear Ms Grosenheider,

I am contacting you in regards to the permit that is being sought by Daley Farms of Lewiston in Winona County to expand their dairy operation to over 4600 animals. I grew up on a farm in West Central Minnesota and am fully aware of the sensitive issue of doing anything that would appear negatively impact 'family farms'. But when these entities reach a scale that would be unrecognizable by my grandparents, I believe it is in all our best interests to treat them like the corporate behemoth that they are.

For this reason I am urging you and your department to require a thorough EIS to assess the risk that a dairy of this size would pose on an already environmentally sensitive area.

Sincerely,
Dr. Todd Olson
Alexandria, MN
320-219-0782
Hello Kim,

I am very concerned about the massive dairy expansion in Winona county. As a fellow resident and farmer in this Bluffless region, and an organic produce farmer, I have huge apprehensions about the safety of such a large herd on our delicate landscape and ground water. Please make sure that all guidelines are followed and that every rock is turned to assure ecological responsibility.

Sincerely,
Norm Gross

--
Norm Gross
507-378-4252
www.earthdancefarm.net
@earthdancefarm
Dear Ms. Grosenheider and MPCA Commissioner Bishop:

Hello:

Please your power given through the Minnesota Environmental Protection Act (MEPA) to:

- order an in-depth Environmental Impact Statement (EIS) or
- deny permitting on an industrial-scale animal factory (1,000 animal units and above)

where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area.

*If negotiating in good faith, Daley farms should be more than willing to participate in public scrutiny for the well-being of their neighbors and customers before expanding.*

In addition, the court was correct in noting that the *MPCA was remiss in not considering greenhouse-gas emissions when it conducted its environmental review.* As the court noted, the MPCA routinely considers greenhouse-gas emissions in its environmental reviews of other projects; therefore, please consider greenhouse-gas emissions in the environmental review as well.

Sincerely,

Mary C. Voight
Please Please Please demand EIS for ALL operations that might threaten the state of our waters and lands.
Once water and land are polluted, it is difficult and costly, if not neigh on impossible to clean and reclaim these places.
It is your job to insure that all commercial operations in our state are wisely assessed.
I am counting on you to keep our State clean and free of polluting enterprises so that future generations will thrive here.
Most sincerely,
Carla M Benjamin
carlabenjaminartist@gmail.com
Dear Commissioner Bishop,

I urge you to exercise the power given to you through the MN Environmental Protection Act to order an in-depth EIS or deny permitting on all industrial-scale animal factories where there exists the “potential for significant environmental effects.” This is your civic duty. The health of Minnesota’s land and water depends on your protection.

Thank you.
Elizabeth Jarrett Andrew

Aliveness springs from our making something of what we experience and receiving what experience makes of us. --Ann Belford Ulanov
An Environmental Impact Statement (EIS) on farms with one thousand animals or more is just plain common sense. Manure from these animals can pollute local waters. Manure at these amounts contains a potent amount of methane which is a far stronger greenhouse gas than carbon dioxide. Manure at the amounts produced on large farms has a far greater negative impact than the same amount produced by a number of smaller farms.

A EIS is both a scientific necessity and common sense when evaluating large farms. Thank you karl meller.
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. The Daley Farms EAW fails to require action to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to include mitigation measures to offset all of these emissions. If it is not, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts yearly greenhouse gas pollution equivalent to the yearly tailpipe emissions of nearly 7,000 new cars on Minnesota roads. But the EAW estimates emissions reductions from only one mitigation measure, and that mitigation would reduce the pollution by just 1,000 tons per year, or about 3% of the total emissions. The MPCA has already identified over 20 management practices that could be used to offset greenhouse gas pollution from agriculture, but the EAW fails to discuss most of these practices. Moreover, the EAW does not estimate the degree to which these practices could reduce emissions from this feedlot, leaving the public without any information about how this project could be better designed to reduce its emissions. Even more problematic, the permit fails to require any of these mitigation practices even though they will also help reduce water pollution from the feedlot.

Even more disturbing is the argument in the EAW that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” This is a recipe for inaction. Taken to its logical conclusion, this argument would mean no mitigation measures can be required of any proposal that emits greenhouse gases in Minnesota, no matter how large, since all project are just a small share of the global emissions total. The Minnesota Public Utilities Commission uses a cost per ton of carbon dioxide to calculate the incremental impact of GHG emissions from a project and incorporates that cost into decisions. MPCA should be performing a similar analysis.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened to require mitigation of all of these emissions using best management practices.

Sincerely,
Aaron Klemz
1359 Hillcrest Dr NE
Fridley, MN 55432
Dear Resource Manager Kim:

Despite the fact that it is well known that the Karst subsoil region is very susceptible to infiltration of liquids into the water table, some businesses persist in ignoring the danger to health that results. Externalizing costs is an irresponsible business model.

A variance allowing for a larger herd increases the potential or certainty really, for the health effects associated with polluting a water supply. This variance should not be granted.

Thank you for your consideration.

Richard Meierotto
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

The world's top scientists all agree, we have about 10 years to stop the world from hitting a
tipping point of no return. Action is required RIGHT NOW.
Please be on the right side of history for your children and grandchildren.

Sincerely,
Anne Marie Gillen
3999 Clover Avenue
St. Paul, MN 55127
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Thanh Lo
623 15th Ave north
South St. Paul, MN 55075
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

The time is here, right now, to prove yourselves as leaders of the welfare of humanity. Chose
what is ethical, for the sake of all.
Respectfully,
Elizabeth Norman

Sincerely,
Elizabeth Norman
P. O. Box 127
Hovland, MN 55606
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Please protect our natural resources and base your actions on scientific evidence.
Sincerely,
Tom Griffin
4720 11th Ave S
Minneapolis, MN 55407
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

The cost of inaction far outweighs what it will cost to change our energy system. The main
reason for our inertia on dealing with climate change is the power of fossil fuel companies in our government. We all know that now it's time to make changes.

Sincerely,
Russell Yttri
658 Greenbrier St, #11
St Paul, MN 55106
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Jim Wilson
2489 Trojan Drive
Green Bay, WI 54304
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Mike Ferguson
205 Johnson Ave Apt B8
Eagle Lake, MN 56001
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Janey Palmer
3600 W. 55th St.
Edina, MN 55410
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Jim Marsden
1872 Howard St. N.
Maplewood, MN 55109
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

If you truly care - prove it to the state of Minnesota. It's far more than just about the money.
Well, it should be.

Regards,
Greg Solberg

Sincerely,
Greg Solberg
1645 Millwood Ave
Roseville, MN 55113
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Last week I slipped on the ice and suffered a concussion. While one slip and fall injury is not
an indictment on climate change, it is a symptom of the crisis. People are suffering the ill health effects of the climate crisis as is Wildlife.

Sincerely,
Catherine Zimmer
1790 Hague Ave
St Paul, MN 55104
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Please, please take action now. Our future depends on it.
Sincerely,
Carmen Marti
2128 Moorhead Rd
Cloquet, MN 55720
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

As a Science Teacher/Environmental Educator and a former Engineer, I am wholeheartedly
against the expansion of this industrial dairy farm; not only due to its GHG emissions but also other harmful environmental effects to the surrounding community!!

Sincerely,
Brad Snyder
8887 Dallas Lane N.
Maple Grove, MN 55369
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

I am NOT anti-agriculture. Family farms are a desirable institution worthy of public support.
Small farms are beneficial to the environment, health and our culture. Industrial agriculture should require strict adherence to a different set of rules.

Sincerely,
Karen Leno
460 1st Ave SE
Harmony, MN 55939
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

The MPCA’s purpose is to protect the environment of our state, and there is no larger threat
than the impacts of GHG emissions. These impacts are already being felt in the state, and every project must have a plan for mitigating these impacts.

Sincerely,
Daniel Tikk
791 Ashland Avenue
St. Paul, MN 55104
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Sharon Bachman
13000 Sylvan Ave
Lindstrom, MN 55045
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Bonnie Fox
1944 LOCHAVEN ALCOVE
WOODBURY, MN 55125
Commissioner Bishop and MPCA staff working on the Daley Farm EAW:

I'm a full time pastured hog farmer in southeastern MN and the sixth generation in my family to farm in Houston County. I also serve on the Houston County EDA and the Driftless Grown Advisory Committee.

I am extremely concerned about the Daley Farm expansion. After reviewing the EAW, it is clear to me that the proposed expansion clearly has the potential for very significant environmental impacts, so in order to follow the law and show the people of southeastern MN that the MPCA exists to control pollution, not facilitate it, an EIS must be ordered.

Commissioner Bishop, I'm cc'ing you on this comment because in my interactions with you it's been clear to me that you take your duties seriously and want to center equity, climate change and the needs of all citizens (not just pollution proposers) in your work. It's simply not right for a massive operation like the Daley's to expect to expand without a full accounting of the environmental impacts they expect to have on the residents of southeastern Minnesota.

In the end this will all come down to you -- you are the sole decision maker on EISs. It will take bravery and guts to make the right call but please remember the hundreds of postcards from farmers and rural residents from all over the state that I presented to you. If you have our back, we'll have yours. Please do the right thing, follow Minnesota law, and order a full EIS.

Dayna Burtness
Nettle Valley Farm
Spring Grove MN 55974

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Nettle Valley Farm
Spring Grove, MN
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

If government is not going to protect the environment and the people it is suppose to protect,
then it is time to get rid of the government and let the scientists and environmentalists make the big decisions..

Sincerely,
Jim Etzel
5652 Bachelor Rd NW
Hackensack, MN 56452
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dan Nelson
3010 Winnetka Ave N, Apt 423
Crystal, MN 55427
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

I urge you to use the full powers and expertise of the MPCA to reduce the emissions that are
leading to climate disaster.

Thank you.

Sincerely,
Clara Ueland
1902 Homestead Trail
Long Lake, MN 55356
I'm writing to voice my concern about the huge expansion of the Daley Dairy Factory Farm located in Lewiston, MN. I urge MPCA Commissioner Laura Bishop and the environmental review staff to use the power given to them through the MEPA to order an in-depth environmental impact statement (EIS) or deny permitting Daley Farms to expand to a horrendously dangerous herd size.

Thank you for your attention to this matter.

Doreen Blohm
Oakdale, MN 55128
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Elizabeth Kerwin
525 Fairview Ave S apt 214
St. Paul, MN 55116
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

The benefits of strengthening strategies to mitigate greenhouse gas emissions is good for all of
us, in the short and long term. Let's commit to doing what we can one project at a time. Presently, this means Daley Farms.

Thank you,

-Pat Pardun

Sincerely,
Patricia Pardun
580 Chestnut Street, P.O. Box 146
Marine on St. Croix, MN 55047
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Robert Wohlberg
6739 11th ave s
Richfield, MN 55423
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review; we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Cathy Wood
3700 E Superior St
Duluth, MN 55804
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Cynthia Launer
3415 Harriet Ave.
Minneapolis, MN 55408
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Phyllis Ballata
4712 Cook Avenue
White Bear Lake, MN 55110
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Richard Nethercut
14083 County 23
Cnaton, MN 55922
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Karen Brennhofer
305 high dr
Sartell, MN 56377
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Barbara Whitney
2715 Silver View Drive
Orono, MN 55356
From: JLVrchota@merchantsbank.com
To: Grosenheider, Kim (MPCA)
Subject: Re: Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions related
Date: Thursday, January 30, 2020 3:14:32 PM

Kim,
I wanted to put in a comment in regards to the Daley Expansion. I'm an Ag Lender here in Winona County and have watched us drop from one of the top Dairy Producing counties to far down the ranks. Small dairy farms are going out of business due to pricing and the inability to compete unless they reach a larger economy of scale. The fact is that we've lost so many producers and so many cows, that the Daley Expansion won't even bring us up to the cow numbers we were at 5 years ago. I believe the issue is greenhouse gas emissions that is under assessment at this time, but if the cow numbers are down this much, their addition is not going to have any more effect than the higher cow numbers that the county had just 5-6 years ago. There are too many variables in this assessment, and even the federal Environmental Protection Agency (EPA) has been unable to create accurate models for livestock facilities' impact on air quality. The Daley's due an excellent job managing their manure and in fact area wells nitrate percentages have improved 2-3% since 1991. The economy needs the Daley's as well as their needs are filled by local businesses. I'd ask that you look carefully at the need for this additional environmental review. Every day we keep this family farm from expanding hurts dairy production in Winona County, and hurts local businesses that provide supplies for this operation. Thank you for allowing me to make this comment during the 30 day comment period.
Respectfully,
Jim Vrchota

Jim J Vrchota
Vice President Commercial/Ag Banker

My Leadership Mission Statement: “To live the life of a Servant Leader, with Integrity and Empathy, and to be a Positive Force in the Lives of the People I Touch.”
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

NOW would be a VERY GOOD time to START.
Sincerely,
Wendy Peardot
4500 Southmore Dr
Minneapolis, MN 55437
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Add a personalized message. As a natural resources professional, it's abundantly clear to me
that anthropogenic climate change is in progress and that we are past due for meaningful action.

Sincerely,
Peter Leschak
Box 51
Side Lake, MN 55781
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Peggy Endres
943 Wilder St S
Saint Paul, MN 55116
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Danielle Engle
7375 157th St W
Apple Valley, MN 55124
Dear Ms. Grosenheider,

ALL animal confinements should, indeed MUST go through the Environmental Impact Statement process, if we truly are going to care for our bountiful and beautiful environment.

My wife and I spent 18 years in northwest Iowa. Where we couldn't open our windows, swim or fish in the local waters, or successfully grow a garden because of the stench, and the air and water pollution caused by industrial scale (confinement) animal husbandry and herbicidal agriculture.

We MUST save Minnesota from that dismal fate!

Rev. John M. Riggle

Rev. John M. Riggle
C: (712) 449-0027

"I thank my God ... in every prayer of mine for you ..." Philippians 1:3 & 4

"Come to me, all you who are weary and carrying heavy burdens, and I will give you rest. Take my yoke upon you and learn from me ... for I AM gentle and humble in heart, and you will find rest for your souls. For my yoke is easy and my burden is light." Matthew 11:28-30
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Thanks for sticking to your goals
Sincerely,
Craig Kvamme
2716 15 st sw
bemidji, MN 56601
This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Please apply at precautionary principle in permitting an expanded dairy. Your job through MEPA is to protect the environment and citizens. This proposed expansion is in an already polluted and sensitive area. There is no way that more than 1000 cows in one facility is sustainable in the region.

DO YOUR JOB. Either say no (best) or order and in-depth EIS!!
Nancy Conger
North Branch MN
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Nancy Salminen
1415 Walsh Road
Ely, MN 55731
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Loni Kemp
14083 County 23
Canton, MN 55922
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Also, we don't need or want another factory farm in Minnesota. Especially one that will
increase the pollution of our air, land, and water.

Sincerely,
Carlys Quiram
PO Box 22
Bluffton, MN 56518
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Vivian Levine
3911 Random Lane
Sacramento, CA 95864
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Jan Ackerman
15781 Hayes Trl.
St. Paul, MN 55124
Kim,

I am sending this email to you in support of the permit for Daley Farms proposal for expansion. I am a former DVM to the dairy from the Lewiston Veterinary clinic and presently working with the dairy in baby calf management using pasteurized colostrum to enhance the immune system. The technology used at the dairy is cutting edge at many of the areas concerning animal agriculture. I have been, and still am, in awe of the number of families involved in making their operation one of the premier in the state. Their complete understanding of operating a dairy farm is exemplary of the needs of a modern dairy production facility.

I would highly recommend the approval of their application and allow them the ability to move ahead with their plans to increase their animal numbers.

Thank you.

Robert J. Schell DVM
Calfstart LLC
203 1st Ave SE
Altura, MN 55910
DrBob@CalfStart.com
www.CalfStart.com
507-458-5624

Sent from my iPhone
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Kim,

We are writing to you regarding the EAW related to potential greenhouse gas emissions related to Daley Farms of Lewiston dairy modernization project. First of all, we totally support the Daley family’s efforts to expand their farm and to pass on their family farm that has been part of our community and their family for six generations. The Daley Family is an awesome family, and they are excellent dairy farmers and stewards of the land. It is amazing to me, that people who have absolutely no knowledge of agriculture or dairy farming, can be so vocal regarding this issue, and so influential. These individual’s opinions are based on scare tactics generated by an activist group in our community. It is also frustrating that the majority of the comments opposing this modernization project come from people who do not even reside in Winona County.

Neither the Minnesota Pollution Control Agency, nor any prior court decision has previously required an analysis of potential greenhouse gas emissions from a livestock facility in Minnesota. There is no easy measure for determining the environmental impact from a feedlot permit because of the substantial difficulty and uncertainty in estimating emissions from animal feedlots. Even the Federal EPA has been unable to create accurate models for livestock facilities’ impact on air quality because there are too many variables in the process.

The Daley’s are excellent stewards of the land. Supporting documents demonstrated that due to the family’s stewardship and utilization of best practices, that nitrate percentages in area wells have improved by 2-3 percent since 1991. The MPCA also publicly stated that the project would not have any adverse effects on water quality. The manure basins not only meet, but far exceed, the required engineering standards. According to a study of air emissions for the expanded facility, it would also meet air quality standards and odor guidelines.

There are numerous environmental advantages to this project; the project will utilize 1,000 additional acres of land to raise alfalfa and will convert and retain even more acres for use as pasture. It has been proven that alfalfa and pasture grass sequester carbon in the soil and reduce the amount of carbon in the atmosphere. The application of manure will replace nutrients that farmers would otherwise provide to their fields via the application of chemical fertilizers. Chemical fertilizer production has been shown to increase GHG emissions from the land.

Livestock production is positive for the environment and for the community as a whole. I have visited many areas in the United States that have lost their livestock farming presence. Those
communities have been drastically hurt by not having livestock. We strongly support the efforts of the Daley family to pass their farm to the next generation and firmly believe this project has been delayed for far too long.

Thank you for taking the time to read our comments.

Sincerely,

John and Connie Meyer
18689 Highway 248
Rollingstone, MN 55969
507-458-0569
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Judy Nelson
54 Helberg Road
Esko, MN 55733
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Mary Pouliot
2157 Overlook Dr.
Bloomington, MN 55431
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dave Huberty
213 e Sheridan st
Ely, MN 55731
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

It’s NOT enough to just measure greenhouse gas pollution in an environmental review!! We
need to be doing everything we possibly can to keep this planet healthy and thriving for the next generations!

Sincerely,
Nicole Laumer
2905 Knox Ave S apt 1
Minneapolis, MN 55408
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Information without action is worthless. There must be action to mitigate this climate crisis.
And those actions must be in writing and enforceable.

Sincerely,
Doris Gasteiro
301 South 5th St, Apt. 328
Mankato, MN 56001
With the vast corruption taking place on a national level, we should not succumb to the same thing here in MN.

An EIS for the Daley farm is an absolute necessity.

Anyone with an ounce of sense knows that that many cattle in one place is an absolutely shit show—literally and figuratively. An EIS will provide concrete facts for this.

Dr. Elizabeth Oness
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Maura O'Connor
46 Lisa Drive
Newark, DE 19702
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Patricia Donaldson
P.O. Box 7035
Saint Paul, MN 55107
On behalf of Dodge County Concerned Citizens, see attached comments requesting an EIS regarding expansion of Daley Farms.

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizens
TO: Kim Grosenheider, Resource Management and Assistance Division, MPCA

FROM: Sonja Trom Eayrs, on behalf of Dodge County Concerned Citizens

Re: EIS Required – Expansion of Daley Farms Factory Farm on Karst Topography

DATE: February 1, 2020

Dodge County serves as an example of the dangers associated with installation of a large factory farm on karst topography. The Swiss settlement of Berne, an area known for its beautiful karst topography, limestone outcroppings, sink holes and natural springs is situated on the north end of the county. Nearly 15 years ago, the Berne neighborhood formed the Berne Alliance and vigorously protested installation of a large gestation sow factory farm on karst topography. Dodge County, which has never denied approval of a large factory farm, approved the factory farm anyway. To hell with the neighbors.

The gestation facility, the essential hub to further development, would eventually supply piglets to other large hog feeder operations in the immediate area. Berne Alliance members raised concerns regarding environmental degradation to the sensitive geologic area, pleas which were dismissed by county and state officials and brushed aside.

Following installation of this large factory farm and other area feeder operations, Dodge County has experienced a serious high nitrate problem in private wells throughout the county. Dodge County officials acknowledge “that nitrate is present above background concentrations in
21% of all wells and above the health risk limit in 7% of all wells.”¹ Testing of nitrate levels from 1995 to 2011 revealed that 21% of private drinking water wells were impacted by nitrate or potentially unsafe to drink.² County officials also acknowledge that “[d]rinking water sources are highly vulnerable to surface contamination in about 1/3 of the county. These are the areas with shallow soils over limestone and over sand aquifers. People living in these areas have a greater likelihood of drinking water contaminated by nitrogen.”³ Despite acknowledgment of this serious problem, County officials make no effort to look forward and address the serious nitrate problem in the county.

Following installation of this large swine factory farm situated on karst topography, nitrate levels continued to rise dramatically in area wells. My mother-in-law, Ruth Eayrs, watched nitrate levels rise above safe standards and encouraged family members to drink only bottled water at the Eayrs farm. For years, water testing revealed nitrate levels far in excess of the state health standard of 10 mg/L. The Eayrs family participated in the Nitrate Monitoring Program and dutifully submitted water samples to the local environmental services office in the spring and fall of each year. While pigs in the neighboring swine factory farm drink pristine water from a well drilled 480 feet down to the Prairie Du Chien Aquifer through multiple layers of porous limestone,⁴ the neighbors drink nitrate-filled water. The Eayrs family farm repeatedly reports dangerous nitrate

---

¹ 2018 Comprehensive Plan, Dodge County, MN (Draft 12/12/18) at 48; see also, Nitrogen in Dodge County Ground and Surface Waters, Dodge County Environmental Services.
² Nitrogen in Dodge County Ground and Surface Waters, Dodge County Environmental Services.
³ Id.
⁴ Minnesota Department of Health, Well and Boring Record, Minnesota Well No. 733093 issued to Mark Finstuen, 1/20/2006.
levels nearly three times the state standard of 10 mg/L – 25.1 mg/L, 16.2 mg/L, 26.6 mg/L, 21.2 mg/L. Levels beyond 10 mg/L “are linked to health effects in infants and expectant mothers, and the presence of nitrate may be an indicator of other of other contaminants in the water.”

The Eayrs family is not alone. According to the Environmental Working Group (EWG), in a report released in January 2020, “[d]rinking water for an estimated half a million Minnesotans is drawn from groundwater contaminated with elevated levels of nitrate, a toxic pollutant that is linked to cancer and is especially dangerous to infants.” “About one in eight Minnesotans served by groundwater-based public water systems consume tap water that, in tests performed over the past 10 years, had at least one detection of nitrate at or above the level the state considers a marker of potentially worsening contamination. Tens of thousands more Minnesotans are drinking from private household wells with elevated nitrate.”

Nitrates and cancer—this dangerous link startles local citizens. Over the years, Berne area residents witnessed the death of several neighbors from cancer. “Cancer Road”—conveniently located on the same road as a large swine factory farm—has been the site of several cancer deaths over the years, claiming members of the Streiff, Knobel, Bennerotte families and finally claimed the life of my mother-in-law, Ruth Eayrs, in the fall of 2013. A vibrant and intelligent woman with a compassionate heart, Ruth lived most of her life just one mile south of “Cancer Road.”

---

5 Dodge County Environmental Services test results dated April 6, 2017.
6 Dodge County Environmental Services test results dated November 28, 2017.
7 Dodge County Environmental Services test results dated April 16, 2018.
8 Dodge County Environmental Services test results dated December 15, 2018.
9 Dodge County Environmental Services, 721 Main Street, Dept. 391, Mantorville, MN test results dated April 6, 2017 and November 28, 2017.
10 Porter, Sarah, Senior GIS Analyst and Weir Schechinger, Anne, Senior Analyst of Economics, Tap Water for 500,000 Minnesotans Contaminated with Elevated Levels of Nitrate, Environmental Working Group (January 2020).
11 Id.
Confounded by the number of cancer deaths in Dodge County—cancer has tragically touched the lives of several area factory farm operators and their neighbors. Suffering local citizens search for answers.

High nitrates not only seep into private wells, they also seep into public well systems. Throughout Minnesota, public water systems struggle to provide clean drinking water for residents. “Data from the US. Environmental Protection Agency show that 472,983 Minnesotans—more than the population of Minneapolis—are served by a total of 727 public water systems that are contaminated with at least 3 mg/L of nitrate. Almost 300,000 people drink from public systems contaminated at or above 5 mg/L, and more than 150,000 from public systems with at least 10 mg/L.”

Please, learn from the lessons in Dodge County and order an EIS for the massive Daley Farms expansion. Do not repeat the mistakes of Dodge County in Winona County.

12 Porter, Sarah, Senior GIS Analyst and Weir Schechinger, Anne, Senior Analyst of Economics, Tap Water for 500,000 Minnesotans Contaminated with Elevated Levels of Nitrate, Environmental Working Group (January 2020).
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

At this time of record flooding, rising sea levels and massive forest fires lasting weeks on end
all over the globe, it’s time every single person, business and government agency take action to mitigate our environmental impact now.

Sincerely,
Lori Kampa
10640 26th St SE
Saint Cloud, MN 56304
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Mary Ann Lundquist
4224 Queen Ave S
Minneapolis, MN 55410
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Stop nickel and diming my nieces' safety and happiness. Do more than is "practical", "politic"
or even "scientific": Be big, think big when thinking about people, and Scrooge-like when thinking of benefits to business: do the right thing.

Sincerely,
Thomas G Dickinson
3212 18th Ave S
Minneapolis, MN 55407
I am urging Commissioner Bishop to vote YES on an EIS. We have a water pollution crisis well under way in MN. Mostly due to poor monitoring and enforcement of manure and fertilizer application actions by a large number of farms. Abuses on vulnerable soil is all the more reason to enact LAWS requiring these very large CAFOs to have MANDATORY and automatic EISs to protect the ground water of our citizens. Preventable pollution measures should be a no questions action.

Renee Bjork
20584 Cty Rd 18
Brooten MN 56316
320 424 8910

Sent from Yahoo Mail on Android
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Janice Hallman
5355 anderlie lane
Saint paul, MN 55110
Ms. Grosenheider,

- If Daley Farms were to be allowed to expand, it would be the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy.

- The EAW's recommendations are inadequate, inaccurate, and incomplete. MPCA stated it can't "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph)

- "Estimates of potential emissions" are unsubstantiated. We don't know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: "The Project will release air and odor emissions typically associated with a dairy farm" (6A). This expansion would create a mega-dairy 9 to 23 times bigger than the typical Minnesota dairy, but concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water.

- Daley Farms has been out of compliance with state regulations for run-off with violations filed by the MPCA's feedlot division that have gone unenforced over 23 years. The EAW assumes Daley will comply with the MPCA's recommendations if a permit is granted.

- Recommendations to control greenhouse gasses are vague and not maintainable. For instance, "Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public." The Daley operation will have no control over the spreading of manure on acres owned by others (about 42% of the MMP acreage), since the EAW only applies to the Daley land.

This is not an acceptable proposal by any reasonable, prudent person's standards.

Julius Salinas
Dear Ms. Grosenheider. I moved to MN from CA over twenty years ago. What attracted me was the thoughtful and forward looking way that MN approached issue related to the environment. Things haven't been perfect, but overall MN makes good choices. I think that's a big reason MN outshines other states in the region in terms of national reputation. One of the things that was so sad about driving CA's Interstate 5 is the giant feedlot that is filled with beef cows standing in their own filth in all kinds of weather. The smell travels for over twenty miles down the Interstate in both directions. You cannot help but feel sickened at the smell, and feel deeply sad for the animals and those who work there. It is horrible to witness.

In later years I learned more about the horrible impact these feeding operations also have on the environment. Serious damage to air, soil and water occur simply because too many animals are packed together for the sake of money. Why, when small farmers are struggling, Climate disaster is at hand, and the impact of such places can be so destructive is there no Environmental Impact Study? It makes no sense, and the lack of one taints the reputation of your fine institution. That alone should make you pause for reflection.

Please give our farmers, who are already being decimated, and our planet, which suffers too, the chance to be protected by something as simple as an Environmental impact study.

Thank you,
Sally Padgett
Bethel University,
Saint Paul, MN
I am writing on behalf of Dodge County Concerned Citizens in opposition to expansion of Daley Farms in Winona County, Minnesota.

The Trom family farm is situated in southern Dodge County, Minnesota. Our beautiful family farm is surrounded by 11 swine factory farms in a 3-mile radius. We can speak firsthand to the dangers associated with factory farms. These operations are placed within feet of family farms that have been in the family for generations. Industry giants don't give a damn about the neighbors. My parents were recently involved in legal proceedings involving the industry and Dodge County elected officials. I ask that you include the attached briefs that were filed with the Minnesota Court of Appeals in your official record. The briefs address the serious environmental, antibiotic resistance bacteria as a risk to public health, general public health concerns and other problems associated with factory farms - problems that are consistent with the existing Daley facility in Winona County. Expansion of the Daley facility will only serve to exacerbate these serious problems.

Take action to protect the citizens of Winona County - citizens you are paid to represent - not the industry.

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizen
No. A16-1099

State of Minnesota
In Court of Appeals

Lowell Trom, et al., Appellants,
v.
County of Dodge, et al., Respondents, and
Masching Swine Farms, LLC, Respondent.

BRIEF OF AMICI CURIAE
THE HUMANE SOCIETY OF THE UNITED STATES
AND ANIMAL LEGAL DEFENSE FUND

JAMES P. PETERS (#177623)
Law Offices of James Peters PLLc
460 Franklin Street N. #100
Glenwood, MN 56334
(320) 634-3778
Attorney for Appellants

PAUL D. REUVERS (#217700)
Iverson Reuvers Condon
9321 Ensign Avenue S.
Bloomington, MN 55438
(952) 548-7205
Attorney for Respondent County

JACK Y. PERRY (#209272)
Briggs and Morgan
80 S. 8th Street
Minneapolis, MN 55402
(612) 977-8400
Attorney for Respondent
Masching Swine Farms, LLC

JENNEANE JANSEN (#236792)
Kris Palmer (#240138)
Jansen & Palmer, Llc
4746 Elliot Avenue S.
Minneapolis, MN 55407
(612) 823-9088
Attorneys for Amici Professors and Researchers

KEVIN P. LEE (#395933)
Minn. Ctr. for Envtl. Advocacy
26 E. Exchange Street, Suite 206
St. Paul, MN 55101
(651) 223-5969
Attorney for Amici
Environmental Organizations

BRUCE D. NESTOR (#318024)
De León & Nestor, Llc
3547 Cedar Avenue S.
Minneapolis, MN 55407
(612) 659-9019
Attorney for Amici The Humane Society of the United States and Animal Legal Defense Fund
TABLE OF CONTENTS

TABLE OF AUTHORITIES ........................................................................................................ ii

ARGUMENT ..............................................................................................................................1

I. INTRODUCTION .................................................................................................................. 1

II. THE PLANNING COMMISSION, DODGE COUNTY BOARD, AND TRIAL COURT ALL ERRED IN IGNORING ANTIBIOTIC RESISTANCE IN BACTERIA AS A RISK TO THE PUBLIC HEALTH .................................................................................................................. 3

   a. The County and the District Court Failed to Consider Appellants’ Significant Health Concerns of Increased Antibiotic Resistance from the Masching Feedlot Approval. ..........3

   b. The Dodge County Zoning Ordinance Requires Consideration of Antibiotic Resistance and Its Public Health Implications.................................................................6

   c. The Addition of a Large Hog Feedlot Significantly Increases the Risk of Proliferation of Antibiotic-Resistant Bacteria.................................8

   d. The County Decision to Approve the Masching Feedlot Conditional Use Permit without Any Consideration to the Risk of Increased Antibiotic Resistance Was Arbitrary and Capricious ..........................................................19

III. THE DISTRICT COURT’S STANDARD OF REVIEW WAS FAR TOO DEFERENTIAL TO COUNTY DECISION-MAKERS .........................20

IV. CONCLUSION ...................................................................................................................25

CERTIFICATE OF BRIEF LENGTH ..........................................................................................26
# TABLE OF AUTHORITIES

## Cases

<table>
<thead>
<tr>
<th>Case</th>
<th>Citation</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>BECA of Alexandria, LLP v. County of Douglas ex rel. Bd. of Comm'rs,</td>
<td>607 N.W.2d 459 (Minn. App. 2000)</td>
<td>7, 19</td>
</tr>
<tr>
<td>Corwine v. Crow Wing County</td>
<td>244 N.W.2d 482 (Minn. 1976)</td>
<td>20</td>
</tr>
<tr>
<td>In re Block, 727 N.W.2d 166 (Minn. App. 2007)</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>In re City of Annandale, 731 N.W.2d 502 (Minn. 2007)</td>
<td></td>
<td>21, 24</td>
</tr>
<tr>
<td>Interstate Power Co. v. Nobles County Bd. of Comm'rs, 617 N.W.2d 566 (Minn. 2000)</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Minn. Ctr. for Envtl. Advocacy v. City of St. Paul Park, 711 N.W.2d 526 (Minn. App. 2006)</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Minn. Ctr. for Envtl. Advocacy v. MPCA, 644 N.W.2d 457 (Minn. 2002)</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Pope County Mothers v. Minn. Pollution Control Agency, 594 N.W.2d 233</td>
<td>(Minn. App. 1999)</td>
<td>7, 18, 19</td>
</tr>
<tr>
<td>RDNT, LLC v. City of Bloomington, 861 N.W.2d 71 (Minn. 2015)</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>Reserve Mining Co. v. Herbst, 256 N.W.2d 808 (Minn. 1977)</td>
<td></td>
<td>21, 22</td>
</tr>
<tr>
<td>Reserve Mining Co. v. MPCA, 364 N.W.2d 411 (Minn. 1985)</td>
<td></td>
<td>23</td>
</tr>
<tr>
<td>Schwardt v. County of Wantonwan, 656 N.W.2d 383 (Minn. 2003)</td>
<td></td>
<td>7, 20, 23</td>
</tr>
</tbody>
</table>

## Statutes

<table>
<thead>
<tr>
<th>Statute</th>
<th>Section</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minn. Stat. § 394.301</td>
<td></td>
<td>6, 22, 23</td>
</tr>
</tbody>
</table>

## Other Authorities

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
</table>


European Ctr. for Disease Prevention & Control et al., *Joint Opinion on Antimicrobial Resistance Focused on Zoonotic Infections* (2009) ................. 9, 10, 15, 16

Eva Hershaw, “When the Dust Settles,” Texas Monthly (Sept. 2016) ......................................................................................... 15

FDA, 2014 Summary Report on Antimicrobials Sold or Distributed for Use in Food-Producing Animals (Dec. 2015) ......................................................................................... 17


Gerd Hamscher et al., *Antibiotics in Dust Originating from a Pig-Fattening Farm*, 111 Envtl. Health Perspectives 1590 (2003) ......................................................................................... 15


John P. Holdren & Eric Lander, President's Council of Advisors on Sci. & Tech., *Report to the President on Combating Antibiotic Resistance* (2014) ......................................................................................... 8, 14, 17


M. Carrell et al., Residential Proximity to Large Numbers of Swine in Feeding Operations is Associated with Increased Risk of Methicillin-Resistant Staphylococcus Aureus Colonization at Time of Hospital Admission in Rural Iowa Veterans, 35 Infection Control & Hosp. Control Epidemiology 190 (2014) ......................................................................................................................... 12, 18

M. Faldynova et al., Prevalence of Antibiotic Resistance Genes in Faecal Samples from Cattle, Pigs and Poultry, 58 Veterinarni Medicina 298 (2013) ......................................................................................................................................................................................... 12


M.H. Rostagno et al., Split Marketing as a Risk Factor for Salmonella Enterica Infection in Swine, 6 Foodborne Pathogens & Disease 865 (2009) ......................................................................................................................... 11


N. Wu et al., Abundance and Diversity of Tetracycline Resistance Genes in Soils Adjacent to Representative Swine Feedlots in China, 44 Envtl. Sci. & Tech. 6933 (2010) ......................................................................................................................................................................................... 11


Press Release, United Nations, High-Level Meeting on Antimicrobial Resistance (Sept. 21, 2016) ......................................................................................................................................................................................... 3

Science Daily, “Multidrug-Resistant Bacteria Found to be Airborne in Concentrated Swine Operation” .................................................. 14

Shylo E. Wardyn et al., *Swine Farming is a Risk Factor for Infection With and High Prevalence of Carriage of Multidrug-Resistant Staphylococcus Aureus*, 61 Clinical Infectious Diseases 59 (2016) ......................... 10


Timothy A. Johnson et al., *Clusters of Antibiotic Resistance Genes Enriched Together Stay Together in Swine Agriculture*, 7 mBio e2214-15 (Mar./Apr. 2016) .................................................. 8


**Regulations**

Dodge County Zoning Ordinance § 18.13.12 .................................. 25

Dodge County Zoning Ordinance § 18.13.8 .................................. 6, 7, 19

Exec. Order No. 13676 (Sept. 18, 2014) .................................. 16

ARGUMENT

Pursuant to this Court's August 19, 2016 Order, as well as Rules 129 and 132 of the Minnesota Rules of Civil Appellate Procedure, amici The Humane Society of the United States ("HSUS") and Animal Legal Defense Fund ("ALDF") submit the following brief in support of Appellants.¹

I. INTRODUCTION.

In their challenge to the approval of Masching, LLC hog feedlot conditional use permit ("CUP"), Appellants Lowell and Evelyn Trom did not receive the agency and judicial review they deserved. The Dodge County Planning Commission and Board of Commissioners (collectively, "the County"), and subsequently the Dodge County District Court, approved the Masching CUP without full inquiry into the hog feedlot’s public health threat, opening the door for disease and infection to enter easily into the Appellants’ community. In support of Appellants, HSUS and ALDF respectfully submit this amicus brief to assist the Court in understanding two critical errors that occurred within the CUP approval and judicial review decisions below.

First, the County and the District Court both failed to consider a serious threat to public health and animal welfare: the spread of antibiotic-resistant bacteria. Appellants repeatedly explained to the County how the hog feedlot CUP risked developing and widely spreading antibiotic-resistant bacteria in the area, posing a specific public health threat to feedlot workers, neighbors, and County residents. The Masching feedlot will

¹ No party's counsel authored this brief in whole or in part, and no person or entity other than amici and their counsel contributed to the preparation and submission of this brief.
produce manure that will first pile up inside the feedlot building, and will then be spread over at least 244 acres. Antibiotic-resistant bacteria from the manure can jump to human populations via various environmental pathways—through the air as dust, up from the soil into edible crops, and into groundwater and surface waterways. Yet the County did not press pause on its fast-track approval of the Masching CUP—i.e., what the District Court called a “cart-ahead-of-the-horse approach to CUP analysis and approval”—to assess the potential health risks. Nor did the District Court acknowledge the serious threat of increased antibiotic resistance. In spite of broad scientific consensus that the continuous, herd-wide use of antibiotics to raise pigs has led to the development and spread of antibiotic-resistant bacteria, producers at hog feedlots routinely provide low level doses of antibiotics to every animal in the facility, regardless of whether a specific animal is sick. See Björn Bengston & Christina Greko, Antibiotic Resistance – Consequences for Animal Health, Welfare, and Food Production, 119 Upsala J. Med. Scis. 96 (2014).
the County—especially on this important public health issue. The District Court erred in
upholding the CUP decision despite there being nothing in the record to permit
meaningful judicial review of the County’s consideration of the consequences of large-
scale antibiotic usage at the Masching facility.

Antibiotic-resistant bacteria are so significant a threat that the United Nations
General Assembly, acting for fourth time ever on a public health issue and the first time
since the Ebola emergency of 2014, declared resistance a “most urgent global risk.” If a
county were to fail to consider public health implications in approving a CUP that
increased the risk of Ebola, a reviewing court would surely intervene—yet here, the
District Court allowed the County to ignore a similar risk.

Accordingly, for the reasons described below, amici HSUS and ALDF support
Appellants’ position that this Court should reverse the District Court and vacate the
Masching CUP.

II. THE PLANNING COMMISSION, DODGE COUNTY BOARD, AND
TRIAL COURT ALL ERRED IN IGNORING ANTIBIOTIC
RESISTANCE IN BACTERIA AS A RISK TO THE PUBLIC HEALTH.

a. The County and the District Court Failed to Consider Appellants’
Significant Health Concerns of Increased Antibiotic Resistance from
the Masching Feedlot Approval.

Before the County, the Appellants repeatedly expressed concern about how the
Masching CUP posed a risk of increased antibiotic resistance. When the County first

---

antimicrobial-resistance/.
considered the Masching CUP application, in April 2014, Appellants’ counsel James Peters submitted a letter explaining:

MRSA [bacterium named methicillin-resistant Staphylococcus aureus] is considered a major threat to public health with the FDA taking action against hog production facilities to reduce this threat. Among other things, the FDA announced in December 2013 that it is implementing a voluntary plan with the industry to phase out the use of antibiotics for enhanced food production. Antibiotics used in hog feed is a factor in the development of drug-resistant bacteria. Industrial farm workers have been contaminated with pig MRSA, an antibiotic resistant bacteria, that is increasingly found in hogs. The Project would in Dodge County add to what governments consider a major public health threat.

AR 065 (emphasis added). The Peters letter included an exhibit listing multiple studies that explain how CAFOs generally, and hog feedlots in particular, increase the risk of creating and spreading antibiotic-resistant bacteria. AR 069-70. Soon after receiving the Peters letter, the County approved the CUP without considering the feedlot’s impact on developing antibiotic-resistant bacteria. See AR 70A-77.

Appellants appealed the April 2014 CUP approval, and the District Court vacated the CUP on November 18, 2014. See Mem. Order 5, Trom et al. v. Dodge County, 20-cv-15-17 (3d Judicial Dist. Ct. May 13, 2016) [hereinafter “May 2016 Order”]. Two days later, Masching applied for a new CUP for the same project. AR 122. Appellants again submitted information identifying serious concerns with how concentrated feedlots like the Masching CUP proposal contribute to an increase in antibiotic-resistant bacteria. For instance, Appellants submitted a letter from Michael Williamson asking that the County not approve the Masching CUP because hog feedlots “cause health problems.” AR 629. The Williamson letter included, as an exhibit, a white paper from the National
Association of Local Boards of Health. The white paper described how feedlots like the Masching CUP feedlot can create public health harms:

The trend of using antibiotics in feed has increased with the greater numbers of animals held in confinement. The more animals that are kept in close quarters, the more likely it is that infection or bacteria can spread among the animals. Seventy percent of all antibiotics and related drugs used in the U.S. each year are given to beef cattle, hogs, and chickens as feed additives. Nearly half of the antibiotics used are nearly identical to ones given to humans.

There is strong evidence that the use of antibiotics in animal feed is contributing to an increase in antibiotic-resistant microbes and causing antibiotics to be less effective for humans. Resistant strains of pathogenic bacteria in animals, which can be transferred to humans [through] the handling or eating of meat, have increased recently. This is a serious threat to human health because fewer options exist to help people overcome disease when infected with antibiotic-resistant pathogens. The antibiotics often are not fully metabolized by animals, and can be present in their manure. If manure pollutes a water supply, antibiotics can also leach into groundwater or surface water.

AR 651 (internal citations omitted).

Even though the County decision-makers claimed they “all had a chance to read” the letters they received, see AR 959, neither the County Planning Commission nor the County Board considered, or even referenced, the threat of increased antibiotic resistance in their reports and meetings. See, e.g., AR 779-84, 785-87, 884-971, 986-1007.

The District Court similarly did not consider the risk of increased antibiotic resistance. Appellants directed the District Court to their submissions before the County,

4 See also AR 961 (“Okay, we got this big binder here that was handed to us yesterday and that we all read last night”) (transcript of Dec. 11, 2014 Dodge County Planning Commission meeting); AR 994 (“We also received the letters that was [sic] talked about earlier so we’ll – we’ll put that into the – packet”) (transcript of Dec. 11, 2014 Dodge County Board of Commissioners meeting).
which discussed their suite of public health concerns, including the increased
development of antibiotic resistance. *See Pls.’ Mot. for Summ. J. Br. 11-12, 18-19. In its
decision, the District Court only reviewed the County’s consideration (or lack thereof) of
one public health issue—the “alleged connection” of feedlots to “development of a
‘cancer cluster.’” May 2016 Order 14. This was the totality of the District Court’s
discussion of whether the CUP will endanger the public health. Neither the Appellants’
antibiotic resistance concerns nor the County’s failure to consider such concerns
appeared in the District Court’s Order.5

b. **The Dodge County Zoning Ordinance Requires Consideration of
Antibiotic Resistance and Its Public Health Implications.**

As part of its authority to carry out planning and zoning activities, Dodge County
may designate a process for permitting “conditional uses.” *See Minn. Stat. § 394.301,
subd. 1. The County has made such a designation through its zoning ordinance. *See AR
439 (Dodge County Zoning Ordinance § 18.13.8) [hereinafter “Zoning Ordinance”].

“Conditional uses may be approved upon a showing by an applicant that the
standards and criteria stated in the ordinance will be satisfied.” *Minn. Stat. § 394.301,
subd. 1. However, the County decision approving a CUP is arbitrary or capricious if,
among other reasons, “it entirely failed to consider an important aspect of the problem.”

---

5 The District Court may have been referencing the Williamson letter when it wrote,
“Troms and Dodge County Concerned Citizens have presented articles indicating that
‘concentrated animal feeding operations or large industrial farms can cause a myriad of
environmental and public health problems.” May 2016 Order 14. If so, the District
Court’s review skipped over the public health concerns in the letter. The court focused
exclusively on one of the environmental problems identified, simply stating, “there is no
evidence in the record adequate to support a conclusion that *this* project will damage the
habitat of protected species.” *Id.* at 14-15 (emphasis in original).
Multiple Zoning Ordinance criteria, which require the County to make findings before it may grant a CUP, encompass the public health threats of increasing antibiotic-resistant bacteria. In relevant part, the Zoning Ordinance states that before approving a CUP, the County Board shall find that:

I. The establishment, maintenance or operation will not be detrimental to or endanger the public health, safety, or general welfare [. . . ]

IV. The proposed use is compatible with adjacent uses of land. The use shall not be substantially injurious to the permitted uses nor unduly restrict the enjoyment of other property in the immediate vicinity. This includes whether the applicant has ensured adequate measures have been or will be taken to prevent or control offensive odor, fumes, dust, noise, and vibration, so that none of these will constitute a nuisance6 [. . . and]

IX. That existing groundwater, surface water and air quality are or will be adequately protected.

Zoning Ordinance § 18.13.8.

With regard to ordinance criteria like these, this Court has held that “[a] legally sufficient reason [to deny a CUP] is one reasonably related to the promotion of the public health, safety, morals and general welfare of the community.” BECA of Alexandria, LLP v. County of Douglas ex rel. Bd. of Comm’rs, 607 N.W.2d 459, 463 (Minn. App. 2000) (quotation omitted).

6 The Minnesota Supreme Court has read human health concerns into the “broad language” of another county’s zoning ordinance provision that ensured “that the proposed use will not interfere with neighbors’ enjoyment of their property or create a nuisance.” Schwardt v. County of Wantonwan, 656 N.W.2d 383, 387 (Minn. 2003).
c. The Addition of a Large Hog Feedlot Significantly Increases the Risk of Proliferation of Antibiotic-Resistant Bacteria.

A broad array of scientific research and governmental findings ties antibiotic use in the raising and slaughter of food-producing animals, such as pigs, to increased antibiotic resistance in bacterial populations in animals, the environment, and humans. See, e.g., Timothy A. Johnson et al., Clusters of Antibiotic Resistance Genes Enriched Together Stay Together in Swine Agriculture, 7 mBio e2214-15 (Mar./Apr. 2016) (“In this study, we identify high correlations in the cooccurrence of clusters of identical antibiotic resistance genes (ARGs) and mobile genetic element sequences in Chinese swine farms and farm-impacted soils as well as U.S. laboratory swine.”); Jim O’Neill et al., Tackling Drug-Resistant Infections Globally: Final Report and Recommendations, The Review on Antimicrobial Resistance, at 24 (May 2016). According to a 2014 blue-ribbon report to the President of the United States, “[a]ll uses of antibiotics – whether in human or animal populations – promote the emergence and spread of antibiotic resistance by selecting for microbes able to grow well despite the presence of antibiotics.” John P. Holdren & Eric Lander (co-chairs), President’s Council of Advisors on Sci. & Tech., Report to the President on Combating Antibiotic Resistance 50 (2014) [hereinafter “2014 Report to President”].

7 The Mayo Clinic, located about 20 miles from Dodge County, has on its website an easy-to-understand multimedia description of how antibiotics given to farm animals can lead to illness or even death in humans, titled, “Antibiotic Resistance from Farm to Table.” See Mayo Clinic, “Animal use in agriculture,” available at http://www.mayoclinic.org/diseases-conditions/infectious-diseases/multimedia/img-20144910 (last visited Sept. 15, 2016).
Bacteria are promiscuous organisms that can “adapt rapidly to new environmental conditions and can acquire genes or undergo molecular changes with increasing exposure to antimicrobials in human and veterinary medicine, leading to resistance to these agents.” European Ctr. for Disease Prevention & Control et al., Joint Opinion on Antimicrobial Resistance Focused on Zoonotic Infections 7 (2009) [hereinafter “2009 European Centre for Disease Prevention Opinion”]. Through contact, antibiotic-resistant bacteria can disseminate resistant genes by injecting other bacteria with copies of mobile genetic elements called plasmids—stretches of DNA containing multiple genes, each of which may confer increased resistance to different antibiotics. See U.S. Gov’t Accounting Office, No. GAO-04-490, Antibiotic Resistance: Federal Agencies Need to Better Focus Efforts to Address Risk to Humans from Antibiotic Use in Animals 9 (2004) [hereinafter “2004 GAO Report”]. Bacteria may also develop resistance through mutations in their own DNA. Id.

“The dose of antibiotic and length of time bacteria are exposed to the antibiotic are major factors affecting whether the resistant bacteria population will dominate.” Id. The provision of antibiotics to an entire group of animals at a facility in steady, low doses “strongly encourages” drug resistance, “especially when provided in feed or water, where they remain active and are widely dispersed.” Stuart B. Levy, Multidrug Resistance—A Sign of the Times, 338 New Eng. J. of Med. 1376, 1377 (1998); see also White House, National Action Plan for Combating Antibiotic-Resistant Bacteria 20 (2015) (“Because antibiotics in feed or water are typically administered to herds or flocks of food-producing animals, in-feed or in-water antibiotic use leads to an increased risk of
selecting for resistance”); 2009 European Centre for Disease Prevention Opinion, at 9 (“Flock or herd administration of antimicrobials, which in most cases is given orally is considered one of the most important factors contributing to the selection of antimicrobial-resistant zoonotic bacteria”).

Hog feedlot operations are particularly susceptible to the development of antibiotic-resistant bacteria. See Rebecca Goldburg et al., The Risks of Pigging Out on Antibiotics, 321 Science 1294 (2008) (finding 70% of pigs tested in Iowa and Illinois were carrying MRSA); Shylo E. Wardyn et al., Swine Farming is a Risk Factor for Infection With and High Prevalence of Carriage of Multidrug-Resistant Staphylococcus Aureus, 61 Clinical Infectious Diseases 59 (2016). Operators consistently provide antibiotics to their entire herd through feed or water, for both growth-promotion and prevention purposes. See generally, Bengston & Greko, supra note 2.

Bacteriology 429 (1988). As a result, it is unsurprising that bacteria with genes resistant to tetracycline and sulfonamide antibiotics—both of which are medically important—have been found in soils adjacent to hog feedlots. See N. Wu et al., *Abundance and Diversity of Tetracycline Resistance Genes in Soils Adjacent to Representative Swine Feedlots in China*, 44 Envtl. Sci. & Tech. 6933 (2010).

Exposure to one antibiotic may “co-select” for resistance to multiple antibiotics. See A. Carattoli, *Plasmids and the Spread of Resistance*, 303 Int’l J. Med. Microbiology 298 (2013). One study of antibiotic resistance on hog farms discovered that “resistance genes found in our samples were not limited to the antibiotics administered,” and stated the phenomenon “is most likely due to aggregation of resistance genes on mobile genetic elements.” Yong-Guan Zhu et al., *Diverse and Abundant Antibiotic Resistance Genes in Chinese Swine Farms*, 110 Proceedings of Nat’l Acad. of Scis. 3435, 3437 (2013). In this way, even feedlots that give animals an antimicrobial class of drug that is not used in clinical medicine may still cause bacteria to select for genes resistant to drugs that are used in medicine. For example, U.S. Department of Agriculture researchers have shown that antibiotics in feed given to hogs cause a significant increase in the abundance of

---

8 According to one experiment concerning stress and pigs, “only 25% of the pre-stress isolates showed multiple antimicrobial resistance patterns, in contrast to 85% of isolates from post-stress. Moreover, a significant difference was observed for tetracycline resistance between isolates obtained from the carcasses of the control (40%) versus the stressed group (80%), suggesting that stressed animals were shedding higher numbers of resistant bacteria that contaminated the carcasses.” M.H. Rostagno et al., *Split Marketing as a Risk Factor for Salmonella Enterica Infection in Swine*, 6 Foodborne Pathogens & Disease 865 (2009). Tetracycline is a very important antibiotic in human medicine, used to treat *Brucella*, *Chlamydia*, and *Rickettsia* infections. See World Health Org., Advisory Group on Integrated Surveillance of Antimicrobial Resistance, Critically Important Microbials for Human Medicine 7, 20 (2011).
genes resistant to antibiotics not appearing in the feed. Torey Looft et al., In-Feed Antibiotic Effects on the Swine Intestinal Microbiome, 109 Proceedings of the Nat’l Acad. of Scis. 1691 (2012). Similarly, treating chickens with antibiotic streptomycin not only selects for bacteria with streptomycin resistance, but can also create resistance to sulfonamides, an unrelated class of antibiotics considered very important to human medicine. M. Faldynova et al., Prevalence of Antibiotic Resistance Genes in Faecal Samples from Cattle, Pigs and Poultry, 58 Veterinarni Medicina 298 (2013).

The antibiotic-resistant bacterial populations in food-producing animals are capable of transferring to humans. See, e.g., FDA Guidance for Industry #209, The Judicious Use of Medically Important Antimicrobial Drugs in Food-Producing Animals 12 (Apr. 2012) (performing literature review and describing, among others, the 2004 GAO Report, which definitively concluded that “antibiotic-resistant bacteria have been transferred from animals to humans”). A recent study of veterans in rural Iowa found that the frequency of antibiotic-resistant Staphylococcus aureus was 88% higher among veterans living within one mile of high-density hog feedlots. M. Carrell et al., Residential Proximity to Large Numbers of Swine in Feeding Operations is Associated with Increased Risk of Methicillin-Resistant Staphylococcus Aureus Colonization at Time of Hospital Admission in Rural Iowa Veterans, 35 Infection Control & Hosp. Control Epidemiology 190 (2014).^9

---

^9 According to the District Court, the Appellant Troms and other neighbors live within one mile of the Masching feedlot at issue here. See May 2016 Order 16 n.13.

When applied on land, the manure and its antibiotic-resistant bacteria can enter the soil, groundwater or surface water through runoff. Id. According to an article that Appellants identified in the Administrative Record, “genes resistant to tetracycline, a common antibiotic, have been found in groundwater as far as a sixth of a mile downstream from two swine facilities that use antibiotics as growth promoters.” Envtl. News Service, “Antibiotic Resistant Genes Traced from Farms to Groundwater,” May 1, 2001 (listed on AR 69); see also Bridgett M. West et al., Antibiotic Resistance, Gene Transfer, and Water Quality Patterns Observed in Waterways near CAFO Farms and Wastewater Treatment Facilities, 217 Water, Air, & Soil Pollution 473, 473 (May 2011) (studying six sites in Michigan and finding results that “indicate that CAFO farms not
only impair traditional measures of water quality but may also increase the prevalence of multi-drug-resistant bacteria in natural waters”).

Bacteria also enter into soil “when manure from antibiotic-fed animals is land applied as a source of crop nutrients.” Chander et al., 34 J. Env'tl. Quality at 1952 (listed on AR 069). A 2005 study found that two antibiotics used in hog production, tetracycline and tylosin, remained active in soil, allowing for “emergence of antibiotic resistant bacteria in the environment.” Id. at 1956. In addition, antibiotics and antibiotic-resistant bacteria in soil can contaminate plants grown on the manure-applied lands, such that “[a]ntibiotics present in plant materials ingested by humans may provide resistance to human pathogens thus resulting in illnesses that may be difficult to cure with presently available antibiotics.” Kumar et al., 34 J. Env'tl. Quality at 2084 (listed on AR 069); see also 2014 Report to President at 50-51 n.84.

Second, antibiotic-resistant bacteria can enter the air, where they can infect feedlot workers and neighbors. According to a description of a Johns Hopkins study of air inside large-scale hog production facilities, which Appellants also identified in the Administrative Record, “bacteria resistant to at least two antibiotics [appeared] in air samples collected from inside” the facilities. Science Daily, “Multidrug-Resistant Bacteria Found to be Airborne in Concentrated Swine Operation,” available at https://www.sciencedaily.com/releases/2004/12/041206213925.htm (last visited Oct. 7, 2016) (listed on AR 070). The finding led researchers to believe that feedlot workers have a great risk of airborne exposure to antibiotic-resistant bacteria, and “may also become reservoirs of drug-resistant bacteria that can be spread to family and the broader
community.” Id.; see also Gerd Hamscher et al., *Antibiotics in Dust Originating from a Pig-Fattening Farm*, 111 Envtl. Health Perspectives 1590, 1592 (2003) (finding that “dust originating from a pig-fattening farm represents a new route of entry into the environment for drugs applied in animal houses,” which poses a risk of antibiotic resistance in humans from dust inhalation); Jessica L. Rinsky et al., *Livestock-associated Methicillin and Multidrug resistant Staphylococcus aureus is Present among Industrial, Not Antibiotic-free Livestock Operation Workers in North Carolina*, 8 PloS ONE e67641 (2013) (finding MRSA transferred from livestock to workers).

Downwind neighbors can also be exposed to antibiotics and antibiotic-resistant bacteria present in dust. See generally, Eva Hershaw, “When the Dust Settles,” Texas Monthly (Sept. 2016) (describing 2011 event in Missouri, where a tornado carried a fungus and antibiotic-resistant bacteria “over long distances”). According to a recent study, “feedlot-derived microbes, including those possessing antibiotic resistance, can be transported to new locations where they may occupy new niches.” See A.D. McEachran et al., *Antibiotics, Bacteria, and Antibiotic Resistant Genes: Aerial Transport from Cattle Feed Yards via Particulate Matter*, 123 Envtl. Health Perspectives 337, 342 (2015).

Third, bacteria that develop antibiotic resistance in animals can affect public health through human handling and consumption of meat. 2004 GAO Report at 11. “Most food-borne infections originate from faecal contamination of carcasses during slaughter or cross-contamination during subsequent processing.” 2009 European Centre for Disease Prevention Opinion at 8-9. The Centers for Disease Control and Prevention (“CDC”) observed that in 2015, 192 cases and 30 hospitalizations arose from antibiotic-

Upon human exposure, the resistant bacteria, or "superbugs," can colonize the human gut and cause illnesses resistant to clinically important antibiotics. See Mayo Clinic, "Antibiotic resistance: Understanding the connection to antibiotic use in animals raised for food," available at http://www.mayoclinic.org/diseases-conditions/infectious-diseases/in-depth/antibiotic-resistance/art-20135516; see also 2009 European Centre for Disease Prevention Opinion at 9 ("[H]umans can become more susceptible to infection with antimicrobial-resistant zoonotic bacteria to which they are exposed").

Thus, according to the President of the United States, antibiotic-resistant bacteria from animal agriculture pose a serious threat to public health, and "[c]ombating antibiotic resistant bacteria is a national security policy," Exec. Order No. 13676 (Sept. 18, 2014) (citing CDC estimates that annually at least two million illnesses and 23,000 deaths are caused by antibiotic-resistant bacteria alone); see id. §§ 5, 7. Scientists have estimated that, by 2050, antimicrobial resistance would be related to ten million deaths per year, overtaking the current rates of cancer-related deaths. Jim O’Neill, Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations, Review on Antimicrobial Resistance, at 5 (Dec. 2014). The threat of antibiotic-resistant bacteria to public health—especially to the health of feedlot workers and neighbors—is so severe that the American Public Health Association has issued a policy document calling on
“federal, state and local governments to impose a moratorium on new Concentrated Animal Feed Operations.” See Am. Pub. Health Ass’n Policy 2003-7.10

The continuous provision of antibiotics to food-producing animals such as pigs also increases the risk of harm to the animals themselves. A number of different contagious bacterial diseases cause suffering in animals raised for food. See J. Vaarten, Clinical impact of antimicrobial resistance in animals, 31 Scientific and Technical Review of the Office International des Epizooties 221 (2012). As the blue-ribbon panel reporting to the President acknowledged, “antibiotic resistance also limits the therapeutic effectiveness of antibiotics in animals themselves; this further supports the need to reduce resistance in animal agriculture.” 2014 Report to President at 51. MRSA has become common among pigs. See Verkade & Kluytmans, Livestock-associated Staphylococcus


Here, the Masching feedlot is certain to increase the number of bacteria in the area, which will develop antibiotic resistance. As the District Court observed in colloquy with Appellants' counsel, the area around the Masching feedlot is saturated with other feedlots and the manure they produce. See Mot. Summ. J. Hearing Tr. 40-41. Moreover, the District Court concluded that the manure from the Masching facility alone will be spread over at least 244 acres, and near manure coming from other feedlots. May 2016 Order 9-11. As explained above, the bacteria in the Masching manure can interact with other feedlot manure to share or accept new antibiotic resistance, and can easily enter the soil, crops, groundwater and waterways—environmental pathways to the surrounding human population. Moreover, the Masching feedlot neighbors—including Appellants, who are older and, thus, more susceptible to illness—live quite close. Cf. M. Carrell et al., 35 Infection Control & Hospital Control Epidemiology 190 (Iowa study finding higher percentage of veterans with MRSA living within one mile of hog confinement facilities). The threat of antibiotic-resistant bacteria poses a “salient problem” to which the County must give a “hard look.” See Pope County Mothers, 594 N.W.2d at 236.
The County Decision to Approve the Masching Feedlot Conditional Use Permit without Any Consideration to the Risk of Increased Antibiotic Resistance Was Arbitrary and Capricious.

Neither the County Planning Commission nor the Board considered the increased presence of antibiotic-resistant bacteria, even though the County is tasked with ensuring the protection of public health when evaluating a CUP application. See Section II.a-b, supra. For example, the County failed to investigate how, if at all, Masching plans to protect its workers and neighbors from exposure to antibiotic-resistant bacteria. See generally, AR 779-81, 785-86, 884-971, 986-1007. And despite the fact that continuous use of antibiotics is common at facilities like the Maching feedlot, see notes 2 and 10, supra, the County did not even ask the obvious questions of whether Masching plans to feed its hogs antibiotics, and assuming so, what kinds of antibiotics, and for what duration. See AR 779-81, 785-86, 884-971, 986-1007. By overlooking the public health risk that the Masching feedlot will increase the threat of antibiotic resistance in the community, and the risk that antibiotic-resistant bacteria will enter the local environment, the County bypassed multiple specific requirements in its own ordinance. See Zoning Ordinance § 18.13.8(A)(I), (IV), (IX). The County, therefore, acted arbitrarily and capriciously because it "entirely failed to consider an important aspect of the problem."

See Pope County Mothers, 594 N.W.2d at 236; BECA of Alexandria, 607 N.W.2d at 463.

11 Appellants and other local residents raised the issue of how the Masching CUP will contribute to the spread of antibiotic-resistant bacteria early and often. See Section II.a, supra (describing comments from the community concerning antibiotic resistance during the County’s consideration of both the Masching 2014 and 2016 CUP applications). Defendant Masching had plenty of opportunities to remove the public health threat of antibiotic resistance as an issue by disclaiming plans to use continuous doses of antibiotics at the feedlot, but never did so.
III. THE DISTRICT COURT'S STANDARD OF REVIEW WAS FAR TOO DEFERENTIAL TO COUNTY DECISION-MAKERS.

The District Court applied an overly deferential standard in reviewing the County’s approval of the Masching CUP. Referencing Schwardt v. County of Wantonwan, the District Court stated that it would provide heightened deference to the local authority for the approval of a CUP. May 2016 Order 4. But the Supreme Court’s directions on deference to CUP approvals are not so clear cut. In fact, by providing more judicial deference to a CUP approval than it would provide to a CUP denial, and consequently blessing the CUP approval even though the County completely failed to consider an important public health issue, the District Court contravened core principles of Minnesota administrative law.

In Schwardt, the Minnesota Supreme Court acknowledged it had “traditionally held CUP approvals to a more deferential standard of review than CUP denials.” 656 N.W.2d at 389 n.4 (citing Interstate Power Co. v. Nobles County Bd. of Comm’rs, 617 N.W.2d 566 (Minn. 2000) and Corwine v. Crow Wing County, 244 N.W.2d 482 (Minn. 1976)). The Court still accepted the deferential standard because “[n]either party argued that this distinction is unwarranted.” Id. This observation that a “traditional” standard of review went uncontested suggests that the Supreme Court may not believe there is a valid reason for the distinction in judicial deference between CUP approvals and CUP denials.

The Schwardt decision cites two cases—Interstate Power and Corwine—for why courts have “traditionally” applied a heightened deference standard of review to CUP approvals. Both cases explain that “[w]hen a use permit is approved, the decision-making
body is always implicitly giving the same reason – all requirements for the issuance of
the permit have been met.” Corwine, 244 N.W.2d at 486; see also Interstate Power, 617
N.W.2d at 579-80.

But the increase of deference to an administrative entity, based on the assumption
that the entity considered all relevant issues sub silentio, conflicts with administrative law
doctrines.

According to the Minnesota Supreme Court, judicial deference to an agency is
“rooted in the separation of powers doctrine and the agency’s training and expertise in the
subject matter.” In re City of Annandale, 731 N.W.2d 502, 512 (Minn. 2007). Agencies
deserve deference when they employ their expertise and “special knowledge in the field
of their technical training, education, and experience.” Reserve Mining Co. v. Herbst, 256
N.W.2d 808, 824 (Minn. 1977). Thus, to receive judicial deference, the County must
actually engage with the issues within its field of expertise—it “necessarily requires
application of the agency’s technical knowledge and expertise to the facts presented.”
Minn. Ctr. for Envtl. Advocacy (MCEA) v. MPCA, 644 N.W.2d 457, 464 (Minn. 2002).

Indeed, the requirement that an agency must actually apply its technical training
and expertise to the facts of the controversy to receive judicial deference is a corollary to
the “arbitrary and capricious” standard of review in administrative law. “An agency’s
decision is arbitrary or capricious if the agency relied on factors the legislature never
intended it to consider, if it entirely failed to consider an important aspect of the problem,
if it offered an explanation for the decision that runs counter to the evidence, or if the
decision is so implausible that it could not be ascribed to a difference in view or the result
of agency expertise.” *In re Block*, 727 N.W.2d 166, 177-78 (Minn. App. 2007). Similarly, courts will intervene “when a ‘combination of danger signals . . . suggest the agency has not taken a hard look at the salient problems’ and the decision lacks ‘articulated standards and reflective findings.’” *MCEA v. City of St. Paul Park*, 711 N.W.2d 526, 534 (Minn. App. 2006) (quoting *Reserve Mining Co.*, 256 N.W.2d at 825). The presumption against deference in the absence of agency findings reflects the “general rule” that an agency “should state with clarity and completeness the facts and conclusions essential to its decision so that a reviewing court can determine from the record whether the facts furnish justifiable reason for its action.” *Minn. Transitions Charter Sch. v. Minn. Dep’t of Educ.*, 2004 Minn. App. LEXIS 525, *10 (Minn. App. May 11, 2014). Judicial review has no meaning if the decision-making record is absent a key issue relevant to the decision.

Thus, a County cannot receive heightened deference for approving a CUP based on an assumption that the County’s approval implicitly—*i.e., silently*—found that all relevant issues underlying the required criteria have been considered. Because a CUP is a variation from a normal land use, county ordinances contain material obligations, and applicants must demonstrate that all of the “standards and criteria stated in the ordinance will be satisfied.” Minn. Stat. § 394.301, subd. 1 (emphasis added); see also *RDNT, LLC v. City of Bloomington*, 861 N.W.2d 71, 78 (Minn. 2015) (explaining that the “burden was on [the applicant] to show that it could satisfy the standards specified by ordinance”).

---

12 A CUP approval requires the county to ensure that an applicant satisfy each and every standard set out in a county ordinance, and a CUP denial only requires the county to find
Courts cannot assume, without any showing in the record, that applicants, and the county agencies that approved the applicants’ permits, have met their burden. See *Murphy v. Comm’r of Econ. Sec.*, 1998 Minn. App. LEXIS 1125, *15-16 (Minn. App. Oct. 6, 1998) (“Although our standard of review is deferential and we afford due regard to agency expertise, due process prohibits us from affirming a factual finding based on an entirely silent record where the underlying facts are not of such common knowledge that we may take judicial notice of them”); see also *Loncorich v. Buss*, 868 N.W.2d 755, 765 (unpublished Minn. App. 2015) (Hudson, concurring) (“[O]ur courts should require more by mandating that CUP applicants strictly comply with ordinance requirements by submitting all required information with the application so that a full, meaningful hearing on the merits can be properly conducted”) (emphasis added). As the Minnesota Supreme Court has explained, such a judicial assumption unfairly makes Appellants guess at an agency’s reasons while also endorsing *post hoc* agency rationalizations:

[A]n appellant in this situation must intuit the rationale for the agency’s decision and prepare argument based on their speculation as to the agency’s thinking. The agency, on the other hand, is able to rationalize its decision in retrospect and in direct response to an appellant’s contentions. Sanctioning this procedure would be unfair to appellants and runs the risk inherent in any opportunity to rationalize or justify what one has done before.

*Reserve Mining Co. v. MPCA*, 364 N.W.2d 411, 415 (Minn. 1985) (internal quotation omitted).

the applicant to fall short of one ordinance standard. See Minn. Stat. § 394.301, subd. 1; see also *Schwardt*, 656 N.W.2d at 387 (explaining how a county acts unlawfully if it approves a CUP application that does not meet one of the standards set out in ordinance). Thus, if courts must apply different levels of deference to county CUP decisions, one would expect CUP application *denials* to receive more deference than *approvals*. 
Increased deference, premised on the assumption that the County considered and determined that the CUP applicant met all ordinance criteria, is especially inappropriate for the facts here. Masching filed the application at issue on November 20, 2014. The very next day, well before the public had time to submit comments, the County had already prepared a Staff Report recommending approval of the CUP. See AR 199. After denying requests to extend the permit application consideration period, the County Planning Commission approved the CUP on December 11, 2014, a mere 13 business days after the application was filed. See AR 530-31, 1008-09. This short turnaround between application and approval does not and cannot “implicitly” suggest that the County considered all Zoning Ordinance criteria and assured itself that the application met them. To the contrary, as the District Court found, the County took a “cart-ahead-of-the-horse approach to CUP analysis and approval,” thinking “it could act on a CUP application without having information important to the question of its issuance.” May 2016 Order 7. The County did not apply technical knowledge and expertise to the facts presented. See, e.g., Section II, supra (detailing how the County did not confront the serious public health concerns presented during the CUP application process, including concerns about how CUP approval might lead to increased antibiotic resistance in the area). Accordingly, the County does not deserve more judicial deference for approving the Masching CUP application than it would have received for a denial. See City of Annandale, 731 N.W.2d at 512.13

13 Moreover, there is no evidence of any Dodge County legislative intent for applying increased deference to a CUP approval. The CUP judicial review provision of the Zoning
IV. CONCLUSION.

The development of antibiotic resistance from pig feedlot operations is a serious threat to public health and animal welfare. The District Court erred when it did not find that the County had failed to evaluate the critical health risk that the Masching feedlot may pose to its workers, neighbors, and consumers. Moreover, the District Court afforded far too much deference to the County, even in the face of a complete lack of evidence in the decision-making record of any consideration of a crucial public health concern, in reviewing the County’s CUP approval decision. For the foregoing reasons, this Court should reverse the District Court’s decision upholding the County’s approval of the Masching CUP.

Respectfully submitted,

S/BRUCE D. NESTOR

Bruce D. Nestor, Esq. (#0318024)
De León & Nestor, LLC
3547 Cedar Ave. South
Minneapolis, MN 55407
Tel: (612) 659-9019
Fax: (612) 436-3664
nestor@denestlaw.com

S/DANIEL H. LUTZ

Daniel H. Lutz
The Humane Society of the United States
1255 23rd Street NW
Washington, DC 20037
Tel: (202) 676-2386
Fax: (202) 676-2357
dlutz@humanesociety.org

Attorneys for Amici HSUS and ALDF

Ordinance, titled “Appeal of County Board Decision,” makes no distinction between review of a CUP approval and a CUP denial. See Zoning Ordinance § 18.13.12 (“Any aggrieved person or persons, or any department, board or commission of the jurisdiction, or of the state shall have the right to appeal the decision of the County Board to the District Court on questions of law and fact”).

25
CERTIFICATE OF BRIEF LENGTH

I hereby certify that this brief conforms to the requirements of Rule 132.01 of the Minnesota Rules of Civil Appellate Procedure. The length of this brief is 6,974 words.

The brief was prepared using Microsoft Word 2010.

By, Dated: October 10, 2016

S/BRUCE D. NESTOR
Bruce D. Nestor, Esq. (#0318024)
De León & Nestor, LLC
3547 Cedar Ave. South
Minneapolis, MN 55407
Tel: (612) 659-9019
Fax: (612) 436-3664
nestor@denestlaw.com
NO. A16-1099

State of Minnesota

In Court of Appeals

Lowell Trom, et al., Appellants,

vs,

County of Dodge, et al., Respondents,

Masching Swine Farms, LLC, Respondent.

BRIEF OF AMICI CURIAE
MINNESOTA CENTER FOR ENVIRONMENTAL ADVOCACY,
ENVIRONMENT AMERICA, d/b/a ENVIRONMENT MINNESOTA,
AND FOOD & WATER WATCH

James P. Peters (#0177623)
LAW OFFICES OF
JAMES P. PETERS, PLLC
460 Franklin Street North, #100
P.O. Box 313
Glenwood, MN 56334
(320) 634-3778

Attorneys for Appellants Lowell Trom, et al.

Paul D. Reuvers (#0217700)
IVERSON REUVERS CONDON
9321 Ensign Avenue South
Bloomington, MN 55438
(952) 548-7205

Attorney for Respondents
County of Dodge, et al.

Kevin P. Lee (#0395933)
MINNESOTA CENTER FOR
ENVIRONMENTAL ADVOCACY
26 East Exchange Street, Suite 206
St. Paul, MN 55101
(651) 223-5661

Attorneys for Amici Minnesota Center for
Environmental Advocacy, Environment
America, d/b/a Environment Minnesota,
and Food & Water Watch

Jack Y. Perry (#0209272)
BRIGGS AND MORGAN, P.A.
2200 IDS Center
80 South Eighth Street
Minneapolis, MN 55402
(612) 977-8400

Attorney for Respondent
Masching Swine Farms, LLC

(Additional Counsel for amici listed on following page)
Bruce D. Nestor, Esq. (#0318024)
DE LEÓN & NESTOR, LLC
3547 Cedar Avenue South
Minneapolis, MN 55407
(612) 659-9019

Daniel H. Lutz
THE HUMANE SOCIETY
OF THE UNITED STATES
1255 – 23rd Street N.W.
Washington, D.C. 20037
(202) 676-2386

*Attorneys for Amici The Humane Society of the United States and Animal Legal Defense Fund*

Jenneane Jansen (#236792)
Kris Palmer (#240138)
Jansen & Palmer, LLC
4746 Elliot Avenue South
Minneapolis, MN 55407
(612) 823-9088

*Attorneys for Amici Dr. Robert S. Lawrence, MD,
Dr. Keeeve E. Nachman, Ph.D., MSPH,
Mr. Robert P. Martin, BA, Dr. Jillian P. Fry, Ph.D.,
MPH, Ms. Claire M. Fitch, MSPH,
Ms. Carolyn R. Hricko, MPH*
# TABLE OF CONTENTS

TABLE OF AUTHORITIES...........................................................................................................ii

INTRODUCTION AND INTEREST OF THE AMICI CURIAE.......................................................1

ARGUMENT..................................................................................................................................3

I. THE MSF FEEDLOT POSES A KNOWN THREAT TO THE ENVIRONMENT..............................3

II. THE BOARD FAILED TO TAKE THE REQUIRED HARD LOOK AT THE ISSUES RELEVANT TO ITS MSF CUP DETERMINATION..........................................................10

A. Approval Of The MSF CUP Failed To Satisfy The Requirements Of The Ordinance § 18.13.8, Endangering the Environment And The Public’s Welfare.........................................................12

B. The Board’s Refusal To Enforce Informational Requirements Under The Ordinance Deprived The Public Of Its Ability To Evaluate And Challenge A Feedlot That Posed A Significant, Known Risk To Its Environment And Welfare............................................................17

III. THE BOARD IMPROPERLY SUBSTITUTED THE REQUIREMENTS OF THE FEEDLOT RULES FOR THE REQUIREMENTS OF THE ORDINANCE, UNDERMINING THE EXPRESS PURPOSE OF COUNTY AND STATE ZONING LAWS........................................................................................................20

CONCLUSION............................................................................................................................25
### TABLE OF AUTHORITIES

<table>
<thead>
<tr>
<th>Cases</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application of Q Petroleum, 498 N.W.2d 320 (Minn. 1981)</td>
<td>10, 17, 20</td>
</tr>
<tr>
<td>Eagle Lake of Becker Lake Ass’n v. Becker Cty. Bd. of Comm’rs, 738 N.W.2d 788 (Minn. App. 2007)</td>
<td>10</td>
</tr>
<tr>
<td>In re Block, 727 N.W.2d 166, (Minn. App. 2007)</td>
<td>10, 12, 17, 19</td>
</tr>
<tr>
<td>Trom et al., v. County of Dodge et al., 20-CV-14-293 (3d Jud. Dist. Ct.) (November 18, 2014)</td>
<td>18</td>
</tr>
</tbody>
</table>

#### Statutes

<table>
<thead>
<tr>
<th>Statutes</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 U.S.C. § 291</td>
<td>20</td>
</tr>
<tr>
<td>7 U.S.C. § 2131</td>
<td>20</td>
</tr>
<tr>
<td>11 U.S.C. §303(a)</td>
<td>20</td>
</tr>
<tr>
<td>29 U.S.C. § 152(3)</td>
<td>20</td>
</tr>
<tr>
<td>29 U.S.C. § 213</td>
<td>20</td>
</tr>
<tr>
<td>33 U.S.C. § 1342</td>
<td>20</td>
</tr>
<tr>
<td>33 U.S.C. § 1362</td>
<td>20</td>
</tr>
<tr>
<td>42 U.S.C. § 7412</td>
<td>20</td>
</tr>
<tr>
<td>42 U.S.C. § 7521-7590</td>
<td>20</td>
</tr>
<tr>
<td>42 U.S.C. § 9601</td>
<td>20</td>
</tr>
<tr>
<td>42 U.S.C. § 11021(e)(5)</td>
<td>20</td>
</tr>
<tr>
<td>Minn. Stat. § 116D.04</td>
<td>20</td>
</tr>
<tr>
<td>Minn. Stat. § 116.07</td>
<td>20</td>
</tr>
<tr>
<td>Minn. Stat. § 394.21</td>
<td>13, 23</td>
</tr>
<tr>
<td>Minn. Stat. § 394.301</td>
<td>10, 12</td>
</tr>
<tr>
<td>Minn. Stat. § 561.19</td>
<td>20</td>
</tr>
</tbody>
</table>

#### Rules

<table>
<thead>
<tr>
<th>Rules</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 C.F.R. 68.125</td>
<td>20</td>
</tr>
<tr>
<td>40 C.F.R. 355.40</td>
<td>20</td>
</tr>
<tr>
<td>Dodge County Zoning Ordinance, Ch. 1, 4, 16, and 18</td>
<td>passim</td>
</tr>
<tr>
<td>Minn. R. 4410.0300</td>
<td>20</td>
</tr>
<tr>
<td>Minn. R., Ch. 7020</td>
<td>passim</td>
</tr>
</tbody>
</table>
INTRODUCTION AND INTEREST OF THE AMICI CURIAE

On December 11, 2014 the Dodge County Planning Commission (“Commission”) and Board of Commissioners (“Board”) held specially arranged sessions to reapprove a feedlot conditional use permit (“CUP”) application submitted by Masching Swine Farms, LLC (“MSF”). AR 884-971, 981-85. Concentrated animal feeding operations (“CAFOs”) such as MSF pose a series of significant threats to water, air, and land. While a handful of federal and state laws regulate CAFO activity generally, county-level zoning ordinances often provide the only means to determine when a CAFO is not an appropriate operation for its proposed location. Where, as here, a Board fails to uphold its ordinance, the environmental and public health and welfare concerns protected by the ordinance are undermined.

The Minnesota Center for Environmental Advocacy (“MCEA”), Environment Minnesota, and Food & Water Watch (“FWW”) (collectively “amici”) are concerned that upholding the MSF feedlot CUP has implications beyond the parties to this litigation. The issues in this case concern the duties of delegated counties such as Dodge to properly exercise their permitting and regulatory authority over feedlots. In addition, issues in this case concern and will likely affect citizens’ ability to meaningfully participate in the permitting and citing processes for feedlots, during which a critical and unique opportunity is guaranteed to the public both to protect one’s property rights and health

1 Pursuant to Minn. R. Civ. App. P. 129.03, amici hereby state that no counsel for a party authored this brief in whole or in part and no person other than the amici, their members, or their counsels made any monetary contribution to the preparation or submission of this brief.
concerns and to encourage environmental protection. *Amici* submit this brief in support of the Plaintiff-Appellants Lowell Trom and Evelyn Trom, respectfully requesting that this Court reverse the district court and Board and vacate the CUP granted to Defendant-Respondent MSF.

MCEA is a Minnesota non-profit organization founded in 1974 whose mission is to use law, science, and research to preserve and protect Minnesota’s natural resources, wildlife, and the health of its people. MCEA is engaged in public policy advocacy and education in five program areas, including water quality and natural resources. As part of its advocacy, MCEA has participated in administrative rulemaking proceedings (Minn. R., Ch. 7020) concerning the regulation of pollutants discharged to surface and ground waters from CAFOs. MCEA’s continued participation in such matters since 1974 is unique, and gives MCEA specific expertise and experience in the local regulation of animal feedlot operations. MCEA has a distinct interest in ensuring that local regulations properly implement state laws intended to prevent pollution of rivers, streams and lakes from animal feedlot operations. MCEA also has a distinct interest in ensuring that local regulations preserve and respect the procedural rights of itself and other citizens or organizations working to protect the natural resources of this state. MCEA has state-wide membership, and many of those members individually participate in proceedings of the sort at issue in this particular appeal.

Environment Minnesota is the state affiliate of Environment America, a 501(c)(4) organization doing business as Environment Minnesota on behalf of its thousands of supporters in the state. As part of its longstanding commitment to protect our rivers,
lakes, streams and other water resources, Environment Minnesota is deeply concerned by the water pollution impacts of industrial livestock operations, such as the MSF feedlot. Environment Minnesota has expertise particular to this case, and recently published a national report outlining the water pollution threats of industrial agribusiness operations, including animal feedlots of the type at issue in this matter.

FWW is a national, non-profit consumer advocacy organization with its headquarters in Washington, D.C. and several offices throughout the United States. FWW’s mission is to champion healthy food and clean water for all by standing up to corporations that put profits before people, and advocating for a democracy that improves people’s lives and protects our environment. FWW works to ensure safe food and clean water, advocating for safe, wholesome food produced in a humane and sustainable manner and the public, rather than private, control of water resources. FWW has more than 900,000 members and supporters in the United States. More than 28,000 of these members and supporters are Minnesota residents, and at least 30 live in Dodge County.

ARGUMENT

I. THE MSF FEEDLOT POSES A KNOWN THREAT TO THE ENVIRONMENT.

Swine CAFOs such as the MSF feedlot pose several significant threats to the environment and to public health, both individually and in the aggregate. A primary

2 Assuming the 2,400 finishing-swine legal capacity is not exceeded, the MSF feedlot meets the size threshold definition of a medium CAFO. 40 C.F.R. 122.23 (b)(6); Minn. R. 7020.0300, subp. 7d.
3 Nat. Ass’n of Local Bds. of Health, Understanding Concentrated Animal Feeding
threat is due to the quantity of manure they produce.\textsuperscript{4} One hog produces roughly ten times more fecal waste than a human.\textsuperscript{5} The Minnesota Pollution Control Agency ("MPCA") estimates that the amount of manure generated in Minnesota is equivalent to a human population of about 50 million.\textsuperscript{6} At full legal capacity, the MSF CAFO alone will produce more fecal waste than the total human population of Dodge.\textsuperscript{7} Pig manure contains high levels of several potential contaminants such as nitrogen, phosphorus, ammonia, nitrate, hydrogen sulfide, and methane, in addition to any pathogens, hormones, antibiotics, and chemicals used or produced at the feedlot, which pose a variety of distinct threats to water and air.\textsuperscript{8}

The MPCA’s water monitoring suggests that about 40 percent of Minnesota’s lakes, rivers, and streams are impaired, failing to meet one or more water quality

\begin{flushleft}
\end{flushleft}
\begin{flushright}
\textsuperscript{4} Id.
\end{flushright}
\begin{flushleft}
\end{flushleft}
\begin{flushleft}
\textsuperscript{6} MPCA, \textit{Livestock and the environment} (December 2014), available at www.pca.state.mn.us/sites/default/files/wq-f1-01.pdf.
\end{flushleft}
\begin{flushleft}
\textsuperscript{7} In 2010, Minnesota’s census-reported human population was 5,303,925, of which 20,087 resided in Dodge. U.S. Census Bureau, QuickFacts-Minnesota, available at www.census.gov/quickfacts/table/PST045215127. Minnesota’s current hog population is an estimated 8,100,000 (accounting for 11.7\% of the national inventory), with a Dodge County pig population in 2012 of 163,874. U.S. Dept. of Agriculture—National Agricultural Statistics Service, Quick Stats, available at quickstats.nass.usda.gov/. Pigs in Dodge are thus producing the fecal equivalent of more than 1,638,740 humans.
\end{flushleft}
\begin{flushleft}
\textsuperscript{8} Nat. Ass’n of Local Bds. of Health, \textit{supra} at 2; see generally, Marc Ribaudo et al., \textit{USDA—Manure Management for Water Quality}, Agricultural Economic Report No. 824 (June 2003).
The majority of impaired waters are in the southern half of Minnesota, which has the highest number of stressors related to excess nutrients, such as nitrogen and phosphorus, excess sediment, lack of habitat and connectivity, and impaired biological communities. More than half of these southern waters fail to meet swimmable or fishable standards. Several “fish-kills” have occurred in Southeastern Minnesota: In July 2015, 10,000 fish died after heavy rains, which saw nutrient levels exceed drinking water standards by 400 percent. In 1998, a 100,000 gallon manure spill into a creek killed nearly 700,000 fish along 19 miles of stream.

Westfield-Ripley Drainage Ditch runs through the Toquam land on which MSF is located and on which MSF manure is to be applied. A few hundred feet from the CAFO the ditch turns and runs less than a mile downstream and empties into the Little Cedar River, which is an impaired water listed as “non-supporting of aquatic life for aquatic macroinvertebrate communities” due, in part, to low oxygen caused by high concentrations of nitrogen and phosphorus. The Little Cedar River, in turn, empties into

---

11 Id.
the impaired Cedar River, a tributary of the impaired Iowa River, and ultimately into the Mississippi River.\textsuperscript{15}

The MSF CUP application estimates that its pigs will produce 1.1 million gallons of swine manure that requires land application. AR 146. It also anticipates that its 1.1 million gallons of manure will contain 55,000 pounds of nitrogen and 48,400 pounds of phosphorus. AR 147. Nitrogen and phosphorus in manure applied to land will runoff into the watershed’s already impaired waters at varying rates depending on rain levels, soil permeability, and method of application.\textsuperscript{16} This excess nutrient runoff directly contributes to algal blooms, decreased oxygen levels, and other surface water impairments.\textsuperscript{17} Nitrogen also converts in the soil to nitrate, which is a potential drinking water contaminant that is of serious concern for infant health.\textsuperscript{18}

As early as 1992, agricultural sources discharged 4.65 million tons of nitrogen and 1.16 million tons of phosphorus into surface waters each year.\textsuperscript{19} Since 1992, agricultural waste has dramatically increased, with operations consolidating and growing at a high

\textsuperscript{15} Id.
\textsuperscript{17} Id.
\textsuperscript{18} Id.
rate in the interim.\textsuperscript{20} In 1994, land use models indicated that agriculture was the leading source of nitrogen (76 percent) and phosphorus (56 percent) in the environment.\textsuperscript{21}

Since crop absorption rates for nitrogen and phosphorus differ, farms may apply manure to cropland according to a nitrogen or phosphorus standard.\textsuperscript{22} One study estimated that 51 percent of nitrogen in pig manure and 64 percent of its phosphorus, applied nationally in 1997, was in excess of crop needs at the farm level.\textsuperscript{23} In 1998, most farms, regardless of size, failed to meet recommended nitrogen based standards for application of manure.\textsuperscript{24} Only 18 percent of large farms met recommended nitrogen application standards.\textsuperscript{25} Even then, fewer farms were applying manure to meet a phosphorus standard, because the high phosphorus content of manure relative to crop needs significantly reduces the quantity of manure that can be applied on an acre of land.\textsuperscript{26} No large farms in the Eastern Corn Belt, Mid-Atlantic, or West met a phosphorus based standard.\textsuperscript{27} Slurry systems, such as MSF’s, preserve more of the nutrients in manure than do lagoon systems, which lose a significant amount of nitrogen to the atmosphere and phosphorus to the sludge at the lagoon bottom.\textsuperscript{28} As a result, more land per animal is necessary under a slurry system than a lagoon system in order to meet either

\begin{itemize}
\item \textsuperscript{20} Curt Zimmerman, \textit{Minn. Dept. of Agriculture—2015 Livestock Industry Study} (February 1, 2016), at 3.
\item \textsuperscript{21} James Stephen Carpenter, \textit{Farm Chemicals, Soil Erosion, and Sustainable Agriculture}, Stanford Env. L.J. 190, 201 (1994).
\item \textsuperscript{22} Ribaudo et al., \textit{supra}.
\item \textsuperscript{23} \textit{Id.} at 14.
\item \textsuperscript{24} \textit{Id.} at 17.
\item \textsuperscript{25} \textit{Id.} at 14.
\item \textsuperscript{26} \textit{Id.} at 16.
\item \textsuperscript{27} \textit{Id.}
\item \textsuperscript{28} \textit{Id.} at 18.
\end{itemize}
nutrient standard. When a phosphorus-based standard is required, producers require even more land for application; large farms, on average, would need to spread on over 1,000 additional acres of land to meet a phosphorus-based standard.

This water quality threat is not limited to the immediate locality. The same heavy June rains throughout the Corn Belt that initiated the 2015 Minnesota fish-kill expanded a dead-zone in the Gulf of Mexico to 6,474 square miles in which oxygen levels were too low to support fish and marine life. The National Oceanic and Atmospheric Administration stated that agricultural pollutant-nutrient runoff directly caused the growth of the dead-zone in the Gulf. MSF seems a long way from the world’s second-largest dead-zone, but the few maps submitted with the CUP application show that runoff produced by MSF manure has a direct hydrological connection to the Gulf of Mexico.

In an attempt to limit this environmental threat to surface waters, the feedlot rules require manure management plans (“MMPs”) that “help ensure that application rates do not exceed crop nutrient needs, and that setback from waters and drain tile intakes are observed.” The determination of how much of MSF’s 103,000 pounds of pollutant-nutrients will runoff into impaired surface waters is complicated and depends on weather,

---

29 Id.
30 Id.
32 Id.
33 MPCA, Livestock and the environment, supra.; Minn. R. 7020.2225.
method of application, crop rotations, and expected yield.\textsuperscript{34} In light of this difficulty, the
feedlot rules do not provide a specific application rate for nitrogen or phosphorus, but
instead require application rates in line with current recommendations from the
University of Minnesota—Extension. Minn. R. 7020.2225. The current MPCA
recommendation provides a maximum recommendation of 180 pounds per acre.\textsuperscript{35} The
requirements also confirm that other pollutant-nutrients often exceed crop needs when
manure is applied at a nitrogen standard and that “[s]ometimes there are economic and
environmental benefits of applying manure at rates lower than [nitrogen] needs.”\textsuperscript{36}

Dodge’s zoning administrator, advising the Board, failed to detail the calculations
behind her estimation that just 244 acres were required for the land application of the
annual 1.1 million gallons of manure produced by MSF. AR 941-43. However, if manure
is applied at her suggested rate, more than 225 pounds of nitrogen and 196 pounds of
phosphorus would be applied to each acre, well in excess of MPCA recommended
guidance that determines feedlot rule compliance.\textsuperscript{37} This suggests that land application of
MSF manure is unlikely to comply with the manure management requirements of the
feedlot rules. Citizens submitted detailed evidence, arbitrarily and unreasonably set-aside
by the Board, that there was insufficient land to support MSF’s manure footprint and that
at least 190 of the 490 acres reserved for MSF manure had been doubly-pledged, as was

\textsuperscript{34} University of Minnesota—Extension, \textit{supra}.
\textsuperscript{35} Jose A. Fernandez & Michael A. Schmitt, \textit{Manure management in Minnesota—WW-
03553} (revised 2012), \textit{available at https://www.extension.umn.edu/agriculture/manure-
management-and-air-quality/manure-application/manure-management-in-minnesota/
docs/manure-management-in-minnesota.pdf}.
\textsuperscript{36} \textit{Id}.
\textsuperscript{37} Fernandez & Schmitt, \textit{supra}.
later verified. AR 291, 890; Appellants’ Brief at 27. The Board’s role, confirmed by the district court and contrary to the advice it received from its zoning administrator, is to satisfy the express requirements of its ordinance in order to protect environmental interests and its public’s health, welfare, and property from uses inappropriate to the proposed location. AR 323-41.

II. THE BOARD FAILED TO TAKE THE REQUIRED HARD LOOK AT THE ISSUES RELEVANT TO ITS MSF CUP DETERMINATION.

Under Minn. Stat. § 394.21, “[f]or the purpose of promoting the health, safety, morals, and general welfare of the community any county in the state having less than 300,000 population...is authorized to carry on county planning and zoning activities.” So empowered, a county board may designate by ordinance certain developments or activities as conditional uses. Minn. Stat. § 394.301. In approving a CUP, a county board’s action must accord with the requirements of its relevant planning and zoning ordinances. Eagle Lake of Becker Lake Ass’n v. Becker Cty. Bd. of Comm’rs, 738 N.W.2d 788, 797 (Minn. App. 2007). Where, as here, a county board failed to take a hard look at the relevant issues in a zoning decision, such as the granting of a CUP, the board’s decision is arbitrary and subject to reversal. In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007). Further, a municipality acts consistent with Minnesota law in refusing to issue a permit based on an incomplete application. Application of Q Petroleum, 498 N.W.2d 320, 325 (Minn. 1981).

The ordinance clearly articulates its purpose in Chapter 1:

Section 1.2—Purpose
1.2.1—This Ordinance is adopted for the purpose of:

A. Protecting and promoting public health, safety, general welfare and morals of the citizens of Dodge County;

B. Protecting and preserving agricultural land, productivity of such land and animal agriculture;

C. Promoting and providing for orderly, responsible, and sustainable development of agricultural, residential, commercial, industrial, recreational, conservation and public areas and land uses;

D. Promoting compatible development and uses to prevent land use conflicts, conserve the value of properties and preserve the quality of life for the citizens of the county;

E. Promoting appropriate development and use of land located within the shoreland to preserve and enhance the quality of surface waters, conserve the economic and natural environmental values of shorelands and provide for the wise use of water and related land resources;

F. Promoting appropriate development of floodplains and limiting the development or use of land which could result in the potential for loss of life and property, create health and safety hazards, and lead to extraordinary public expenditures for flood protection and relief;

G. Protecting and preserving historical, archeological, scenic and other natural resources which are significant to Dodge County;

H. Protect groundwater water quality and quantity and quality by facilitating the adequate provision of water, sewage treatment, manure storage and application and management of all land uses within the county;

J. Protecting the environment;

L. Administering the planning and zoning activities pursuant to Minnesota Statutes 394.21, as amended.

Ordinance § 1.2. Chapter 1 further requires that “no structure shall be erected, converted, enlarged, reconstructed or altered, and no structure or land shall be used for any purpose or in any manner which is not in conformity with this ordinance.” Ordinance § 1.5.
A conditional use is defined as a “land use or development as defined by Ordinance that would be *inappropriate generally* but may be allowed with appropriate restrictions as provided by official controls upon a finding that (1) certain conditions as detailed in the Zoning Ordinance exist; (2) the use or development conforms to the comprehensive land use plan of the County; and (3) is compatible with the existing neighborhood.” Ordinance § 4.2 (emphasis added). “Conditional uses may be approved upon a showing by an applicant that standards and criteria stated in the ordinance will be satisfied. Such standards and criteria shall include both general requirements for all conditional uses and, insofar as practicable, requirements specific to each designated conditional use.” Minn. Stat. § 394.301. Chapters 16 and 18 of the ordinance, among others, provide two such sets of standards and criteria. Where, as here, a county board fails to take a hard look at whether the criteria of its ordinance are met, the decision is arbitrary and subject to reversal. *In re Block*, 727 N.W.2d, at 180.

A. Approval Of The MSF CUP Failed To Satisfy The Requirements Of Ordinance § 18.13.8, Endangering The Environment And The Public’s Welfare.

The ordinance also requires that the County exercise its authority within the limits of Chapter 18, which details the powers, duties, and limitations vested in the Commission and its advisory boards, and which lists the many requirements for conditional uses at the planning, application, vetting, permitting, and rescinding or discontinuance stages. These requirements are not displaced by the feedlot-specific requirements of Chapter 16; indeed, the “findings and recommendations” section of Chapter 18 provides eleven
additional “criteria for granting all CUPS,” which appear on both iterations of the MSF CUP application. AR 2, 122; Ordinance § 18.13.8.

The ordinance first requires that an incomplete application must be returned prior to consideration, and requires that an application will not be considered complete until the fee is submitted. Ordinance §18.13.5. The applicant must show that the use or development conforms to the comprehensive land use plan and is compatible with the existing neighborhood. Ordinance § 18.13.8 (A). The Board may then approve the conditional use, but only upon a finding that the proposed conditional use meets each of the eleven criteria. *Id.* The first criterion requires a Board finding that “[t]he establishment, maintenance, or operation will not be detrimental to or endanger the public health, safety, or general welfare.” *Id.* This language echoes the first express purpose listed by the ordinance in Chapter 1 and the express purpose of relevant state statutes, underscoring the critical duty of the County to protect its citizens from conditional uses inappropriate to the area. Ordinance §§ 1.2, 1.4, 18.13.1, 18.13.8; Minn. Stat. § 394.21. The fourth criterion requires a Board finding that proposed use will not “unduly restrict the enjoyment of other property in the immediate vicinity” including whether the applicant has ensured that the use will not constitute a nuisance. Ordinance § 18.13.8 (A). The fifth criterion requires a Board finding that “the proposed use shall not substantially diminish and impair property values within the area.” *Id.* The ninth criterion requires “[t]hat existing groundwater, surface water and air quality are or will be adequately
protected.\textsuperscript{38} Id. Also, under the ordinance, “minutes of the County Board shall constitute written findings for its decisions.” Ordinance § 18.13.11.

Here, the MSF application fee was waived weeks after it was accepted, in violation of Ordinance § 18.13.5. AR 981. Prior to the fee waiver request and grant on December 11, 2014, the MSF application was incomplete under the ordinance and required to be returned by the zoning administrator. Ordinance § 18.13.5. The county failed to return the incomplete application, but instead (a) prepared a staff report urging approval of the MSF CUP, (b) scheduled special sessions of the Board and Commission, (c) fielded comments from relevant state and county officials otherwise required by the ordinance, (d) organized and held a Feedlot Advisory Committee (“FAC”) review on-site at MSF, and (e) prepared a Feedlot Advisory Report urging approval of the CUP. AR 199, 281, 283, 518-220, 522-24, 778-87.

While the second application was swollen with lengthy construction details pertaining to a building already constructed, it failed to convey information sufficient to support Board findings on whether the criteria of § 18.13.5 were met. AR 986-1007. The public, through extensive written and oral commentary opposing the feedlot, presented detailed evidence of known environmental, public health, and property value threats posed by the feedlot. AR 294-300, 573-667, 871-75, 888-909. These public submissions included comments on the existing oversaturation of feedlots in Dodge, the impaired

\textsuperscript{38} In 2011, the legislature amended law pertaining to surface waters, limiting MPCA’s ability to set more stringent Clean Water Act requirements than those set by federal law. Minn. Stat. § 116.07, subd. 7(c). Despite this limitation, legislature left standing the right for counties to adopt and enforce zoning ordinances or plans, even resulting in more strict standards than under the feedlot rules. Minn. R. 7020.0200.
nature of local surface waters into which MSF manure would runoff, the known, ongoing violations of feedlots in the vicinity, and the distinct threat to nearby property values, amongst other concerns. Id.

Having received this public commentary, the Commission and Board closed their public hearings and assessed the application, relying almost exclusively on the opinion of the county’s zoning administrator, Melissa DeVetter. AR 875-82, 922-67, 984. She opined that the ordinance’s many express requirements under Chapter 18 might be assumed satisfied because compliance with the feedlot rules would later be required of the feedlot.39 AR 938. When questioned by the Commission, with the Board present, about sufficiency of the MMP and the acreage required to support MSF, DeVetter

39 DeVetter stated to the Board, with respect to the first criteria of § 18.13.8: “The first is to establish the maintenance and operation will be detrimental or endanger public health, safety, and welfare. Again, [MSF is] designed to be a zero discharge facility if it’s—if—I’m not sure, this is—what it was trying to relay previously was that this program is so highly regulated by both the county and the state that everything—everything from the engineered plans to how they keep their records has to be in a way that’s defined by the state.” AR 938. With respect to whether MSF’s proposed use was appropriate to its location, DeVetter provided that “the area is zoned agriculture. Conditional—I mean, feedlots, and this could be any kind of feedlot, it could be anything from a small, you know, a couple horses on a lot up to, you know, up to 3,000 animal units, because that’s where half is of, you know, dairy, hogs, beef. It—it is an appropriate use in the agricultural district, and so I’m not sure—I—I’m not sure where else you would put these facilities. If that’s not an appropriate use out in the agricultural district we’re not exactly sure where you would put them.” AR 938-39. Finally, regarding her assessment of MSF’s compatibility and potential to diminish or impair property values, she stated that “the real issue I think here appears to be compatibility with the one adjacent land unit—land owner. Again, this indicates that we have one person that is within, you know, 3,845. As you are aware, they are very opposed to the project, but I’m—I cannot—they have expressed that they would be injured by this. It is our opinion that it—it meets all the ordinance requirements so. We talked about substantially diminishing and impairing property values within the area, we have records that the property wouldn’t be devalued on that.” AR 939
advised that the MPCA feedlot rules concerning manure management would require just 244 acres for application of the annual 1.1 million gallons of MSF manure. AR 941-43. DeVetter arrived at this figure with the assistance of “Paul Brietzke, Minnesota Pollution Control Agency . . . not speaking on behalf of the Pollution Control Agency.” AR 943. A Commissioner then asked DeVetter to clarify that MPCA takes “precedence over anything we would even do anyway, right, the state?” DeVetter responded that the MPCA “regulates air quality. They regulate surface water quality, so they have the standards.” AR 943. The Commissioner stated, “That we use?” to which DeVetter replied, “Correct.” AR 943-44. This interpretation, that the county’s oversight can be substituted with that of the state, evinces a fundamental misunderstanding of CAFO regulation and delegation under state law.

The Board then granted the MSF CUP, finding that “the application and materials submitted by the applicant provide the County Board with all of the information required by the Ordinance and further, provide the County Board with sufficient information to fully evaluate the proposal under the criteria set forth in the County’s Ordinance.” AR 983. “The County Board has considered [] the objections and materials submitted by the project opponents, and rejects their conclusion. The County Board specifically credits the information provided by [DeVetter], who refuted all of their objections.” AR 984.

The Board’s finding that DeVetter refuted all objections presented against the feedlot is incorrect. The Board did not consider evidence of doubly-pledged land, did not consider or weigh evidence of known local impaired surface waters, did not consider evidence of improper application techniques, did not consider the likelihood of nuisance
conditions arising from the feedlot, did not consider the likelihood of surface water pollution from antibiotic use, and, critically, did not consider either the existing oversaturation of the immediate area and county or the cumulative impact of existing feedlots. See AR 779-84, 785-87, 884-971, 986-1007. The Board thus failed to satisfy the requirements of § 18.13.8 (A) with respect, at least, to the first, fourth, fifth, and ninth criteria, instead arbitrarily and capriciously relying on the incomplete and erroneous interpretation of the ordinance and the potential impact of MSF presented by the zoning administrator—against the weight of public showings of known threats to the environment, public’s health, safety, and general welfare. Under In re Block and Application of Q Petroleum, this court should reverse the determination of the Board and vacate the MSF CUP.

B. The Board’s Refusal To Enforce Informational Requirements Under The Ordinance Deprived The Public Of Its Ability To Evaluate And Challenge A Feedlot That Posed A Significant, Known Risk To Its Environment And Welfare.

Due to the failure of MSF to submit a completed feedlot CUP application, the public and Board did not have the requisite information to assess the conditional use with respect to the express purpose of its ordinance, which protects environmental and public health and welfare considerations. Chapter 16 sets standards for specific uses and structures, which are the “minimum requirements for the use or structure and are in addition to any other requirement of this Ordinance . . . [a]ll uses . . . whether Permitted, 

40 Regardless of whether cumulative impacts are relevant to feedlot rule considerations, they are imperative for the determination of whether a conditional use is appropriate where proposed.
Interim, or Conditional shall comply with all applicable Federal, State and County laws, rules and regulations...” Ordinance §§ 16.1, 16.2.1. Chapter 16 also lists feedlot specific permitting criteria delineating feedlot CUP standards, siting requirements, manure management planning, and compliance certifications. Ordinance § 16.24.

Section 16.24.3 of the ordinance, since amended, provided informational requirements for a feedlot CUP application. These informational requirements, also detailed on the County’s CUP application itself as of the February 10, 2014 first MSF application (AR 2), were found lacking by the district court, a decision that was not appealed. *Trom et al., v. County of Dodge et al.*, 20-CV-14-293 (3d Jud. Dist. Ct.) (November 18, 2014) (provided at AR 323-41). MSF submitted a second application, dated two days after the court’s reversal order, on a form recently updated by the County. AR 122-24. The feedlot section of the ordinance had not been amended in the interim. Yet where the earlier CUP form had provided spaces for applicants to fill in the “additional information requirements,” of § 16.42.3 (AR 2), the new form removed spaces for the required information, merely listing the requirements of § 16.24.3 as post hoc conditions of a CUP grant: “Upon approval of the [CUP] for the feedlot additional information is required.” AR 123. This update may have reflected a Board intention to no longer hold feedlot applicants to the informational requirements of § 16.24.3, which it has

---

41 In February 2015, the Board amended the § 16.24.3 feedlot CUP informational requirements as advised by its zoning administrator and county attorney, replacing thirteen informational requirements with the sole requirement that “[a]n application for a CUP shall be submitted on forms provided by the County.” Dodge County, *Planning Minutes (February 4, 2015)*, available at www.co.dodge.mn.us/EnvironmentalServices/2_4_2015_Planning_minutes.pdf
since amended; but at the time of the second MSF CUP approval, the detailed informational requirements were intact and required strict compliance in order to support valid Board approval of a feedlot CUP. See Ordinance § 16.2.1.

MSF's second application on the updated form was more expansive, but still failed to meet the requirements of Chapter 16. AR 122-96. First, the MMP remained inadequate, failing to describe how 1,100,000 million gallons of MSF manure could legally be spread on the pledged land. AR 146-47. Second, the aerial photos, required under § 16.24.3 (F) (I), do not provide enough information for the Board to properly determine that the land is available and sufficient. AR 140-45. Third, the application does not provide information of a “pollution abatement structure.” AR 92.

Despite extensive public commentary on the issues of insufficient acreage for application and of doubly pledged land, the Board refused to take the required hard look at whether enough land was available to support the manure footprint of the MSF feedlot. See AR 779-84, 785-87, 884-971, 986-1007. Instead, the Board took the same approach as when it approved the first MSF CUP, assuming the feedlot was an appropriate use because it would later be subject to feedlot rules once in operation. AR 938-39. However, as stressed by the district court vacating the first MSF CUP, the mere possibility, or even likelihood, of subsequent and alternative regulatory compliance does not relieve the Board of its duty to uphold its ordinance. AR 330.

Because the MSF application was incomplete, failing in part to meet the clear requirements of § 16.24.3, the conditional use did not comply with applicable county and state laws, as required by § 16.2.1. The Board thus did not, and could not, take the
hard look required under *In re Block*. This court should vacate the CUP, as the
determination was based on an incomplete application. *Application of Q Petroleum*, 498
N.W.2d at 325.

**III. THE BOARD IMPROPERLY SUBSTITUTED THE REQUIREMENTS OF THE FEEDLOT RULES FOR THE REQUIREMENTS OF THE ORDINANCE, UNDERMINING THE EXPRESS PURPOSE OF COUNTY AND STATE ZONING LAWS.**

Most regulated sectors are subject to various labor, anti-trust, animal welfare, and
environmental laws, but agricultural producers enjoy a unique level of freedom from
33 U.S.C. § 1362; 42 U.S.C. §§ 7412, 7521-7590, 9601; 42 U.S.C. § 11021(e)(5); 40
C.F.R. 68.125, 355.40(2); Minn. Stat. § 116.0713; Minn. Stat. § 116D.04, subd. 2a (d);
Minn. Stat. § 561.19; Minn. R. 4410.0300, subp. 3; Minn. R. 7020.2002. Authority over
the few remaining environmental regulations from which CAFOs have not been
exempted has been largely delegated from federal to state agencies. *See, e.g.*, 33 U.S.C. §
1342. In Minnesota, where the bulk of feedlot regulation is codified in the feedlot rules,
the MPCA may further delegate responsibility to the county level, as it has in Dodge.
Minn. Stat. § 116.07, subd. 7; Minn. R. § 7020.1500. Under this delegation program, in
which “most of the state’s major feedlot areas participate,” counties must designate a
County Feedlot Officer ("CFO"), who is charged with monitoring and enforcing the
feedlot rules. 42 Minn. R. 7020.1600, subp. 3a (D).

---

42 MPCA, *Delegated County Feedlot Program*, (January 2015) available at
In Dodge, the CFO is a member of the Environmental Services staff, which also includes the zoning administrator, DeVetter. Before his 2011 retirement, Ken Folie was Dodge’s CFO; he does not sit on the FAC, but attended both FAC visits to the MSF feedlot and spoke in support of CUP approval at the second public hearing, claiming an individual interest. AR 911. Ryan Thesing was Dodge’s CFO until the special session approval of the second MSF CUP session, at which his departure was approved. AR 681, 699, 976. Chad Knudson was later introduced as the new CFO.

Nowhere in the administrative record is DeVetter listed as Dodge’s CFO, yet she is held out as the CFO to the state and public across various media: She appears as the contact person on Dodge’s 2011, 2012, 2014, and 2015 MPCA Annual CFO and Performance Credit Reports required of a county CFO under Minn. R. § 7020.1600. DeVetter is listed online as the “County Agricultural Inspector & Designated Employee.” She is also listed as Dodge’s primary contact and CFO on the current MPCA delegated county list, with actual CFO Knudson included as an assistant.

DeVetter was also involved in Planning Commission appointment decisions, recommending soon after the Board’s approval of the first MSF CUP that Commissioner

---

43 Dodge County, Environmental Services, www.co.dodge.mn.us/departments/environmental_services/index.php (last accessed October 9, 2016).
44 Dodge County, Board Minutes (January 27, 2015), available at www.co.dodge.mn.us/County_Board/2015_Board_Minutes/01_27_15.pdf.
46 Minn. Dept. of Agriculture, County Agricultural Inspectors & Designated Employees, available at www.mda.state.mn.us/plants/pestmanagement/weedcontrol/cailist.aspx (last accessed October 9, 2016).
Jessica Masching be replaced with Joshua Toquam. DeVetter also participated in closed sessions with the Board and the county’s attorney, one week after the district court’s reversal of the Board’s decision and five days after MSF submitted a second CUP application to DeVetter, in order to “discuss options and receive direction from the Board” regarding the MSF CUP. DeVetter featured heavily in the each of the County’s MSF CUP determinations, advocating for the CAFO and providing her interpretation of the purpose and requirements of the feedlot rules, the ordinance, and the district court’s order to vacate the first CUP. 

In a sworn affidavit, DeVetter stated that she was initially hired as a compliance officer, “responsible for inspecting zoning permits, processing violations, . . . evaluating compliance with CUP conditions, and performing compliance inspections on feedlots under [the feedlot rules].” AR 668-69. She also swore that the CUP “application and ordinance do not indicate that all of the information [required by the ordinance] has to be submitted up front as part of the application, but is satisfied with conditions placed upon the CUP and the numerous requirements of the county delegated feedlot program and [the feedlot rules.]” Id. This interpretation, which played a critical role in the reasoning of the Board (see AR 943-44), is inaccurate; the informational requirements for a feedlot CUP are clear and unambiguously enumerated in Chapters 16 and 18 of the ordinance.

---

and informed by the clear purpose in Chapter 1. Such requirements are not duplicative of those controlled by the feedlot rules, but are distinct requirements that exist for the express purpose of protecting public health and environmental considerations, as provided by the ordinance and state law. Ordinance §§ 1.2.1, 4.2, 18.13.1, and 18.13.8; Minn. Stat. § 394.21.

Fulfilling dual-functions of zoning administrator and acting-CFO, DeVetter encouraged the county to take a mistaken view of the interplay between the requirements of the ordinance and the feedlot rules. AR 943-44. Minnesota’s feedlot rules exist so that the state can satisfy its duty as a state delegated Clean Water Act authority and to protect, if minimally, environmental and human health concerns related to water and air quality threats posed by CAFOs. Minn. R. 7020.2000, 7020.2002. While permits or certificates may be required of a facility under the feedlot rules, these rules are distinct from zoning regulations and do not directly or sufficiently protect the interest of the neighboring citizens from the impact to their health, environment, and enjoyment of property, as does Dodge’s ordinance. Ordinance §§ 1.2.1, 4.2, 18.13.1, and 18.13.8; Minn. Stat. § 394.21.

The district court order denying the first MSP application identified DeVetter and the Board’s misstep: the county “argues that all the information required by § 16.23.4 will eventually be submitted to the County as Mr. Masching continues the process of approval for his feedlot. For instance, . . . it must comply with [the feedlot rules]. Dodge County argues that, by conditioning Mr. Masching’s CUP on complying with state and local law, it has sufficiently addressed the feedlot CUP requirements of § 16.24.3. This argument is unconvincing. Indeed, the fact that the County found it necessary to
condition the CUP on Mr. Masching's later completion of certain requirements shows clearly that the County did not have any facts regarding these requirements.” AR 338.

In this context, it is especially troubling that the Environmental Services office, to which the CFO—whether DeVetter or Knudson—belongs, publically acknowledges its awareness of multiple violations of the feedlot rules against which it has not acted.50 The same office—perhaps the very individual—that is charged with and knowingly fails to enforce the feedlot rules also holds a key advisory position with respect to the Board's zoning decisions under the ordinance.

The unambiguous purpose of the ordinance focuses heavily on environmental, public health, and protection of citizens' property rights. Ordinance § 1.2.1. Yet such concerns were effectively stripped from the Board's determination process, when it failed to evaluate the evidence before it that the MSF feedlot was incomplete and failed to satisfy multiple requirements of the relevant ordinance. Despite the clear purpose and requirements of the ordinance under Chapters 1, 16, and 18, the Board inquired only whether the feedlot would later be required to comply with the feedlot rules. AR 984. Advised by DeVetter that the state has precedence over any of the Board's determinations and that MSF would later face state feedlot regulation, the Board refused to otherwise consider the known likelihood of environmental and public health threats.

50 "This year we received over 30 calls related to [air quality exemptions for] manure applications. . . . The County knows the number of applications is much greater. It is required by MN Rule 7020.2002 to call in for an air quality exemption before manure application occurs. This call gives the applicator legal coverage related to any odor nuisance complaints that may filed [sic]. Dodge County, Feedlot Flyer (December 2015), available at www.co.dodge.mn.us/EnvironmentalServices/Feedlot%20newsletter%202012072015.pdf."
extensively documented by the public. AR 938-39, 943-44, 984. Ordinance requirements, not the feedlot rules, are due the hard look of the Board, which it failed to give in granting the second MSF CUP.

**CONCLUSION**

Failure by the Board to take a hard look at the requisite criteria of the ordinance is grounds for reversal by this court. The Board failed to meet its duty under, at least, Chapters 16 and 18, failing the purpose of the ordinance expressly provided in Chapter 1. As such, and because the feedlot application proposes an inappropriate use in an unsuitable area, which poses a distinct threat and non-speculative detriment to the environment, public health, safety, welfare, and property interests, this court should reverse the Board and district court, vacating the MSF CUP.

Dated: October 10, 2014

By: /s/ Kevin P. Lee
Kevin P. Lee (#0395933)
Minnesota Center for Environmental Advocacy
26 East Exchange Street, Suite 206
St. Paul, MN 55101
Telephone: (651) 223-5969
Fax: (651) 223-5967
klee@mncenter.org

*Attorney for Amici Curiae Minnesota Center for Environmental Advocacy, Environment America d/b/a Environment Minnesota, and Food & Water Watch*
CERTIFICATION OF BRIEF LENGTH

I hereby certify that this brief conforms to the form requirements and length limits of Minn. R. Civ. App. P. 132.01, subds. 1 and 3, for a brief produced with a proportional font. The brief was prepared using Microsoft Word 2007, which reports that the brief contains 6,832 words.

Dated: October 10, 2014

By: /s/ Kevin P. Lee
Kevin P. Lee (#0395933)
Minnesota Center for
Environmental Advocacy
26 East Exchange Street, Suite 206
St. Paul, MN 55101
Telephone: (651) 223-5969
Fax: (651) 223-5967
klee@mncenter.org

Attorney for Amici Curiae Minnesota
Center for Environmental Advocacy,
Environment America d/b/a Environment
Minnesota, and Food & Water Watch
State of Minnesota
In Court of Appeals

Lowell Trom, et al., Appellants,

v.

County of Dodge, et. al.,

Respondents

and

Masching Swine Farms, LLC,

Respondent.

APPELLANTS' BRIEF AND ADDENDUM

JAMES P PETERS (#0177623)
Law Offices of James P Peters PLLC
460 Franklin St N #100
PO Box 313
Glenwood MN 56334
(320) 634-3778
Attorney for Appellants

PAUL D. REUVERS (#0217700)
Iverson Reuvers Condon
9321 Ensign Avenue So.
Bloomington, MN 55438
(952) 548-7205
Attorney for Respondent County

JACK Y. PERRY (#0209272)
Briggs and Morgan
80 South 8th St
Minneapolis MN 55402
(612) 977-8400
Attorney for Respondent MSF, LLC

JENNEANE JANSEN (#236792)
Kris Palmer (#240138)
Jansen & Palmer, LLC
4746 Elliot Avenue South
Minneapolis, MN 55407
(612) 823-9088
Attorneys for Petitioners, Dr. Robert S. Lawrence, MD,
Dr. Keeve E. Nachman,
Ph.D., MSPH, Mr. Robert P. Martin, BA, Dr. Lillian P. Fry,
Ph.D., MPH, Ms. Claire M. Fitch,
MSPH, Ms. Carolyn R. Hricko,
MPH

KEVIN P LEE (#0395933)
MN Center for Environmental Advocacy
26 E. Exchange Street, Suite 206
St. Paul MN 55101
Telephone: (651) 223-5969
Attorney for Amicus Curiae MCEA ET AL
BRUCE D NESTOR (#0318024)
DE LEÓN & NESTOR, LLC
3547 Cedar Ave. South
Minneapolis, MN 55407
Tel: (612) 659-9019
Attorney for Applicants HSUS and ALDF

DANIEL H LUTZ
THE HUMANE SOCIETY OF THE UNITED STATES
1255 23rd Street NW
Washington, DC 20037
Tel: (240) 388-5023
Attorney for Applicants HSUS and ALDF
ARGUMENT ....................................................................................................................... 17

I. STANDARD OF REVIEW ................................................................................................. 17

II. RESPONDENT COUNTY FAILED TO TAKE A HARD LOOK AT THE ENVIRONMENTAL CONCERNS RELATED TO THE PROPOSED PROJECT, INCLUDING CUMULATIVE NUISANCE ODORS AND AIR EMISSIONS, MANURE MANAGEMENT AND WATER CONTAMINATION AS REQUIRED BY THE COUNTY ORDINANCE. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS UNREASONABLE AND ARBITRARY ....................................................................................................................... 19

III. RESPONDENT COUNTY WHOLLY FAILED TO CONSIDER AND EVALUATE PUBLIC HEALTH CONCERNS REGARDING THE CREATION OF ANTIBIOTIC RESISTANT BACTERIA, AMONG OTHER THINGS, AS REQUIRED BY THE COUNTY ORDINANCE. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS UNREASONABLE AND ARBITRARY. ....................................................................................................................... 28

IV. RESPONDENT COUNTY APPROVED THE CUP FOR THE PROPOSED PROJECT THROUGH AN EXPEDITED PROCESS LACING FUNDAMENTAL FAIRNESS THAT INVOLVED A STAFF REPORT THAT SERVED AS AN ADVOCACY PIECE FOR THE PROJECT, A BIASED, FLAWED AND UNFAIR PUBLIC HEARING PROCESS AND A FAILURE TO MANAGE AND ADDRESS THE VOLUMINOUS . . . RECORD OF CONCERNS. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY WAS UNREASONABLE AND ARBITRARY ....................................................................................................................... 33
V. THE COURT OF APPEALS SHOULD REVERSE THE GRANT OF THE CUP AND VACATE SO THAT THE COUNTY EXERCISES ITS AUTHORITY TO REMEDY THE SITUATION ANEW WITHOUT REFERENCE TO ITS PRIOR DECISIONS AND CONSISTENT WITH CURRENT MINNESOTA STATUTES AND RULES.................................................................38

VI. THE DISTRICT COURT CORRECTLY DECIDED THAT SERVICE OF PROCESS WAS EFFECTIVE TO OBTAIN JURISDICTION......................39

CONCLUSION ......................................................................................................................................................48

TABLE OF AUTHORITIES

MINNESOTA CASES

BECA of Alexandria, L.L.P. v. Cnty. of Douglas ex rel Bd. of Comm’rs,
607 N.W.2d 459, 464 (Minn. App. 2000)........................................38, 48

Bd. of Supervisors of Benton Twp. v. Carver Cnty. Bd. of Comm’rs,
302 Minn. 493, 499, 225 N.W.2d 815, 819 (Minn. 1975).................28

Calm Waters, LLC v. Kanabec County Bd. of Com’rs,
756 N.W.2d 716, 719 (Minn. 2008).................................................35

Canadian Connection v. New Prairie Township,
581 N.W.2d 391 (Minn. App. 1998).................................................18

Citizens Advocating Responsible Dev. v. Kandiyohi County Bd.
of Comm’rs, 713 N.W.2d 817, 838 (Minn. 2006)............................18, 20, 29

Corwine v. Crow Wing County, 309 Minn. 345, 352,
244 N.W.2d 482, 486 (1976).........................................................18

Demolition Landfill Services, LLC v. City of Duluth, 609 N.W.2d 278,
281-82 (Minn. App. 2000), review denied (Minn. July 25, 2000)..........35

Duncanson v. Board of Supervisors of Danville Tp.,
551 N.W.2d 248 (Minn. App. 1996)..................................................18

E.T.O., Inc. v. Town of Marion, 375 N.W.2d 815, 820 (Minn.1985)........33

Erickson v. Coast Catamaran Corporation, 414 N.W.2d 180 (Minn. 1987) .41, 47
House v. Hanson, 245 Minn. 466, 473, 72 N.W.2d 874, 878 (1955)......................... 40
In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007) ........................................ 17, 19, 29
In re Disciplinary Action Against Coleman, 793 N.W.2d 296, 302 (Minn. 2011).............................. 41
In re Judicial Ditch No. 2, 163 Minn. 383, 202 N.W.2d 52 (Minn. 1925) ..................... 45
In re Skyline Materials, Ltd., 835 N.W.2d 472 (Minn. 2013)................................. 39
Lenz v. Coon Creek Watershed District, 153 N.W.2d 209 (Minn. 1967) ............ 33
Love v. Anderson, 240 Minn. 312, 314, 61 N.W.2d 419, 421 (1953) ................ 41
Matter of Saldana, 444 N.W.2d 892 (Minn.App. 1989) ........................................ 45
McCullough and Sons, Inc. v. City of Vadnais Heights, A14-1992, A15-0064, __ N.W.2d __ (Minn. 2016) ........................................... 40
Mingen v. Mingen, 679 N.W.2d 724, 727 (Minn.2004) .................................. 40
Neitzel v. County of Redwood, 521 N.W.2d 73, 76 (Minn.App. 1994), review denied (Minn. Oct. 27, 1994) ...................................................... 44
Picha v. County of McLeod, 634 N.W.2d 739 (Minn.App. 2001) .................. 45
Pope County Mothers v. Minnesota Pollution Control Agency, 594 N.W.2d 233, 235 (Minn.App. 1999) .................................................. 18, 21, 33
Roehrdanz v. Brill, 682 N.W.2d 626, 629 (Minn.2004) ...................... 40
Save Our Creeks v. City of Brooklyn Park, 699 N.W.2d 307, 310 (Minn. 2005) .......................................................... 41

iii
Shamrock Dev., Inc. v. Smith, 754 N.W.2d 377, 382 (Minn. 2008) ................................................................. 40

Schwardt v. County of Watowan, 656 N.W.2d 383 (Minn. 2003) ............. 17, 28

Smisek v. Comm’r of Pub. Safety, 400 N.W.2d 766, 768 (Minn. App. 1987) ...... 31

St. Croix Dev., LLC v. Gossman, 735 N.W.2d 320, 324 (Minn.2007).............. 40

Sunrise Lake Ass’n, Inc. v. Chisago County Bd. Of Comm’rs,
633 N.W.2d 59, 61 (Minn. App. 2001) ......................................................... 17, 19, 29

Toby’s of Alexandria, Inc. v. County of Douglas, 545 N.W.2d 54
(Minn. App. 1996), review denied (Minn. May 21, 1996).........................40

United Migrant Opportunity Services, Inc. v. Dodge County Planning
Commission, 636 N.W.2d 813 (Minn.App. 2001) ................................. 46

VanLandschoot v. City of Mendota Heights,
336 N.W.2d 503, 509 (Minn. 1983) .......................................................... 18

White Bear Docking & Storage, Inc. v. City of White Bear Lake,
324 N.W.2d 174, 175 (Minn. 1982) .......................................................... 18

Zylka v. City of Crystal, 283 Minn. 192, 196,
167 N.W.2d 45, 49 (Minn. 1969) .............................................................. 18

MINNESOTA STATUTES
Minn. Stat. 15.99 ......................................................................................... 35

Minn. Stat. 16D.04 ....................................................................................... 36

Minn. Stat. 394.301 ............................................................................... 1, 40

Minn.Stat. 606.01 ...................................................................................... 44, 46

Minn. Stat. 645.16 .................................................................................. 35

OTHER AUTHORITY
Trom, et al. v. Dodge County, et al., Dodge County District Court
November 18, 2014 ................................................................. 8
STATEMENT OF ISSUES

I. STANDARD OF REVIEW.

In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007).
Sunrise Lake Ass'n, Inc. v. Chisago County Bd. Of Comm'rs, 633 N.W.2d 59, 61 (Minn. App. 2001).

II. RESPONDENT COUNTY FAILED TO TAKE A HARD LOOK AT THE ENVIRONMENTAL CONCERNS RELATED TO THE PROPOSED PROJECT, INCLUDING CUMULATIVE NUISANCE ODORS AND AIR EMISSIONS, MANURE MANAGEMENT AND WATER CONTAMINATION AS REQUIRED BY THE COUNTY ORDINANCE. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS UNREASONABLE AND ARBITRARY.

The District Court held that the County reasonably approved the CUP.
In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007).
Sunrise Lake Ass'n, Inc. v. Chisago County Bd. Of Comm'rs, 633 N.W.2d 59, 61 (Minn. App. 2001).
III. RESPONDENT COUNTY WHOLLY FAILED TO CONSIDER AND EVALUATE PUBLIC HEALTH CONCERNS REGARDING THE CREATION OF ANTIBIOTIC RESISTANT BACTERIA, AMONG OTHER THINGS, AS REQUIRED BY THE COUNTY ORDINANCE. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS UNREASONABLE AND ARBITRARY.

The District Court held that the County reasonably approved the CUP.

*In re Block*, 727 N.W.2d 166, 180 (Minn. App. 2007).

*Sunrise Lake Ass’n, Inc. v. Chisago County Bd. Of Comm’rs*, 633 N.W.2d 59, 61 (Minn. App. 2001).

IV. RESPONDENT COUNTY APPROVED THE CUP FOR THE PROPOSED PROJECT THROUGH AN EXPEDITED PROCESS LACKING FUNDAMENTAL FAIRNESS THAT INVOLVED A STAFF REPORT THAT SERVED AS AN ADVOCACY PIECE FOR THE PROJECT, A BIASED, FLAWED AND UNFAIR PUBLIC HEARING PROCESS AND A FAILURE TO MANAGE AND ADDRESS THE VOLUMINOUS RECORD OF CONCERNS. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY WAS UNREASONABLE AND ARBITRARY.

The District Court held that the County reasonably approved the CUP.

*Citizens Advocating Responsible Dev. v. Kandiyohi County Bd. of Comm’rs*, 713 N.W.2d 817, 838 (Minn. 2006).

*Pope County Mothers v. Minnesota Pollution Control Agency*, 594 N.W.2d 233, 235 (Minn.App. 1999).

V. THE COURT OF APPEALS SHOULD REVERSE THE GRANT OF THE CUP AND VACATE SO THAT THE COUNTY EXERCISES ITS AUTHORITY TO REMEDY THE SITUATION ANEW WITHOUT REFERENCE TO ITS PRIOR DECISIONS AND CONSISTENT WITH CURRENT MINNESOTA STATUTES AND RULES.

The District Court affirmed the grant of the CUP.


VI. THE DISTRICT COURT CORRECTLY DECIDED THAT SERVICE OF PROCESS WAS EFFECTIVE TO OBTAIN JURISDICTION.

The District Court held that service of process was effective.
In re Skyline Materials, Ltd., 835 N.W.2d 472 (Minn. 2013).
Erickson v. Coast Catamaran Corporation, 414 N.W.2d 180 (Minn. 1987).
STATEMENT OF THE CASE

This case presents the question of whether Respondent Dodge County’s (“County”) December 11, 2014, decision to grant a conditional use permit (“CUP”) to the proposed total confinement hog barn of Respondent Masching Swine Farms, LLC (“MSF”) under Minn. Stat. 394.301 and the Dodge County Zoning Ordinance (“Ordinance”) was unreasonable and arbitrary. MSF proposes the hog barn for 6 acres in Westfield Township, Dodge County, Minnesota (“Project”).

Appellants respectfully request that this Court of Appeals reverse the December 11, 2014 decision of Respondent County and vacate the CUP granted to the Project of MSF as arbitrary and unreasonable.

STATEMENT OF FACTS

A. Parties, Appellants. Appellant Lowell Trom is a life-long resident of Dodge County who with his wife Evelyn own the family farm in Westfield Township located at 12451 – 700th Street, Blooming Prairie. He was born there in 1929. The home place is about 1/2 mile east of the project. His parents, Elmer and Marie Trom, moved onto the farm in about 1925. Lowell Trom has been active in the community and formerly served as the Chair of the Dodge County Board, the Westfield Township Board and other elected positions.

Appellant Evelyn Trom is married to Lowell. They have spent their entire lifetimes building their farm and farming operations in Westfield Township and raising their family. The Trom home place has served as the central location for numerous multi-
generation family events including receptions, family reunions and a wedding. The Trom home place has been featured as a show place. AR593-99.

**Dodge County.** Respondent Dodge County is a political subdivision of the State of Minnesota, which is created pursuant to Minn. Stat. Ch. 373 ("County"). The County has adopted and amended the Zoning Ordinance, including an amendment in February 2015 to Section 16.24.3. The County acts through the elected Board of 5 members ("Board") and the appointed planning commission ("PC") of 7. The PC is to "provide assistance to the County Board and Zoning Administrator in the administration of [local] ordinance and shall review, hold public hearings, and make recommendations to the County Board on all applications for Zoning Amendments, Conditional Use Permits, Interim Use Permit, Temporary Use Permits and Subdivision proposals using the criteria listed in [Chapter 18]." Dodge County Zoning Ordinance 18.4.2. The County is a delegated County for purposes of the feedlot program of the MPCA under the Minnesota feedlot program Rules, Minn.R. Ch. 7020.

The PC is comprised primarily of registered feedlot operators. At the public hearing on December 11, 2014, at least 5 of the 7 PC members were registered feedlot operators. AR897. The PC includes Joshua Toquam, the son of Roger Toquam, who has a direct financial interest in the proposed Project. Roger sold 6 acres of bare land for the Project. Toquam has a manure spreading agreement ("MSA") for liquid manure, which swine operators consider valuable. Joshua Toquam participated as a member of the PC at the public hearing on December 11, 2014, despite his father’s interest in the Project and,
although abstaining from the final vote (AR967). There was no indication that the County enforced the term limits for PC members. AR987.

MSF. Respondent MSF is a limited liability company set up for the Project. MSF owns 6 acres in Westfield Township having purchased that from Roger Toquam. The location is in the Cedar River Watershed District, only a few feet from the drainage ditch that feeds into the Cedar River that runs through Austin. AR57.

B. Dodge County Zoning Ordinance. The Ordinance contains mandatory provisions and defines “shall” means mandatory and not discretionary. Chapter 2; 2.3.2E; AR-80; Chapter 4; 4.1.3: “The word ‘shall’ is mandatory and not discretionary.” AR82.

Section 16 sets standards for all land uses, including feedlots. AR88. All uses "shall comply with all applicable Federal, State and County laws, rules and regulations..." AR-88. Section 16.24.3 requires a complete application from the applicant for a feedlot CUP and formerly included a listing of information about the proposal. AR91-92. The manure management plan information is also part of required information for a Certificate of Compliance from MPCA.

The April 2014 version of the County Application form for a feedlot CUP required the same information from the applicant at the time of application as did these Minnesota Rules, Ch. 7020. AR1-3. Section 16.24.1 requires an applicant for a new feedlot to apply for a Certificate of Compliance when applying: “A Certificate of Compliance must be applied for from the MPCA at any time: A. A new feedlot is proposed where a feedlot did not previously exist...”. AR90. After the filing of the Trom's first appeal in May 2014, the County twice changed the Application form to reduce the required information.
Section 18.13.5 in effect in December 2014 requires all applicants for a feedlot CUP to submit a complete application on a form provided by the County and information that contains all required information for review of the proposal and for any CUP.

AR102. In February 2015, and after the District Court in November 2014 vacated the original CUP for processing an incomplete application, the County amended Section 16.24.3 of the Ordinance to strip out the complete information requirements for a feedlot. Where the application is incomplete, Section 18.13.5 requires the County to return the application for the complete information: “If the request does not contain all required information or sufficient information for the permit to be issued, it shall be returned within fifteen (15) days with a written request for additional information.” AR102.

Section 18.13.6 allows the County to forward to the PC for public hearing only a completed application: “Upon receipt of a complete application and other required supporting material, the Zoning Administrator shall forward a copy of the completed application and attachments to the Planning Commission prior to hearing.” AR102. By amending Section 16.24.3 in February 2015, the County seeks to sharply limit the information required for a complete application.

Section 18.13.8 sets forth the criteria for granting CUPS:

A. CRITERIA FOR GRANTING ALL CUPS - Conditional uses may be approved, by the County Board, upon a showing by the applicant that the use or development conforms to the comprehensive land use plan of the County and is compatible with the existing neighborhood. For approval of the CUP, the County Board shall find that:
   I. The establishment, maintenance or operation will not be detrimental to or endanger the public health, safety, or general welfare
II. The proposed use will be able to meet the standards of this Ordinance or any other applicable County Ordinance and is not contrary to established standards, regulations or ordinances of other governmental agencies;

III. Each structure or improvement is so designed and constructed that it is not unsightly, undesirable or obnoxious in appearance to the extent that it will hinder the orderly and harmonious development of the County and the use district wherein proposed;

IV. The proposed use is compatible with adjacent uses of land. The use shall not be substantially injurious to the permitted uses nor unduly restrict the enjoyment of other property in the immediate vicinity. This includes whether the applicant has ensured adequate measures have been or will be taken to prevent or Dodge County Zoning Ordinance 18-38 control offensive odor, fumes, dust, noise, and vibration, so that none of these will constitute a nuisance, and to control signs and other lights in such a manner that no disturbance to neighboring properties will result.

V. The proposed use shall not substantially diminish and impair property values within the area;

VI. The establishment of the use will not impede the orderly and normal development and improvement of the surrounding properties for uses permitted in the Zoning District;

VII. The proposed use will not have a detrimental effect on existing parks, schools, roads and other public facilities;

VIII. Adequate water supply and sewage disposal facilities are provided and in accordance with the Minnesota Department of Health and the Dodge County Subsurface Sewage Treatment Ordinance No. 4, or successor;

IX. That existing groundwater, surface water and air quality are or will be adequately protected; X. Adequate utilities, access roads, on-site parking, onsite loading and unloading berths and drainage have been or will be provided;

XI. Adequate measures have been taken to provide ingress and egress so designed as to minimize traffic congestion on public roads; AR103-104.

C. **First CUP Application.** On February 10, 2014, Masching submitted his Application for the Project with one page of information (AR1; AR53) and one aerial photo (AR4). Pages 2 and 3 of the application were blank. AR2-3. The project, 2,400 head of finishing hogs, equals 720 animal units under the MPCA guidelines, which generate manure equivalent to a city of 7,200 people.
D. **County April 2014 CUP Approval.** On February 26, 2014, the County deemed the Application complete. AR28. The County sent out Notice and request for comment to various entities, including Westfield Township, the County SWCD, County Highway Department, MN DNR, MNDOT and the CRWD. AR5-7. On March 4, 2014, the County Feedlot Advisory Committee ("FAC") met for a site visit, including the applicant, and Nick Masching’s dad, Scott Masching, and viewed the proposed feedlot site. Of the 6 people present, 2 were Maschings. The FAC recommended approval of the proposal with 10 conditions. AR13-15. Missing were soil borings, design plans, manure management plans, land spreading agreements and information about the composting facility for dead animal disposal. AR14-15.

On March 19, 2014, the County mailed notice to neighbors and published notice of a public hearing for April 2, 2014. AR16-17.

Of note, Westfield Township officials involved in recommending approval of the proposed Project to the County had a financial stake with family members related to the proposers of the Project. Treasurer, Larry Schmeling, signed a MSA effective March 28, 2014, with James and Rebecca Masching and signed on April 12, 2014. Dodge County Recorder Document No. A205533. Supervisor, Bruce Wolf, signed the same MSA. Document No. A205534. The same for Supervisor, Bruce Fiebiger. Document No. A205535. These were never disclosed to the public. Jane Masching, Nick Masching’s (owner of Respondent MSF) mother, a loan officer at Citizens State Bank of Hayfield that funded the Project, notarized all the MSAs. Document No. A209498.
The County prepared a set of proposed Findings of Fact and Recommendations for approval. AR43-52. The County sent the Staff Report to Westfield Township for review with the statement that if no comments were received back, the County would take that as an approval. AR43.

The PC public hearing took place on April 2, 2014 and the 8 page transcript is on file herein. AR-77-83. Masching presented about 2 sentences of information. There was no presentation of any staff report and essentially no public input. PC minutes: AR28-29. The minutes of the PC establish that the County relied on the OFFSET model. AR684.

The public hearing is required by statute, as well. The Minnesota Legislature amended Minn. Stat. 116D.04, subd. 2a, to exempt feedlots under 1,000 animal units from the environmental review process. The legislature included as a trade-off the requirement that notice and a public hearing before the County Board be held that included all of the feedlot permit application materials available for the public in lieu of the full environmental review process. Minn.Stat. 116D.04, subd. 2a(d). For the public hearing to have any meaning, all of the information must be available.

On April 8, 2014, the Trom Family submitted a comment letter on the project. AR-63-70. The Comment letter raised concerns for, among other things, the public health and the neighborhood. AR63. Concerns were raised for the creation of antibiotic resistant bacteria in this cluster of feedlots: "MRSA is considered a major threat to the public health." AR65. Submitted were numerous studies on threats to the public health from clusters of hog confinements like this spreading disease and creating antibiotic resistant bacteria, including from Johns Hopkins University and Bloomberg School of Public
Health, the University of Cincinnati, the University of Illinois, the University of Minnesota, Duke University, the University of North Carolina and the University of Iowa, among others. AR69-70. The issue remains important. The Court of Appeals can take judicial notice that in September 2016 the United Nations and World Health Organization consider the creation of antibiotic resistant bacteria from hog confinements as a "fundamental threat to human health, development and security". This is only the fourth time that a General Assembly has addressed public health related issues with the prior being HIV/AIDS, non-communicable diseases such as diabetes and heart disease and the Ebola virus.

On April 8, 2014, the Board held the regular meeting, went into closed session without explanation or mention in the minutes and approved the CUP without discussion. AR71. Brad Trom stated that the County did not allow public input. AR600-01. Lowell Trom stated as follows with regard to this April 8, 2014 public meeting:

My son, Brad, and I attended the meeting of the Dodge County Board of Commissioners on April 8, 2014. I was denied the opportunity to comment on this huge project with far-reaching implications. The County Board did not allow any discussion nor did they even acknowledge that my son and I were present at the meeting as afterward, Commissioner Erickson approached me and stated that they did not have any choice and had to approve the project. AR574.

E. 2014 Appeal to District Court. On May 5, 2014, this appeal followed in the Dodge County District Court. The Ordinance creates such appeal jurisdiction. AR109.

F. November 18, 2014 Order and Judgment. After hearing, the District Court vacated the CUP. Trom, et al., v. Dodge County, Dodge County District Court Case No. 20-CV-14-293 (November 18, 2014). AR323.
G. **November 20, 2014 Application.** Less than 48 hours later, MSF submitted a new application dated November 20, 2014 on a new form. AR122. The new form allowed the County to defer from consideration at the CUP hearing all MPCA required information about the Project, including information about manure management. AR122.

Although the project was put on notice that it went ahead at its own risk, the project went ahead with MPCA permitting in July 2014 and began construction in August 2014. AR772-74.

Of particular significance, MSF did submit a MSA with Roger Toquam for 490 acres. AR141-145. Included is a MPCA Manure Ownership Transfer Form. AR146-150. Roger Toquam had already pledged 190 of these acres in Ripley Township to AgStar Financial Services for a MSA on another project on March 3, 2009. Document No. 180943. There is no reference to the March/April 2014 MSAs with the Westfield Township.

The November 2014 Application came in on a third application form that does not require any of the MPCA information. AR122. The stripped down third Application form allows the County to issue the CUP without consideration of the required information.

H. **November 21, 2014 Staff Report and Scheduling.** The County prepared a new Staff Report dated November 21, 2014. AR199-201. The Staff Report provides in part:

Feedlots inherently pose a risk to groundwater and surface water because of manure storage, handling and land spreading agreements. These risks will be considered when reviewing the application for feedlot construction permit in accordance to MN Rule 7020. Feedlots of this size also present a risk for nuisance related to noise, odor and traffic. The County is currently requesting additional information from the applicant regarding these potential impacts and information required in the County Zoning Ordinance and MN Rule 7020. AR200.
By the morning of November 21, 2014, the County: (a) prepared a Staff Report recommending approval of the CUP for the Project (AR199); (b) scheduled a special meeting of the PC for December 11, 2014 to approve the CUP (AR281); and (c) included the CUP on a rescheduled Board meeting set to reconvene specifically for this (AR 281). By 9:15 am on the morning of November 21, 2014, the County received comments from the County Engineer stating no concerns. AR523. By 11:14 am, the County received comments from the County SWCD stating no concerns. AR524. By 11:17 am, the County received the same from MN DOT. AR522. The County had also emailed the Staff Report directly to the attorneys who represented the Project and Westfield Township for review and comment under the County practice of obtaining Township “comments, concerns and opinions regarding the proposed land use.” AR199.

The County held a Feedlot Advisory Committee ("FAC") review on November 26, 2014. AR518. Scott Masching attended the meeting of the advisory committee with Nick Masching, his son. AR518. The minutes show no manure application plans and a needed preconstruction meeting. AR520. Construction was already complete. AR520.

The Public was later notified of Public Hearing for December 11, 2014. AR283. The County denied a request for a short continuance of the hearing. AR530-531.

On December 9, 2015, the County received written objections to the CUP from counsel for the Trom Family. AR286. The Trom Family raised concerns about threats to air and water quality and the public health, as well as to the unfair, flawed and biased process and procedures. AR286; 293. The County also included in the record the April 8, 2014 comment letter with studies. AR63-70.
The County received written objections dated December 10, 2014, from Dodge County Concerned Citizens ("DCCC"). AR294. DCCC objected to the public health concerns from the project and cumulatively as the tipping point with the 10 other existing hog confinements within a 3 mile radius. AR295. DCCC had asked: "Saturation . . . How much is enough". AR738. DCCC objected to the "environmental toxins". AR296. DCCC objected to the unfair, rushed and biased process in which the County appeared to be serving as an advocate for the Project. AR298. DCCC commented: “As detailed in Exhibits 7 and 8, there are at least 10 hog confinement units within a 3-mile radius of the Trom farm, several of which exceed 1,000 animal units.” AR300. DCCC raised concerns for the health of animals and people in the area, including "respiratory problems, skin infections, nausea, depression and even death". AR300. DCCC provided evidence as follows regarding the health of the dogs:

As detailed in the affidavit of Brad Trom dated September 7, 2014 (Exhibit 13), Brad noticed several years ago that his dogs vomited around dusk. This is the time of day that the numerous hog confinement facilities in the area open their windows and allow fresh air into the units. Brad’s dogs are keened outdoors much of the year. With their highly sensitive sense of smell, they are especially vulnerable to the stench and noxious fumes from these facilities. AR-300.

DCCC also provided: "There is a suspected cancer cluster in the area near the Trom farm. Within a 3-mile radius of the Trom farm, there have been at least 13 individuals who have been diagnosed or died as a result of cancer. Within this same 3-mile radius, there are at least 10 hog confinement units, several of which exceed 2,000 animal units. AR295. DCCC also commented that the manure management plan is inadequate. AR302. DCCC provided a listing of supporting documents and information.
Submitted were the Affidavits filed in the prior civil appeal in Dodge County, including those of Lowell Trom (AR573), Sonja Trom Eayrs (AR589), Brad Trom (AR600), James Trom (AR608) and Douglas Eayrs (AR612). Randy Trom submitted a separate letter of objection dated December 7, 2014. Michael Williamson submitted a separate letter of objection dated December 7, 2014. Peggy Trom submitted a separate letter of objection dated December 8, 2014.

Lowell Trom complained that: "If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area. The combination will be intolerable". AR577.

I. **December 11, 2014 County Approvals.** The County held the public hearing and special meeting of the PC on December 11, 2014. The minutes are at AR870. The record also includes the transcript. AR884. Despite setting aside about 3 hours, the County limited presentations to just a few minutes. The County shut down public comment from attorney Peters based on the stated allotted three minutes. The County also shut down Sonja Trom Eayrs from giving complete public input for herself and several family members either unable to attend or unable to speak for themselves. AR893 & 898-899. Although Eayrs presented 8 signed authorizations to speak on behalf of other family members, including her mother, Evelyn Trom, who suffers from Advanced Parkinson's Disease and cannot speak for herself, the PC limited Eayrs to five minutes. AR917-919. Also speaking were: Douglas Eayrs, Brad Trom, Lowell Trom and Jim Trom.

For Westfield Township, Owen Kirkebon, supervisor, testified that the township believed that the County should issue the CUP. AR908. Ken Folie spoke stating that he
was representing himself. AR911. Folie stated that the County did not need to evaluate effects from manure management. AR911-12. Because the project only owned 6 acres and relied on transfer of manure to a licensed applicator for spreading on other's fields, Folie asserted that the County did not need to evaluate this. Id. Folie had attended the FAC site visit on November 26, 2014. AR518.

After the public input, the PC moved to close the public hearing and then allowed County staff presented to the PC, including responding to the objections. AR922.

The PC agenda is part of the record. AR424. Also included in the record are the proposed findings of the County. AR428. The PC voted to approve the CUP with the addition of biofilters on the Project. AR969.

The record also includes information on the County Board meeting of December 11, 2014, which started out in a prior morning session and then reconvened in the afternoon following the PC public hearing for the sole purpose of approving the CUP. In the morning session, the County Board waived the application fees of Masching LLC. AR981. In the reconvened meeting in the afternoon, the County Board voted to approve a resolution that approved the CUP for the Project. AR973. The Resolution for Approval of the CUP is in the record. AR983 & AR1008. The transcript of the County Board afternoon session is part of the record, as well. AR987.

Despite litigation with Appellants for months, nowhere in the record did the County ever address or respond to numerous concerns raised by Appellants and others public health concerns about, among other things, antibiotic resistant bacteria and
spreading of disease from this proposed project in the cluster of 10 others within the 3 mile radius. Nowhere in the record did the County respond.

J. **2015 Appeal Action in District Court.** In January 2015, Plaintiffs filed this appeal action in the Dodge County District Court. Appellants served the appeal documents three different ways. First, service was on counsel of record by US Mail consistent with the Minn.R.Civ.App.P. on January 7, 2015, with copies to attorney Paul Reuvers for Respondent County and attorney Jack Perry for Respondent Masching. Peters Affidavit in COA, August 5, 2016; para. 5; Exhibit B. Second, Appellants on January 7, 2015, mailed the appeal documents to the Dodge County Sheriff for service of process consistent with Minn.R.Civ.P. on the office of the Board Chair of Dodge County who had presided over the meeting on December 11, 2014, who was then Rodney Peterson, with the address being at the official address for the Respondent County Board, Courthouse of Dodge County, 22 6th Street East, Dept. 31, Mantorville. Peters Aff., para. 9; Exhibit C. Appellants did not request service on Rodney Peterson in a personal capacity and did not ask the Sheriff to serve Rodney Peterson at home or at any law offices. Peters Aff., para. 11. In addition to being the Board Chair on December 11, 2014 and continuing as a board member throughout, Rodney Peterson is a licensed attorney with Lawyer ID #0220565.

Appellants on January 7, 2015, checked the Dodge County website and confirmed on the official site of Dodge County that Rodney Peterson continued to be the Chair of the Board so that Appellants had no notice that Dodge County had changed board chairs the previous day on January 6, 2015. Peters Aff., para. 12. Appellants confirmed via USPS tracking that the Sheriff received the appeal documents on January 8, 2015, at 9:55
a.m. Peters Aff., para. 13. The Sheriff never returned the appeal documents indicating that Rodney Peterson was not the Board Chair and never contacted counsel to inform counsel that Rodney Peterson was no longer the Board Chair. Peters Aff., para. 14. The Sheriff's Certificates of Service show service on Respondent County and Respondent Board by Rodney Peterson on January 13, 2015, at 11:33 a.m. Exhibit D. Third, as discussed below, Appellants later instructed the Sheriff to again serve the County.

In the District Court, Respondents conceded these three methods of service, never argued a lack of actual notice and never argued any prejudice. Respondents admittedly received the appeal documents in a timely manner. While Respondents included the affirmative defense of insufficient service of process in their Answers to Complaint, they failed to plead the specifics as required by Minn.R.Civ.P. 9, including as to how service of process was insufficient regarding the capacity of Peterson to be served in the office as board chair. Respondents never filed any Motion to Dismiss in the District Court and instead raised the service of process issue as an "aha!" in opposition to Appellants' Motion to Amend. Respondent County had timely notice of the appeal documents in the District Court and promptly made their Answer to Complaint and managed to file their Notice to Remove the Honorable Judge Jodi Williamson on February 2, 2015. Peters Aff., para. 19.

With regard to mailing the CUP to Appellants, at all times up to February 4, 2015, Respondent County had still sent no written permit approvals, findings, conditions or the CUP from Respondent County to Appellants following up on the December 11, 2014 hearing and meeting on the Masching CUP and had not sent the official minutes of the
December 11, 2014 meeting triggering notice of decision. Peters Aff., para. 20. On February 4, 2015, Appellants made another formal request on Respondent County via letter and email for a written copy of the December 11, 2014 minutes, findings and conditional use permit ("CUP") for MSF, in accordance with Ordinance Section 18.13.11. Exhibit E. On February 9, 2015, Respondent County mailed the December 11, 2014 minutes of meeting, which mailing did not include a copy of the actual CUP granted to Respondent Masching. Exhibit F.

On April 13, 2015, Appellants effected personal delivery for the third time, this by delivery of the appeal documents to the Respondent County Sheriff for personal service on the office of the Board Chair of Respondent County who had been assigned on January 6, 2015, John Allen, at the official address for the County. Exhibit G. Despite the instructions to serve the office of the board chair on John Allen at the official office of the County - the Courthouse - on April 14, 2015, the Sheriff served the appeal documents on Respondent County by service upon Lisa Kramer - Finance - Auditor. Exhibit H. On April 15, 2015, the Sheriff served the appeal documents on Respondent County by service upon Carol Allen at her home. Exhibit I.

K. May 13, 2016 Order and Judgment. The District Court heard cross motions for summary judgment at the hearing on February 16, 2016. The entire transcript of the hearing is on file herein. Appellants argued, among other things, that the County had failed to consider that this project represented a tipping point in cumulative negative effects to the public health and the environment. Judge Chase stated as follows during the oral arguments on the motions:
What you’re saying is, Judge, this is in a way the straw that’s breaking the camel’s back for the folks in this area of Westfield Township. This is the one that makes it intolerable.” D.Ct. Transcript, p. 37; lines 15-18.

Counsel for Appellants argued:

they can’t look at this in a vacuum. They have to look at this project in the context of the neighborhood. That’s the CARD case that talks about cumulative impacts. It’s the Pratt expert report from the Pope County Mother’s case that talks about—when you’re talking about impacts from feedlots you talk about the cumulative impact of the feedlots in the area. D.Ct. Transcript, pp. 41-42; lines 23-25; 1-6.

The District Court entered judgment on May 13, 2016 affirming the grant of the CUP. In the memorandum, the District Court at page 4 granted a greater deference to the County based on the appeal from an issuance of a CUP, instead of a denial, citing to

Schwardt v. County of Watowan, 656 N.W.2d 383 (Minn. 2003).

K. The Instant Appeal. Appellants timely commenced the instant appeal from the Dodge County District Court judgment by filing a Notice of Appeal and Statement of the Case with this Court of Appeals.

ARGUMENT

I. STANDARD OF REVIEW.

The Court of Appeals will vacate the grant of a CUP where a proposal fails to meet the standards of an ordinance and the grant of a conditional use permit is arbitrary. In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007); Sunrise Lake Ass’n, Inc. v. Chisago County Bd. Of Comm’rs, 633 N.W.2d 59, 61 (Minn. App. 2001).

The Court of Appeals will affirm approval of a CUP where the proposal meets the standards of the ordinance and the approval is reasonable having fairly considered all relevant factors. Schwardt v. County of Watonwan, 656 N.W.2d 383, 386 (Minn. 2003).
Minnesota Courts have in the past granted more deference to municipal decisions granting CUPs than to those denying an application. *Corwine v. Crow Wing County*, 309 Minn. 345, 352, 244 N.W.2d 482, 486 (1976); *Zylka v. City of Crystal*, 283 Minn. 192, 196, 167 N.W.2d 45, 49 (Minn. 1969).

Reviewing courts must provide deference to the quasi-judicial decision-making body and temper the reasonableness inquiry to avoid merely substituting their judgment for that of the decision-making body. *VanLandschoot v. City of Mendota Heights*, 336 N.W.2d 503, 509 (Minn. 1983). “The court’s authority to interfere in the management of municipal affairs is, and should be, limited and sparingly invoked.” *White Bear Docking & Storage, Inc. v. City of White Bear Lake*, 324 N.W.2d 174, 175 (Minn. 1982).

Violation of rules and procedures related to handling the quasi-judicial process and failure to consider important aspects of impacts from a project constitute evidence of arbitrary decision making. *Citizens Advocating Responsible Dev. v. Kandiyohi County Bd. of Comm’rs*, 713 N.W.2d 817, 838 (Minn. 2006); *Pope County Mothers v. Minnesota Pollution Control Agency*, 594 N.W.2d 233, 235 (Minn.App. 1999).


II. RESPONDENT COUNTY FAILED TO TAKE A HARD LOOK AT THE ENVIRONMENTAL CONCERNS RELATED TO THE PROPOSED PROJECT, INCLUDING CUMULATIVE NUISANCE ODORS AND AIR EMISSIONS, MANURE MANAGEMENT AND WATER CONTAMINATION AS REQUIRED BY THE COUNTY ORDINANCE. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS UNREASONABLE AND ARBITRARY.

The Court of Appeals should reverse and vacate the County’s December 11, 2014, decision to grant the CUP to MSF as arbitrary for failure to consider important aspects of the proposal, including the cumulative effect of nuisance odors and air emissions from the proposed project in addition to those from other existing projects, among other things. The record includes numerous comments that the proposed project in combination with others threatens a tipping point to the environment in this part of Minnesota. Respondent County erred as a matter of law by evaluating this proposal in isolation.

Where a County fails to take a hard look at the evidence pertinent to the enumerated criteria in the Ordinance for a CUP, the Court of Appeals will vacate the grant of a CUP approval as unreasonable, arbitrary and an abuse of discretion. In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007). The Court of Appeals will vacate a CUP granted to a project that fails to demonstrate that it will meet the ordinance. Sunrise Lake Ass’n, Inc. v. Chisago County Bd. Of Comm’rs, 633 N.W.2d 59, 61 (Minn. App. 2001).

In re Block demonstrates that our Courts will still reverse the unreasonable approval of a CUP where the County has, within the process of analyzing whether a proposed project meets the ordinance standards, failed to adequately consider a significant aspect of a proposed project. The In re Block project was a commercial kennel
proposing to raise hundreds of dogs for sale in pet stores. The dogs outside of the kennel project had the potential to create significant amount of noise in the neighborhood. The project's proposed solution to reduce noise was to cut the vocal cords of all the dogs through a controversial medical procedure of “debarking” all of the hundreds of dogs. Evidence established that "surgical debarking is overwhelmingly disfavored within the veterinary community and many allege that it is inhumane". Despite the concerns, the County went ahead and approved the CUP.

The Court of Appeals acted and reversed the approval of the project In re Block for failure of the County Board to adequately consider the issues arising from the proposed surgically debarking of all the dogs. The Court of Appeals reversed based on the "scarcity of information provided" and remanded.

Minnesota Courts have also reversed an approval through a quasi-judicial process for review of a land use proposal where the County (or agency) wholly failed to consider and analyze an important issue about the proposal, such as the failure to consider the cumulative effects of the proposed project in addition to existing conditions created by other projects. Citizens Advocating Responsible Dev. v. Kandiyohi County Bd. of Comm'rs, 713 N.W.2d 817, 838 (Minn. 2006) (reversing and remanding where the County considered the proposal in isolation and there was insufficient evidence in the record to show that county evaluated cumulative effects in combination with other projects existing in the vicinity). In CARD, the County failed to consider the cumulative effect of the proposed gravel pit on ground water in combination with the other existing gravel pits in the immediate area.
Where a quasi-judicial agency violates rules and procedures related to handling the quasi-judicial process, the Court will reverse the decision as arbitrary because the violations show a combination of danger signals that the decision resulted from the unreasonable will of the agency, rather than a deliberated judgment. *Pope County Mothers v. Minnesota Pollution Control Agency*, 594 N.W.2d 233, 235 (Minn.App. 1999) (issuance of several site permits by MPCA in violation of prohibition rule during the review process demonstrated will of agency rather than a deliberated judgment). In *Pope County Mothers*, MPCA was evaluating a proposed multi-site hog feedlot project. MPCA was asked to analyze the cumulative effect of odors and air emissions from the combination of emissions from all of the proposed multiple hog confinement barns and the existing barns in the vicinity. MPCA and the project argued that there was no information on the cumulative effect of odors from the hog confinement barns, approved and moved the project forward.

Because of the seriousness of the issue of cumulative effects on odors and air emissions, MPCA concurrently commissioned the Pratt expert report to review and evaluate the potential cumulative effects on air quality from the accumulation of odors and air emissions from the multiple barns in the vicinity. The report was completed within weeks. MPCA's Pratt expert report demonstrated that a cumulative effect existed and that when the odors and air emissions from the several barns was considered, there would be a predicted violation of air quality standards. The District Court considered the Pratt expert report as part of the judicial review, determined that MPCA failed to consider this and other aspects of the proposal and reversed.
The Court of Appeals in *Pope County Mothers* affirmed the District Court on other grounds and did not reach an analysis of the Pratt expert report because the record otherwise supported reversal. The Court of Appeals discussed the issue and in footnote 2 addressed the standard by which the Court considered the report:

"a May 1998 MPCA report ("the Pratt report") on cumulative air emissions from 60 feedlots, including all the feedlots in the HPP project. We do not and need not consider the Pratt report to determine that the MPCA's negative declaration on the need for an EIS was arbitrary and capricious. FN2. The administrative record before us demonstrates that the MPCA did not genuinely engage in the reasoned decision making the law requires." 594 N.W.2d at 238-239.

Here, Appellants presented Respondent County with substantial evidence of the existing daily stench from the 10 hog barns already operating in the 3 mile area and presented evidence that combining additional stench from the proposed project would represent a breaking point making the odors and air emissions unbearable. AR577-578. There are at least 10 units within a 3 mile radius of the Trom home place. AR602; 609. The Lowell Trom and other Affidavits gave details on the "stinking mess" from the "daily stench" of existing nuisance odors from the barns in the area. Id. Trom testified: "If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area. The combination will be intolerable." AR577-78. Lowell Trom testified at public hearing on December 11, 2014, as to the "stinking mess" from all the feedlots. AR907-08. The record includes a map of the existing hog barns. AR544; 586; 739. The record includes a listing of existing hog barns in Dodge County, including Westfield Township. AR532-43.
The record includes a listing of hog barns over 1,000 animal units in Dodge County.

AR548. Brad Trom provided the County with the following information:

The proposed hog facility raises significant health concerns for the health of my rare breed dogs (Chinese Foo dogs). Several years ago, I noticed that my dogs vomited around dusk. This is the time of day that the numerous hog confinement facilities in the immediate area open their windows and allow fresh air into the unit(s). My dogs are kenneled outdoors much of the year. With their highly sensitive sense of smell, they are especially sensitive to the stench and noxious fumes from these facilities. AR601-02.

The stench from the numerous hog confinement units in the immediate area is unbearable and interferes with the daily use and enjoyment of our farm. Regardless of the wind direction and air speed, we must work outdoors. When the air is still, the stench hangs in the air for hours and it is impossible to know which facilities are producing the noxious odors. The stench is overwhelming. The window vents to these facilities are frequently opened around dusk and, on those days that the barns are being cleaned, these facilities create such extreme and noxious odors that it is impossible to be outside. The pungent smell of hog manure permeates the air - there is no escaping the stench. The numerous hog facilities which are already in the immediate area are offensive to the senses. The odors take your breath away at times. If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area. AR 603-04.

The District Court heard at oral argument that the County failed to consider the cumulative effects of this project on the existing conditions:

Judge Chase: "You feel it's incumbent on the county to do that? To study the additive impact of the feedlot on all the other feedlots around."

Counsel: “I think when you have the residents there and they’re complaining about the odors. They’re talking about the multiple facilities in the area, then it’s incumbent upon the agency to respond meaningfully to that issue.”
District Court Transcript, 2/16/2016, p. 38, lines 7-14.

Counsel: "If you had two projects next to each other, did they impact a neighboring at say a .5 level or was it a 1.0 level, a cumulative impact is much like a wave theory. If you have two waves, they come together, they go up. They don’t just balance out. The MPCA commissioned the Pratt Report two months after the decisions were made and the Pratt Report shows that adjacent feedlots do accumulate the impact".
District Court Transcript, 2/16/2016, p. 31, lines 3-11.

Respondent County evaluated the proposed project in isolation and without consideration of the additive effect of odors and air emissions from the proposed project with the existing conditions from other projects identified by Lowell Trom in the record. Respondent County considered setbacks from this barn to residences, considered the design of this proposed hog barn and utilized the OFFSET model to analyze odors and air emissions from this hog barn. None of these evaluate the combination of the odors and air emissions of the proposed project with those from the 10 existing hog barns in the vicinity already causing problems. Respondent's use of the OFFSET model failed to consider cumulative effects so that the County wholly failed to consider this aspect of the problem, just as Kandiyohi County failed to consider the combination of impacts on ground water from the proposed gravel pit with the existing and just as MPCA failed to consider odors and air emissions from the proposed hog barns with the multiple existing hog barns in the vicinity. The OFFSET is a single site model that nowhere factors in cumulative conditions from other existing facilities. Respondent's proposed Findings regarding the OFFSET model provide in part:

Although not required for establishment purposes, OFFSET was run to determine potential nuisance odors to the closest dwelling (other than the owner/operator). The OFFSET predicts an annoyance free value of 98% at the closest dwelling, or an estimated odor impact of 15 hours per month from the months of April to October without odor mitigation. Also, the prevailing winds do not blow towards the Troms, who have opposed this project. The closest dwelling that would be within the path of the prevailing wind is over a mile away. AR433.

Respondent County explained the OFFSET model to the PC on December 11, 2014, as a single site model that evaluates wind direction and other factors from the
single facility. AR932-34. Unfortunately, the OFFSET model fails to take into consideration cumulative effects from the numerous projects and is incomplete.

Respondent County failed completely to analyze the existing conditions and the additive effect of the odors and air emissions from the proposed project in combination with those existing conditions. Like the dozens of applications before, Respondent County rubber stamped approval of this CUP.

Although Respondents argue that the approval of the CUP is consistent with industry practice and regulations, the approval falls outside industry regulations because of the failure to consider cumulative effects of the project in addition to the existing conditions of the 10 other hog barns in the vicinity.

The Order and Memorandum of the District Court at pages 16-18 affirmed the County's decision, accepted the results of the OFFSET model without considering cumulative effects and provided too much deference to the County decision. The District Court included information on personal experiences with hog odors in his own neighborhood and indicated at page 18 that the Court "might disagree" with the conclusions of the County regarding odor during pit agitation. The District Court granted too much deference to the County without considering whether the OFFSET model was in fact fundamentally flawed and allowing the project in isolation.

The Court of Appeals should reverse the grant of the CUP for the failure of the County to consider and evaluate cumulative effects of odors and air emissions from the proposed facility in combination with the existing conditions from other facilities.
Respondent County also failed to adequately consider the effects on the environment from manure spreading, including having enough acres to take up all the nitrogen and phosphorus. The record shows that the County has over 200 permitted feedlots; AR532-43; AR548. The Zoning Administrator has been involved in permitting and review of hog barns in Dodge county since March 2007. AR668-69. Despite what should be significant experience, the County could not address the issue of acreage required for manure application and needed to call MPCA at the last minute to try and sort out the acreage requirements for manure spreading (AR928-932), received information on the number of acres required for a corn and bean crop rotation and never made any calculation of the number of acres required for corn on corn rotation, which requires additional nutrients. If the zoning administrator had been working on hog barn permits since 2007, why did the zoning administrator have no information on the number of required acres and have to call MPCA at the last? The record lacks proof that the County has any practice of adequately reviewing and maintaining manure management plans on the 234 feedlots already in the County. The public process on December 11, 2014 lacked any information rebutting the concerns of cumulative effects of the manure from this barn, together with the existing feedlots in the vicinity and deferred analysis of manure spreading because of a manure transfer form.

While the record does include the MSA signed by Roger Toquam in August 2014 for 490 acres (AR140), the County accepted this without question, including the 190 acres in Section 29, Township 106, Range 18 of Ripley Township. AR144; AR806; AR810. The County never analyzed whether the manure spreading acres were actually
available to this project. The public commented that Toquam had already pledged and was already using that 190 acres of land in Ripley Township, Section 29, for manure spreading from his own existing feedlot. AR291. The County heard objections to the double use of the land in the transcript of public hearing. AR890. [T]"hey're already using that land for manure application from some other site". AR890. Toquam had already pledged this 190 acres in Ripley Township to AgStar Financial Services for a manure spreading easement on another project in 2009. Document No. 180943. The County rebuffed any concerns, did not consider the issue of the double pledge, relied on the manure transfer form and deferred manure management to MCPA. AR950.

Again granting a high level of deference to the County decision, the District Court accepted that 244 acres was enough for a corn and bean rotation and decided that, even if there was a double pledge, 300 acres was still enough for a corn and bean rotation. There was no analysis of corn on corn rotation and no analysis of phosphorus build up, which would have required hundreds of additional acres of land for manure spreading. By deferring to MPCA and granting too much deference to the County, no one is in charge.

Respondent County also failed to adequately consider the cumulative effect of use of groundwater by this proposed hog barn, including well interference. Appellants provided the County with information about excessive water appropriation by hog barns in the vicinity. AR578. Brad Trom notified the County that at least one neighboring well had already gone dry from the well interference. AR605.

In affirming a process that lacked any cumulative effect analysis and lacked essential information on manure spreading, the District Court gave the County a pass.
based on an unduly deferential standard of review for an approval of a CUP. The District
Court granted more deference to the County's decision to grant the CUP than a decision
to deny the CUP, following Schwartt v. County of Watonwan, 656 N.W.2d 383, 386
(Minn. 2003). The Minnesota Court of Appeals has held that, since zoning laws are a
restriction on the use of private property, a landowner whose application for a conditional
use permit has been denied has a lighter burden than one who challenges approval of a
permit. Bd. of Supervisors of Benton Twp. v. Carver Cnty. Bd. of Comm'rs, 302 Minn.
493, 499, 225 N.W.2d 815, 819 (Minn. 1975). Here, the District Court granted the
County too much deference under this standard by allowing the County to ignore
cumulative effects on odors and air emissions despite the detailed concerns of neighbors
and despite the record of saturation from existing feedlots. Too much deference was
granted given based on the record of the County not having given a hard look at the
environmental effects from manure handling.

III. RESPONDENT COUNTY WHOLLY FAILED TO CONSIDER AND
EVALUATE PUBLIC HEALTH CONCERNS REGARDING THE
CREATION OF ANTIBIOTIC RESISTANT BACTERIA, AMONG OTHER
THINGS, AS REQUIRED BY THE COUNTY ORDINANCE. THE
ISSUANCE OF THE CUP BY RESPONDENT COUNTY FOR THIS
PROJECT BASED ON THE ADMINISTRATIVE RECORD WAS
UNREASONABLE AND ARBITRARY.

The Court of Appeals should reverse and vacate the CUP because Respondent
County wholly failed to consider effects of this project on the public health. The
administrative record establishes that the County never evaluated whether the proposed
project meets the Ordinance requirement that the project has no adverse public health
impacts on the neighborhood. This is the first listed criteria in Section 18.13.8 for CUPs:
"The establishment, maintenance or operation will not be detrimental to or endanger the public health." The record establishes that Respondent County disregarded and never analyzed articulated concerns for the public health, thereby rendering arbitrary and unreasonable the approval of the CUP on December 11, 2014.

Failing to consider and evaluate evidence bearing on listed Ordinance criteria for a CUP with more than a scant record makes a decision arbitrary and unreasonable. In re Block, 727 N.W.2d 166, 180 (Minn. App. 2007). The record must show a reasoned response to substantial concerns about important factors and demonstrate that the proposal will meet ordinance standards. Sunrise Lake Ass’n, Inc. v. Chisago County Bd. Of Comm’rs, 633 N.W.2d 59, 61 (Minn. App. 2001). The failure to address a relevant issue is evidence of an unreasonable decision. Citizens Advocating Responsible Dev. v. Kandiyohi County Bd. of Comm’rs, 713 N.W.2d 817, 838 (Minn. 2006).

Here, the Affidavits and information submitted by the Trom Family and other property owners demonstrated for the record threats to the public health from this project in addition to the existing facilities in the vicinity. The Affidavits and letters included the following: 1) Lowell Trom Affidavit, AR573; 2) Sonja Trom Eayrs Affidavit, AR589; 3) Brad Trom Affidavit, AR600; 4) James Trom Affidavit, AR608; 5) Douglas Eayrs Affidavit, AR612; 6) Randy Trom letter, AR621; 7) Peggy Trom letter, AR623; 8) Michael Williamson letter, AR629; and 9) Patricia Derby letter, AR759.

For example, the record shows that Lowell Trom submitted in his affidavit:

The proposed hog confinement unit raises significant health concerns which impair our continued use and enjoyment of the family farm. There are a number of
individuals in the immediate area who have suffered from or died as a result of environmentally-related diseases. . . The proposed hog confinement unit will only add to the already elevated concern of family members and neighbors that pollution to the air and water is directly affecting the health of local families. AR575-76.

The record establishes that Brad Trom raised concerns about environmentally-related diseases from the proposed hog barn. AR602. Peggy Trom raised concerns as follows: "The pollution from animal wastes causes respiratory problems, skin infections, nausea, depression and even death for people who live near factory farms. Centers for Disease Control, Mortality Weekly Report, July 5, 1996." AR624. Peggy Trom submitted an extensive discussion of the public health impacts. AR625-28.

The Williamson letter attached the study: "Understanding Animal Feeding Operations and their Impact on Communities". AR635. This study presents concerns about the spreading of disease and infections from hog confinements to humans and animals. AR649. The study also presents concerns about the low level use of antibiotics:

There is strong evidence that the use of antibiotics in animal feed is contributing to an increase in anti-biotic resistant microbes and causing antibiotics to be less effective for humans. . . The World Health Organization is also widely opposed to the use of antibiotics, calling for a cease of their low-level use in 2003. AR651.

The Court of Appeals can take judicial notice that public health concerns from hog confinements have continued and accelerated. In September 2016, the United Nations and World Health Organization considered the creation of antibiotic resistant bacteria from hog confinements as a "fundamental threat to human health, development and security": www.who.int/antimicrobial-resistance/en/. This only the fourth time that a General Assembly has addressed public health related issues with the prior being
HIV/AIDS, non-communicable diseases such as diabetes and heart disease and the Ebola virus. The World Health Organization issued a press release, which is located at:


The evidence submitted by the Trom Family to Respondent County for evaluation included the April 8, 2014, letter raising, among other things, public health concerns about the project proposed for this area of the County with all the other facilities already there. AR-63-70. Concerns were raised specifically for the creation of antibiotic resistant bacteria in this cluster of feedlots: "MRSA is considered a major threat to the public health." AR65. Exhibit B to the April 8, 2014 letter included the numerous studies on threats to the public health from clusters of hog confinements like this spreading disease and creating antibiotic resistant bacteria from numerous reputable Universities. AR69-70. The record also includes the December 9, 2015, written objections. AR286.

The County received written objections dated December 10, 2014, from Dodge County Concerned Citizens ("DCCC"). AR294. DCCC objected to the "public health concerns" from the project and cumulatively as the breaking point with the 10 other existing hog confinements within a 3 mile radius. AR295; 609. DCCC objected to the "environmental toxins". AR296. DCCC commented: "As detailed in Exhibits 7 and 8, there are at least 10 hog confinement units within a 3-mile radius of the Trom farm, several of which exceed 1,000 animal units" AR300. DCCC raised concerns for the
health of animals and people in the area, including "respiratory problems, skin infections, nausea, depression and even death". AR300. DCCC provided evidence as follows regarding the health of their dogs:

“As detailed in the affidavit of Brad Trom dated September 7, 2014 (Exhibit 13), Brad noticed several years ago that his dogs vomited around dusk. This is the time of day that the numerous hog confinement facilities in the area open their windows and allow fresh air into the units. Brad’s dogs are kenned outdoors much of the year. With their highly sensitive sense of smell, they are especially vulnerable to the stench and noxious fumes from these facilities.” AR-300.

DCCC also provided: "There is a suspected cancer cluster in the area near the Trom farm. Within a 3-mile radius of the Trom farm, there have been at least 13 individuals who have been diagnosed or died as a result of cancer. Within this same 3-mile radius, there are at least 10 hog confinement units, several of which exceed 2,000 animal units. AR295. DCCC provided a listing of supporting documents. AR306-07.

Respondent County failed to consider and evaluate the threat to the public health posed by this project in addition to the others in the vicinity. The PC referenced the hundreds of pages received by the County on December 10, 2014 and baldly asserted for the record that they “all had a chance to read” the materials. AR 959. The PC made a motion to accept the binder of materials in the record, but nowhere held a discussion on the materials as they pertained to the Ordinance criteria. AR 961. Neither the PC nor the County Board considered, or even referenced, the threat of increased antibiotic resistance in their minutes, reports and findings. AR 779-81, 785-86, 884-971, 986-1007.

In Mantorville, Dodge County is handing out CUPs to hog confinements, such as this one, without regard to the creation of antibiotic resistant bacteria that are considered
one of the world's fundamental threats to public health. Less than 20 miles away, the Mayo Clinic in Rochester, which US News and World Report ranked as the best hospital in the nation, is trying it's best to continue to use antibiotics to help treat people. A serious threat to the public health should be noticed by the County, especially in the shadow of the world renowned Mayo Clinic.

IV. RESPONDENT COUNTY APPROVED THE CUP FOR THE PROPOSED PROJECT THROUGH AN EXPEDITED PROCESS LACKING FUNDAMENTAL FAIRNESS THAT INVOLVED A STAFF REPORT THAT SERVED AS AN ADVOCACY PIECE FOR THE PROJECT, A BIASED, FLAWED AND UNFAIR PUBLIC HEARING PROCESS AND A FAILURE TO MANAGE AND ADDRESS THE VOLUMINOUS RECORD OF CONCERNS. THE ISSUANCE OF THE CUP BY RESPONDENT COUNTY WAS UNREASONABLE AND ARBITRARY.

Minnesota law provides that a quasi-judicial decision on a land development project is arbitrary and capricious if it reflects the will, rather than the judgment, of the decision maker, which can be shown by the failure of the decision maker to follow applicable process and procedure. *Pope County Mothers v. Minnesota Pollution Control Agency*, 594 N.W.2d 233, 235 (Minn.App. 1999). Neighboring property owners have the right under Minnesota law to a fair and impartial quasi-judicial process in zoning decisions, including the right to impartial decision makers who lack a direct financial stake in the decision. *E.T.O., Inc. v. Town of Marion*, 375 N.W.2d 815, 820 (Minn.1985); *Lenz v. Coon Creek Watershed District*, 153 N.W.2d 209 (Minn. 1967).

Another danger signal on the approval of the CUP is the pervasive bias in favor of approving feedlots demonstrated by the PC and County Board, including based on the recommendation of the Town Board. While the bias may not have risen to the level of
disqualification of officials from voting for a direct financial stake in the outcome (other than Joshua Masching), the acknowledged bias remains a danger signal to be considered in combination with the others as to the reasonableness of the decision. The Township Officials involved in recommending approval had a financial stake with the family related to the feedlot operations of the Project. Schmeling, Wolf and Fiebiger all signed MSAs with James and Rebecca Masching, who are related to the owner of MSF. The Township Officials never disclosed the MSAs. Westfield Township was on record as having no objection to the Project, as evidenced by the County proposed Findings.

AR431. Owen Kirkebon, supervisor testified at the public hearing on December 11, 2014, on behalf of Westfield Township in support of the CUP for the Project. Kirkebon stated as follows: "Well, we kind of feel that they should have the permit." AR908.

The County heard objections that five of the seven members of the PC were financially benefiting from the feedlot industry so that there was an industry bias. AR897. Richard Wolf, Chair of the PC and a registered feedlot operator, stated at public hearing:

I'd like to maybe address the statement that, 'this is a livestock board.' Yes, it may not—it may look like that, but I think as of right now there's two positions available, or soon to be I believe, that if anybody else would like to be on this board you sure can. AR954.

There are a number of additional danger signals, including the fact that the County rushed the process, prejudged the application and held an unfair hearing. The County had already on November 21, 2014, issued a Staff Report recommending approval of a new CUP before counsel for Appellant had even received in the mail the District Court order vacating the prior CUP. The District Court Order vacating the initial CUP issued on
November 18, 2014. AR323. The County granted approval of the second CUP on December 11, 2014. Section 18.13.13 of the Ordinance provides that: "Whenever an application for a CUP has been considered and denied by the County Board, a similar application for a CUP affecting the same property shall not be considered again by the Planning Commission or County Board for at least six (6) months from the date of its denial." AR109. Ordinances such as this contemplate that the County should wait a minimum of six months before considering once again the resubmission of an application. Although the District Court considered otherwise, this is a question of law. The reversal and vacating of the CUP on November 18, 2014, constituted an effective denial of the CUP for purposes of Minnesota law. Such an Order has greater weight than a denial because of the deferential standard of review. The goal of the Court is to effectuate the legislative intent. Minn. Stat. 645.16. Minnesota courts have defined what constitutes an effective denial of a permit application for purposes of Minnesota law. 

*Demolition Landfill Services, LLC v. City of Duluth*, 609 N.W.2d 278, 281-82 (Minn. App. 2000), review denied (Minn. July 25, 2000); Minn.Stat. 15.99; *Calm Waters, LLC v. Kanabec County Bd. of Com'rs*, 756 N.W.2d 716, 719 (Minn.2008). Respondent County should have waited 6 months.

The County received from MSF the new application on November 20, 2014. AR124. The County prepared and issued the new Staff Report within hours and no later than early in the morning of November 21, 2014. The County had submitted the new Staff Report the morning of November 21, 2014 to various agencies and was receiving back agency comments already that morning. AR522-24 . The County first published
Notice of the Public Hearing on the resubmitted CUP application in the newspaper that went out on November 26, 2014. AR284.

Another danger signal of arbitrary decision making is the County's ongoing refusal to hold a public hearing that considers and evaluates all the relevant issues, documents and information contemplated by the then existing Ordinance, Minnesota Rules, Ch. 7020 and Minn.Stat. 116D.04. The Ordinance required a public hearing on the CUP application and in December 2014 included a number of items of required information pertaining to the project to include manure management, most of which were previously missing on this Project as detailed in the November 18, 2014, Order. The public hearing that the County holds on a CUP does double duty by satisfying the requirement in Minnesota Statutes that states that a public hearing must take place on all feedlot applications for projects under 1,000 animal units, such as this, that also seek to avoid an environmental assessment worksheet ("EAW"). Minn.Stat. 116D.04. Sometime between April 2014 and November 2014, Respondent County changed the application form to defer the required information under the Ordinance and the Minnesota Rules, Ch. 7020. Respondent County changed the application form 3 times since April 2014 each time reducing the information required and thereby rendering meaningless the public hearing process and the fundamental right to be heard. Respondent County's application seeks to defer all the relevant information: "Upon approval of the Conditional Use Permit for the feedlot additional information is required . . . ". AR 123. This is a violation of Minn.R. 7020.2225, Subp. 4, and Minn. Stat. 116D.04, subd. 2a(d).
The County unreasonably limited public input and cut off public comment at the hearing on December 11, 2014. The County had set aside 3.5 hours for the public hearing and yet they limited public input to 3 minutes per person or 5 minutes for a person representing multiple citizens and property owners so that total public input was limited to less than an hour. The County heard objections to this bias, as follows: “What’s the hurry, you set aside from one until 4:30 I think for the public hearing.” AR921. Despite having written authorizations to speak on behalf of 8 family members and citizens, the County cut off Sonja Trom Eayrs from comment after only 5 minutes of input. AR893; AR919. Sonja Trom Eayrs stated that she had 8 signed authorizations and should be permitted to speak for 24 minutes. AR893. The County refused and instead stated: "You've got five minutes right now." AR894. The County shut down input from Sonja Trom Eayrs after 5 minutes. AR897.

In conclusion, the process for review and approval of this project lacked fundamental fairness at every stage of the proceeding -- a biased PC stacked with fellow registered feedlot operators (akin to putting the fox in charge of the henhouse); a rushed process that limited public input by those it affected directly; reliance upon an advocacy report prepared by Melissa DeVetter, the local planning and zoning administrator that did not address a single concern raised by the appellants; and fast-tracking of this controversial project in back-to-back special meetings of the PC and the Dodge County Board of Commissioners called for this single project just days after the District Court vacated the initial permit. The biased, unfair, and rushed process can only lead to one conclusion -- Dodge County did not take a hard look at this project.
V. THE COURT OF APPEALS SHOULD REVERSE THE GRANT OF THE CUP AND VACATE SO THAT THE COUNTY EXERCISES ITS AUTHORITY TO REMEDY THE SITUATION ANEW WITHOUT REFERENCE TO ITS PRIOR DECISIONS AND CONSISTENT WITH CURRENT MINNESOTA STATUTES AND RULES.

In reversing the CUP, the Court of Appeals should vacate the approval rather than remand. *BECA of Alexandria, L.L.P. v. Cnty. of Douglas ex rel Bd. of Comm’rs*, 607 N.W.2d 459, 464 (Minn. App. 2000) (“We are not required to remand where a zoning authority’s decision is arbitrary because it is unsupported by legally sufficient reasons.”). Respondent County should review the proposed project without being constrained by the prior proceedings and in compliance with Minnesota law. The project should go through a full and fair hearing and process in compliance with Minnesota law unfettered by attachment to the prior approvals. Such a process should consider cumulative effects, a response to concerns for the public health, possible mitigation measures and protection of the public health. The effects are not just from a single project. This appeal is an opportunity for the Minnesota Court of Appeals to send a strong message to every local unit of government facing a land use decision -- the public health of all Minnesotans comes first. A hard look under Minnesota law demands review of public health concerns. The public health of our citizens is paramount to profit.

Amicus participation by leading public health, environmental and other groups, including professionals at Johns Hopkins Center for a Livable Future, Humane Society of the United States, Animal Legal Defense Fund, Minnesota Center for Environmental Advocacy, Environment Minnesota and Food & Water Watch underscore the need for reversal and vacating the CUP granted on December 11, 2014.
VI. THE DISTRICT COURT CORRECTLY DECIDED THAT SERVICE OF PROCESS WAS EFFECTIVE TO OBTAIN JURISDICTION.

Respondent MSF argues in cross appeal that the Court of Appeals lacks subject matter jurisdiction over this appeal based on allegedly defective service of process on Respondent County. MSF brought a motion to dismiss in this Court of Appeals based on this argument. In support of its motion, MSF argued that Minnesota case law has referred to compliance with time limits for serving process as subject matter jurisdiction citing to In re Skyline Materials, Ltd., 835 N.W.2d 472 (Minn. 2013).

The Special Term Panel of this Court denied the MSF motion on August 16, 2016 on other grounds and ordered that: "In their briefs, the parties shall clarify whether the service issue relates to personal or subject-matter jurisdiction".

The District Court correctly ruled in its Order that service of process was timely and effective upon Respondent County in the District Court to establish jurisdiction for this appeal. Appellants served the District Court appeal three times, complied with the rules on service of process and, moreover, Respondents waived any objections to any allegedly improper service of process.

Under Minnesota law, objections to service of process relate to personal jurisdiction and not to subject matter jurisdiction. The Court of Appeals conducts a de novo review of whether service of process was effective to obtain personal jurisdiction. The Minnesota Supreme Court has held: “Whether service of process was effective, and personal jurisdiction therefore exists, is a question of law that we review de novo.”
Shamrock Dev., Inc. v. Smith, 754 N.W.2d 377, 382 (Minn. 2008); Roehrdanz v. Brill, 682 N.W.2d 626, 629 (Minn. 2004).

The Minnesota Supreme Court recently clarified that time limits for service are claim processing rules, rather than jurisdictional requirements. McCullough and Sons, Inc. v. City of Vadnais Heights, A14-1992, A15-0064, __ N.W.2d ___ (Minn. 2016).

Subject matter jurisdiction exists in the Dodge County District Court pursuant to Dodge County Zoning Ordinance, Section 18.13.12 and Minn. Stat. 394.301. See, Toby’s of Alexandria, Inc. v. County of Douglas, 545 N.W.2d 54 (Minn. App. 1996), review denied (Minn. May 21, 1996). The time limit placed on bringing an appeal is a claim processing rule.

Appellants properly commenced the appeal in the District Court by service of process three times that acquired personal jurisdiction over Respondent County. In any event, Respondent County waived the issue of improper service.

The Court of Appeals reviews de novo the interpretation and application of the Minnesota Rules of Civil Procedure. St. Croix Dev., LLC v. Gossman, 735 N.W.2d 320, 324 (Minn. 2007); Mingen v. Mingen, 679 N.W.2d 724, 727 (Minn. 2004). This standard is established. House v. Hanson, 245 Minn. 466, 473, 72 N.W.2d 874, 878 (1955).

The Court of Appeals reviews the relevant findings of fact by the District Court regarding service of process under the clearly erroneous standard of review. Minn. R. Civ. P. 52.01; Fletcher v. St. Paul Pioneer Press, 589 N.W.2d 96, 101 (Minn. 1999).

The District Court properly concluded that service of process in the District Court proceedings was proper and timely under Minn.R.Civ.P. 3.01. Personal service on the
office of the board chair, Rodney Peterson, at the official address for the County by delivery to the Sheriff of the appeal documents by letter of January 7, 2015, establishes proper service for jurisdiction for this appeal in compliance with Rules 3 and 4 of the Minnesota Rules of Civil Procedure for District Courts. *Erickson v. Coast Catamaran Corporation*, 414 N.W.2d 180 (Minn. 1987). Delivery of the summons and complaint to the sheriff of the county is effective where that county was the residence of the defendant agent identified in Rule 4.03 as the proper party to receive service. The Minnesota Supreme Court referenced the policy of broad construction of the rules of civil procedure and cited *Love v. Anderson*, 240 Minn. 312, 314, 61 N.W.2d 419, 421 (1953), for the proposition that the Minnesota rules “reflect a well-considered policy to discourage technicalities and from . . . [and] should be liberally construed in the interests of justice”.

The Minnesota Supreme Court has held that substantial compliance with the rules for service of process coupled with actual notice will subject the defendant to jurisdiction. *In re Disciplinary Action Against Coleman*, 793 N.W.2d 296, 302 (Minn. 2011).

The District Court correctly concluded that Appellants complied with the Rule 4.03 and with Rule 3.01(c) by submitting the appeal documents to the Dodge County Sheriff by letter dated January 7, 2015, actually received January 8, 2015, for service on the office of the Board Chair, Rodney Peterson with directions to serve the office of the board chair at the official address of the County Board, the Courthouse. Peterson was the Board Chair on the decisional meeting of December 11, 2014. The letter of January 7, 2015 requested service on Peterson as the Board Chair in a representative capacity, rather than as Rodney Peterson, personally. The address for service was for the office of the
board chair as the official address for Dodge County, which is the Courthouse, and no personal residence and no law offices of an attorney.

The District Court found as a matter of fact that, while the County changed board chairs on January 6, 2015, Appellants confirmed with the official site of Dodge County on January 7, 2015, that Rodney Peterson continued as the board chair. The District Court concluded as a matter of fact that the County gave no notice to Appellants or any other person of the change as of January 7, 2015, so that Appellants had no notice of the change in the board chair. Service of process substantially complied.

The Dodge County Sheriff followed through with service on the office of the board chair on Rodney Peterson in a representative capacity as Board Chair for Dodge County and the Dodge County Board on January 13, 2015. The Dodge County Sheriff did not return the documents to Appellants' counsel unserved and did not contact Appellants' counsel to make alternative arrangements for service.

The District Court correctly held that Appellants also served the attorneys for Respondents with the appeal documents by mail on January 7, 2015, thereby ensuring that Respondents had timely notice and made no arguments of prejudice from lack of notice. The District Court properly found that Appellants substantially complied with Minn.R.Civ.P. 4 and that service of process was accordingly accomplished. The District Court noted that this conclusion is consistent with Minnesota policy that the rules of civil procedure are intended to provide for a resolution of the case on the merits. Save Our Creeks v. City of Brooklyn Park, 699 N.W.2d 307, 310 (Minn. 2005).
Respondents have waived and are estopped under Minn.R.Civ.P. 9.01 from asserting the lack of jurisdiction from service of process. In their Answers to Complaint of February 2015, Respondents assert that service was improper, but fail to specifically negatively aver the alleged lack of capacity of board member Peterson to be served in a representative capacity as the Board Chair. Minn.R.Civ.P. 9.01 requires a party who desires to raise an issue as to the legal capacity of a person to be sued in a representative capacity to specifically state all supporting particulars. Respondents failed to meet the requirements of Minn.R.Civ.P. 9.01 to state that board member Peterson allegedly lacked capacity to be served in a representative capacity for the County and the Board and failed to aver that John Allen was the new Board Chair. Respondents further failed to plead that an official act of the County of January 6, 2015 to name John Allen as Board Chair deprived Peterson of the ability to be served in a representative capacity. Minn.R.Civ.P. 9.04 requires an averment of the official act done in compliance with law. The Answers Respondents contain no such averment and waived the objection. Respondents waited until the last minute to object to service of process and only did so informally in an argument in response to Appellants' motion to amend. There was no motion to dismiss in the District Court.

Service via US mail on counsel is also sufficient in the circumstances of an appeal to District Court of a municipal decision made under Minn. Stat. 394. Savre v. Independent School Dist. No. 283, 642 N.W.2d 467 (Minn.App. 2002). As an appeal action under Minn.Stat. 606.01, jurisdiction under the statute and appellate rules is invoked by service by mail on an attorney representing a party. Minn.R.Civ.App.P. 125.03. The instant appeal action is by Minn.Stat. 606.01 an appellate continuation of the legal process before the
County Board. Minn.R.Civ.P. Rule 5.01 provides: “every pleading subsequent to the original complaint . . . and every written notice, appearance, demand, offer of judgment, designation of record on appeal, and similar document shall be served upon each of the parties.” Minn. R. Civ. P. 5.01. Rule 5.02(a) provides that such “service shall be made upon the [party’s] attorney unless service upon the party is ordered by the court.” Minn. R. Civ. P. 5.02(a).

In addition, Respondents argue that personal service of the Summons and Complaint was not accomplished on newly named Board Chair John Allen within 30 days of the grant of the CUP on December 11, 2015 as required by the Zoning Ordinance and that Appellants had verbal notice of the grant of the CUP at the Board meeting of December 11, 2014, which is actual notice triggering the limitations period. Respondent County argues that the Zoning Ordinance does not specify the type of notice to be given and that the practice of the County is to send notice only to the applicant and not to other interested parties.

Minnesota Courts have recognized that appeals of CUP decisions are to the Minnesota Court of Appeals via Writ of Certiorari, which appeal actions are governed by the applicable statute, Minn. Stat. 606.01-06. Neitzel v. County of Redwood, 521 N.W.2d 73, 76 (Minn.App. 1994), rev.den. (Minn. Oct. 27, 1994).

Minn. Stat. 606.02 establishes that the deadline for an appeal to the Minnesota Court of Appeals via Writ of Certiorari is within 60 days after due notice of the decision. Due notice of decision under Minnesota law constitutes written notice so that the deadline for a certiorari appeal of the granting of a CUP runs from the County giving of written notice to interested parties. Minnesota courts have held - since 1925 - that the 60
day period for an appeal runs from written notice of the decision and not from actual or verbal notice because the term "due notice" under 606.01 requires written notice; verbal notice at a meeting or otherwise obtaining actual notice of a decision fails to constitute due notice to trigger the running of the 60 day period for the public policy reason that the deadlines are clear, established and without dispute. *Picha v. County of McLeod*, 634 N.W.2d 739 (Minn.App. 2001); *In re Judicial Ditch No. 2*, 163 Minn. 383, 202 N.W.2d 52 (Minn. 1925). Written notice solves any issues of timely notice given.

The plain language of the Dodge County Zoning Ordinance requires written notice to interested parties who request such notice, such as Appellants. Section 18.13.11 of the Zoning Ordinance states that the zoning administrator must forward written notice of the County Board's decision to the applicant and any other person who requests notice. This is consistent with Minnesota law on notice. *Matter of Saldana*, 444 N.W.2d 892 (Minn.App. 1989). Appellants formally in writing in 2014 requested notice from Respondent County of all permit actions concerning Respondent Masching. Respondent County did not provide any written notice to Appellants of the CUP until February 2015.

A County may not alter the statutory procedures for establishing jurisdiction of the certiorari appeal, such as the 60 day period for commencement of the appeal and service. Minn.R.Civ. App.P. 115.01 provides that: "The appeal period and the acts required to invoke appellate jurisdiction are governed by the applicable statute".

The time for an appeal of a CUP under Minnesota statute is 60 days after written notice of the decision. Minn.Stat. 606.02 requires service of an appeal action in the Minnesota Court of Appeals within 60 days after due notice of the decision even where
the local zoning ordinance attempts to reduce the time period to 30 days. *United Migrant Opportunity Services, Inc. v. Dodge County Planning Commission*, 636 N.W.2d 813 (Minn.App. 2001). The County may not reduce the 60 day period from due notice of the decision to a lesser period, such as 30 days. *Id.*

The deadline for an appeal of the CUP granted by Respondent County Board to Respondent Masching in this action is 60 days from due notice of the decision. Minn.Stat. 606.02. Although Section 18.13.12 of the Dodge County Zoning Ordinance attempts to reduce the time for an appeal from 60 to 30 days, the statutory period of 60 days controls under Minnesota law.

Appellants received due notice of the decision as required by Minn.Stat. 606.01 no earlier than February 12, 2015. Attached to the Peters Affidavit is the July 22, 2014, formal request by letter and email to the County for, among other things, written notice of all approvals or permits granted for the feedlot project of Respondent Masching. Appellants followed Section 18.13.11 of the Zoning Ordinance, which provides for such a request. Respondent County gave no written notice of decision to Appellants at any time prior to February 9, 2015 by mail, as documented in the Peters Affidavit and have never provided a copy of the CUP. On January 28, 2015, Appellants checked the County's website and did not see any findings or the CUP as part of the minutes of meetings. On February 4, 2015, having not yet received any written notice, counsel for Appellants requested the minutes of the December 11, 2014 meeting via email and letter to the County, as documented by the exhibits to the Peters Affidavit. On February 9, 2015, Respondent County mailed the minutes of the December 11, 2014 meeting to
counsel for Appellants without the actual CUP. Adding 3 days for mailing as specified for by Minnesota law, the minutes were provided to Appellants' counsel effective as of February 12, 2015.

Respondent Dodge County did provide written findings to Appellants by mail effective February 12, 2015. The earliest possible date the 60 day time limitation for an appeal of the granting of the CUP would have started running under Minnesota law would be February 12, 2015 so that jurisdiction would be obtained through service within 60 days, which would establish a deadline of April 13, 2015.

Appellants also secured personal jurisdiction for this appeal by personal service for a third time of the appeal documents on the County Auditor and current board chair John Allen, which service is effective April 13, 2015. Appellants caused hand delivery on April 13, 2015 of the appeal documents to the Dodge County Sheriff for service on the Board Chair, John Allen. A copy of the letter with signed acknowledgement of receipt by the Sheriff is attached to the Peters Affidavit. This service is effective April 13, 2015, which is the date of delivery of the documents to the Sheriff for service on a defendant or agent who resides within the County. Minn.R.Civ.P. 3.01; Erickson v. Coast Coast Catamaran Corporation, 414 N.W.2d 180 (Minn. 1987). April 13, 2015 is 60 days of February 12, 2015, which is the earliest possible date for due notice of decision to Appellants as the date effective on which the County first provided the findings to the Appellants. The Sheriff thereafter served the Auditor and also served Allen's spouse at their home. Service on the Auditor complies with Minn.R.Civ.P. 3 and 4.
CONCLUSION

For the foregoing reasons, Appellants respectfully request that the Court of Appeals reverse and vacate the December 11, 2014, decision of Respondent County to grant a CUP to Respondent Masching Swine Farms, LLC. *BECA of Alexandria, L.L.P. v. Cnty. of Douglas ex rel Bd. of Comm’rs*, 607 N.W.2d 459, 464 (Minn. App. 2000).

LAW OFFICES OF JAMES P PETERS PLLC

DATED: October 3, 2016

By: /s/ James P Peters #0177623
Attorney for Appellants
460 Franklin St N #100
PO Box 313
Glenwood MN 56334
(320) 634-3778

CERTIFICATION OF BRIEF LENGTH

I hereby certify that this brief conforms to the requirements of Minn.R.Civ. App. 132.01, subds. 1 and 3 for a brief produced with a proportional font. The length of this brief is 13,998 words. This brief was prepared using Microsoft Word 2007.

LAW OFFICES OF JAMES P PETERS PLLC

DATED: October 3, 2016

By: /s/ James P Peters #0177623
Attorney for Appellants
460 Franklin St N #100
PO Box 313
Glenwood MN 56334
(320) 634-3778

48
ADDENDUM

Order and Judgment in Trom, et al., v. Dodge County, Dodge County District Court Case No. 20-CV-15-17 (May 13, 2016).
State of Minnesota
In Court of Appeals

Lowel Trom, et al,

Appellants,

vs.

County of Dodge, et al,

Respondents,

And

Masching Swine Farms, LLC

Respondent.

BRIEF OF AMICI CURIAE DR. JILLIAN P. FRy, Ph.D., M.P.H.,
DR. ROBERT S. LAWRENCE, M.D., MS. CLAIRE M. FITCH, M.S.P.H.,
AND MS. CAROLYN R. HRICKO, M.P.H.

JAMES P. PETERS (#0177623)
Law Offices of James P. Peters, PLLC
460 Franklin St. N #100
P.O. Box 313
Glenwood, MN 56334
(320) 634-3778
Attorney for Appellants,
Lowell Trom, et al.

PAUL D. REUVERS (#0217700)
Iverson Reuvers Condon
9321 Ensign Avenue South
Bloomington, MN 55438
(952) 548-7205
Attorney for Respondents
Dodge County, et al.
JACK Y. PERRY (#0209272)  
Briggs and Morgan  
80 South 8th Street  
Minneapolis, MN 55402  
(612) 977-8400  
Attorney for Respondent,  
Masching Hog Farms, LLC

BRUCE D NESTOR (#0318024)  
De León & Nestor, LLC  
3547 Cedar Ave. South  
Minneapolis, MN 55407  
Tel: (612) 659-9019

and

DANIEL H LUTZ  
The Humane Society of the United States  
1255 23rd Street NW  
Washington, DC 20037  
Tel: (240) 388-5023  
Attorneys for Amici  
Humane Society of the United States, and Animal Legal Defense Fund

JENNEANE L. JANSEN (#0236792)  
KRIS E. PALMER (#0240138)  
Jansen & Palmer, LLC  
4746 Elliot Avenue South  
Minneapolis, MN 55407  
(612) 823-9088  
Attorneys for Amici  
Dr. Jillian P. Fry, Ph.D., M.P.H.,  
Dr. Robert S. Lawrence, M.D.,  
Ms. Claire M. Fitch, M.S.P.H., and  
Ms. Carolyn R. Hricko, M.P.H.

KEVIN P. LEE (#0395933)  
Minnesota Center for Environmental Advocacy  
26 East Exchange Street, Suite 206  
St. Paul, MN 55101  
(651) 223-5969  
Attorneys for Amici Minnesota Center for Environmental Advocacy, Environment America, d/b/a Environment Minnesota, and Food & Water Watch
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF AUTHORITIES</td>
<td>ii</td>
</tr>
<tr>
<td>INTEREST OF AMICUS CURIAE</td>
<td>iii</td>
</tr>
<tr>
<td>ARGUMENT</td>
<td>4</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>10</td>
</tr>
<tr>
<td>CERTIFICATION OF BRIEF LENGTH</td>
<td>12</td>
</tr>
</tbody>
</table>
TABLE OF AUTHORITIES

CASES

Big Lake Assoc. v. St. Louis County Planning Comm.,
761 N.W.2d 487 (Minn. 2009) ................................................................. 5
INTEREST OF AMICI CURIAE¹

Jillian P. Fry, Ph.D., MPH, Robert S. Lawrence, MD, Claire M. Fitch, MSPH, and Carolyn R. Hricko, MPH are faculty and/or researchers World Health Organization study the food system and public health. They are all affiliated with the Johns Hopkins Center for a Livable Future (“CLF”).² Within this brief, these amici will refer to themselves as the “Public Health Amici.”

CLF is an interdisciplinary academic center based within the Johns Hopkins Bloomberg School of Public Health, which applies scientific, policy, and regulatory expertise to issues surrounding food systems and public health. http://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/. CLF engages in research, policy analysis, education, and other activities guided by an ecological perspective that diet, food production, the environment, and public health are interwoven elements of a complex system. The Public Health Amici recognize the prominent role that food animal production plays with regard to a wide range of public-health concerns within and associated with that system.

Dr. Jillian P. Fry, Ph.D., MPH, directs the CLF’s Public Health & Sustainable Aquaculture Project, and is an Assistant Scientist in the Departments of Environmental Health Sciences and Health, Behavior, and Society at the Johns Hopkins Bloomberg

¹ No counsel for any party authored this brief in whole or in part. No person or entity other than Amici, or its counsel, made any monetary contribution to the preparation or submission of this brief.

² The views of these amici do not necessarily reflect the views of Johns Hopkins University.
School of Public Health. Dr. Fry's research focuses on the effects of industrial food animal production (including aquaculture) on environmental public health, especially regarding resource use, effectiveness of regulations, and understanding policy processes relevant to food-animal production at the local, state, and federal levels. She has published 5 peer-reviewed journal articles on issues related to the environmental and public-health impacts of industrial food animal production. Dr. Fry also coordinates CLF's response to requests for technical assistance from community members, non-governmental organizations, and other stakeholders who are seeking a public health professional to interpret the scientific evidence on industrial food-animal production. (7/25/16 Palmer Aff., Exhibit 4, Curriculum Vitae of Jillian P. Fry).

Dr. Robert S. Lawrence, MD, is a Professor Emeritus of Environmental Health Science and International Health at the Johns Hopkins Bloomberg School of Public Health. He is also a Professor of Medicine at the Johns Hopkins School of Medicine. Dr. Lawrence is a graduate of Harvard College and Harvard Medical School, and trained in internal medicine at the Massachusetts General Hospital in Boston, Massachusetts. Dr. Lawrence founded the Center for a Livable Future in 1996, served as director until 2015, and has published 8 peer-reviewed articles directly related to the environmental and health impacts of industrial food-animal production. Before joining the Johns Hopkins Bloomberg School of Public Health and starting the CLF, Dr. Lawrence spent many years advancing the field of public health via leadership positions at multiple organizations, including the U.S. Centers for Disease Control and Prevention, the University of North Carolina Chapel Hill, Harvard Medical School, Cambridge Hospital,
the U.S. Preventive Services Task Force, and the Rockefeller Foundation. (See July 25, 2016 Affidavit of Kris Palmer in Support of Amicus Petition, Exhibit 1, Biographical Sketch of Robert S. Lawrence).

Ms. Claire M. Fitch, MSPH, is a Program Officer in the Food System Policy Program at the Johns Hopkins Bloomberg School of Public Health. In this position, Ms. Fitch has conducted literature reviews, and provided public comment and testimony on the public health impacts of industrial hog, turkey, and broiler-chicken production in the U.S. Prior to joining the CLF, Ms. Fitch was a U.S. Borlaug Fellow in Global Food Security with the USAID Nutrition Innovation Lab. (7/25/16 Palmer Aff., Exhibit 5, Curriculum Vitae of Claire M. Fitch).

Ms. Carolyn R. Hricko, MPH, is a Research Assistant in the Food System Policy Program at the Johns Hopkins Bloomberg School of Public Health. Ms. Hricko has a background in global health and sustainability, and has conducted literature reviews on air pollution and other environmental and public health impacts of industrial hog, turkey, and broiler-chicken production and processing in the U.S. (7/25/16 Palmer Aff., Exhibit 6, Curriculum Vitae of Carolyn R. Hricko).

The Public Health Amici assert a public interest. The Dodge County Ordinances at issue in this case required compliance with U.S. and state environmental laws, and the permit at issue in this appeal has broad implications for Dodge County, other counties in Minnesota, and rural areas across the U.S. Through this brief, the Public Health Amici provide interpretation of relevant scientific evidence regarding the public-health and community impacts of industrial-scale hog production.
RECORD FACTS THAT DEMONSTRATED THE LIKELIHOOD OF NEGATIVE PUBLIC HEALTH EFFECTS

The administrative record contained substantial evidence that demonstrated a high likelihood of negative public-health effects caused by industrial-scale hog production such as the one at issue in this case.

Masching Hog Farm (hereinafter, “Masching”) proposed to build a facility that would house 2,400 hogs. Each hog generates as much waste as three people. So the Masching proposal amounted to the equivalent of a housing project that would house 7,200 people for 24 hours a day, seven days a week, 365 days a year.

Per the Masching proposal, all of those 7,200 people’s feces and urine would remain onsite, in a concrete pit underneath their living space, with open-air slats to allow for ventilation of the excrements’ gases. (Id. at AR-780-82). This hypothetical housing project’s waste would remain in that pit for up to a year at a time. (Id. at 782). By the end of each year, this “housing project’s” occupants would have produced an estimated \textit{1.14 million gallons} of liquid waste composed of excrement and urine. (Id. at AR-812).

Such waste breaks down, and as it does, it releases toxic gases, including ammonia, hydrogen sulfide, and methane. (AR-647). All of these gases are potentially explosive, which poses an obvious risk to public health. And the evidence presented to the County specifically described how two of these gases --- ammonia and hydrogen sulfide --- directly affect human health with repeated exposure, even at low doses. (Id. at AR-646-48).
The evidence presented to the County showed that ammonia is an irritant that causes chemical burns to the respiratory tract, skin, and eyes. (Id. at 646). At high concentrations, it generates a severe cough, and chronic exposures to levels as low as 0.5 mg/m3 can result in decreased lung function and respiratory system.

Those at highest risk are children and the elderly. The evidence presented to the County showed that children who are regularly proximate to operations like the Masching’s are more likely to develop asthma (a chronic lung disease that can affect said children for the rest of their lives), and bronchitis. Chronic lung disease can, and often does, kill the elderly. (AR-647).

The evidence presented to the County also showed that hydrogen sulfide causes inflammation of the moist membranes of the eyes and respiratory tract, and olfactory neuron loss. (Id.). It has an extremely noxious “rotten egg” odor. Studies presented to the County showed that this odor is so noxious that repeated exposure (merely due to the odor) can pose risks to mental health. And data submitted to the County showed that the odors from industrial hog operations such as the Masching’s can be detected from as far away as six miles.

The County received evidence demonstrating that 1.1 million gallons of hog waste would be expected to generate significant amounts of ammonia and hydrogen sulfide. Such gases are so concentrated in facilities such as the Masching’s, that the latters’ designs must incorporate powerful ventilation systems, lest the hogs die due to exposure to the gases produced by their own decomposing bodily waste.
These necessary ventilation systems pump the bodily waste materials into the air around the facility, and until these gases disperse, nearby properties experience continuously elevated exposure to them, thereby increasing the properties’ inhabitants’ risk of chronic respiratory illnesses, changes to mental health, and even death.

As one would expect with a 7,200-occupant human housing project, the occupants of such high-density hog facilities are at increased risk of disease from various pathogens, including bacteria and viruses. One of the most commonly found bacteria is *Staphylococcus aureus*. *Staphylococcus aureus* is a pathogen responsible for a significant burden of skin infections and respiratory disorders.

In order to protect the animals (as well as enhance their growth), it is commonplace to feed them antibiotics. The evidence presented to the County included data showing that such feeding practices increase the risk of antibiotic resistance, and that therefore such facilities result in increased local risk of exposure to various antibiotic-resistant bacterial infections, including infections with Methicillin-Resistant *Staphylococcus aureus*, or “MRSA.”

MRSA is a resistant strain of an otherwise-common bacterium. It can be life-threatening. In the elderly, it can cause life-threatening antibiotic-resistant pneumonia. In both elderly and younger people, it can cause severe skin infections, including necrotizing fasciitis, a severe type of skin infection that spreads quickly, and kills the body’s soft tissues. MRSA is one of the so-called “flesh-eating bacteria.”

In addition, pigs are one of the world’s greatest sources of zoonotic diseases (i.e., viral or bacterial diseases that may be spread between animals and humans). Zoonotic
diseases may be spread via contaminated water sources, air, and insect vectors. And the evidence presented to the County showed that large, concentrated hog facilities, such as the Masching’s, are breeding grounds for these zoonotic diseases.

To be fair, the County ultimately required some preventatives to avoid public health insult. But the County did not require (and therefore, the record does not include) any data from which the County (or a reviewing court) could reasonably assess whether the Masching’s proposal would affect water or air quality, or whether the presence of this facility would pose a health risk to nearby residents.

ARGUMENT

The Dodge County Zoning Ordinance criteria for granting a Conditional Use Permit includes determinations that the project will not be detrimental to or endanger public health and that groundwater, surface water, and air quality will be protected. (Id. at AR-355).

In the Planning Commission Meeting and Dodge County Board Meeting minutes (Id. at AR-29 and AR-77), it is apparent that public-health issues were not discussed. The offset determination by the County Feedlot Officer that the site was “98% odor annoyance free” is not a robust analysis and fails to consider air emissions during manure removal and spreading, the compounded odor effects of the animal density in that area, the public-health impacts of gases and particulate matter associated with odor, and the offset under various weather conditions. In short, this data cannot be deemed a sufficient amount of evidence for a local authority to determine that a project will not be detrimental to public health.
The district court properly described a court’s standard of review of a county’s decision. That standard of review includes appropriate deference to the County. Such deference is necessary to preserve separation of powers. See, e.g., *Big Lake Association v. Saint Louis County Planning Commission*, 761 N.W.2d 487, 490-91 (Minn. 2009).

But in this case, the County undertook to protect public health. The state regulatory agencies assumed that the County would honor that undertaking. Where, as here, local governments like the County fail to give a hard look at proposals that endanger public health, court intervention is appropriate.

**I. Air quality is a public-health issue, not a "nuisance."**

The Masching’s proposal is a medium-to-large scale hog feedlot. Such facilities are often described as Concentrated Animal Feeding Operations, or “CAFOs.”

Gaseous emissions from hog feedlots primarily come from decomposing manure. When underground storage is used, gases are released by ventilation systems, manure removal, and during spreading. Such feedlot buildings also disseminate gases and particulate matter (*Id.* at AR-652). Major air pollutants from hog feedlots and the resulting public health risks are summarized in the NALBOH review (*Id.* at AR-652-654) and GRACE Communications Materials (*Id.* at AR-632-634). Main air emissions include hydrogen sulfide, ammonia, particulate matter, endotoxins, and methane.

One study, submitted below, identified 331 fixed gases and volatile organic compounds (VOCs) in air samples near North Carolina farms. A North Carolina State University study found that when human subjects were exposed to simulated feedlot emissions in a field laboratory for one hour, subjects were 4.1 times more likely to
develop headaches, 6.1 times more likely to report eye irritation, and 7.8 times more likely to report nausea than those in a control group (breathing clean air). (Id. at AR-633). Some of the health conditions associated with exposure to feedlot emissions include asthma symptoms, bronchitis, nasal irritation, diarrhea, hoarseness, sore throat, cough, chest tightness, nasal congestion, palpitations, shortness of breath, stress, drowsiness, and alteration in mood. (Id.).

Decomposing hog manure emits hydrogen sulfide, a colorless gas that limits cells' ability to use oxygen. This gas is particularly dangerous because the intensity of its odor only slightly increases at levels above 6 parts per million (ppm), and can reduce individuals' sense of smell at concentrations of 150 ppm or higher. Exposure to 500 ppm or higher is likely to be lethal. Exposure at low levels is associated with chronic cough, throat irritation, eye symptoms, nasal symptoms, headache, low blood pressure, and psychological disorders. Exposure is also linked to nausea, stomach distress, and blistering of the lips. Exposure to high levels can cause skin, eye, and respiratory irritation, neurologic and cardiac disorders, loss of consciousness, shock, pulmonary edema, seizures, comas, and death. Minnesota's Pollution Control Agency has documented hydrogen sulfide concentrations in excess of World Health Organization maximum exposure standards on properties near hog feedlots (Id. at AR-634).

Ammonia, emitted via manure decomposition, is absorbed in the upper airways and exposure can cause wheezing, shortness of breath, chronic lung disease, and irritation of the eyes, throat, respiratory system, sinuses and skin. Exposure to moderate concentrations of ammonia (50-150 ppm) can cause severe cough and mucous production
and exposure to concentrations higher than 150 ppm can cause scarring of the upper and lower airways, reactive airways dysfunction syndrome (RADS), persistent airway hypersensitiveness, lower lung inflammation, and pulmonary edema. Exposure to extremely high concentrations of ammonia can be fatal.

Detection of odor from hog feedlots indicates exposure to one or more of the gases described above, and may also mean that particulate matter and endotoxins are present. Regular exposure to particulate matter — which may include fecal matter, feed materials, skin cells, and pathogens — is linked to bronchitis, asthma, chronic respiratory symptoms, organic toxic dust syndrome, and cardiac disorders (including arrhythmia and heart attacks). Endotoxins may also be present in particulate matter and can cause respiratory problems even in extremely low concentrations.

II. The county also failed to consider evidence of substantial public-health impacts from pathogens.

After the Plaintiffs’ Motion for Summary Judgment was granted and the Maschings’ Conditional Use Permit vacated (*Id.* at AR-330), Nick Masching reapplied for a CUP with additional information (*Id.* at AR-128), including a geotechnical evaluation and a manure management plan. No additional information was provided to satisfy the zoning ordinance criteria that the project would not be detrimental to or endanger public health or air quality. The Planning Commission granted a CUP, citing the additional information contained in the second application, despite the continued lack of materials related to public health and/or air quality.
Based on the NALBOH report and information from the GRACE Communications Foundation submitted below, there is ample evidence contained in the record showing that large-scale animal operations are a serious threat to public health, especially when geographically clustered. This information is widely available, from these sources and many others, and should have been considered by Dodge County when making a decision about granting the CUP. For Dodge County to approve numerous hog feedlots and be in compliance with their zoning ordinance that claims to protect public health, air, and water, robust monitoring and action plans should be in place to track levels of common contaminants from feedlots and to respond if/when air and/or water are contaminated by the large-scale hog operations in Dodge County. Under current regulations, once the CUP is granted there are very minimal air regulations due to a significant exemption for feedlots (Id. at AR-578) and oversight of manure management relies heavily on record keeping and voluntary compliance (Id. at AR-574-578).

The evidence presented to the County showed that over 150 disease-causing bacteria, viruses, and other pathogens can be found in animal manure and can be transferred to people through fecal-oral transmission and exposure to contaminated air, drinking water, and recreational water. (Id. at AR-655-657). The crowded conditions in confined animal feeding operations like the Masching’s proposal present frequent opportunities for the transmission of pathogens among animals, and between animals and humans.

While exposure to these pathogens poses a risk to healthy people, those with compromised immune systems, such as pregnant women, infants and young children, the
elderly and those who are HIV positive or have had chemotherapy, are at even greater risk of severe illness or death. Widespread disease outbreaks, such as salmonellosis, cryptosporidiosis and giardiasis, can result from exposure to water contaminated by pathogens.

These diseases cause symptoms ranging from nausea, vomiting and diarrhea, to dehydration, fever, and muscle pain and may result in death. Industrial hog operations also present opportunities for the replication, mutation, and recombination of viruses that can result in the development of novel viruses, some of which may lead to more efficient human-to-human transmission. (Id. at AR-657).

Antibiotics are routinely administered through animal feed, sometimes at non-therapeutic doses to promote growth and/or prevent disease. The evidence presented to the County showed that approximately 70% of all antibiotics and related drugs in the U.S. each year are sold for use in food animals, and more than half of those antibiotics are considered important in human medicine. There is strong evidence that the use of antibiotics in food animal production contributes to antibiotic resistance in bacteria and decreases the effectiveness of antibiotics in human medicine. This threatens human health because fewer options exist to help people overcome disease when infected with antibiotic-resistant pathogens. Moreover, antibiotics are often not fully metabolized by animals and can be present in manure. If manure pollutes a water supply, antibiotics can also leech into groundwater or surface water. Because of this concern for human health, there is a growing movement to eliminate the routine use of antibiotics in food animal production.
The NALBOH report, presented to the County, mentions opposition to the use of non-therapeutic antibiotics in animal agriculture by the American Medical Association and World Health Organization. (Id. at AR-657). In the fall of 2013, a research study titled “High-Density Livestock Operations, Crop Field Application of Manure, and Risk of Community-Associated Methicillin-Resistant Staphylococcus Aureus Infection in Pennsylvania” was published in JAMA Internal Medicine (a leading journal published by the American Medical Association).

The study focused on rates of MRSA infection, a type of bacteria resistant to some medically-important antibiotics, among residents living various distances from industrial hog operations and spray fields. The study had the following conclusion: “Proximity to hog manure application to crop fields and livestock operations each was associated with MRSA and skin and soft-tissue infection. These findings contribute to the growing concern about the potential public health impacts of high-density livestock production.”

In addition, the World Health Organization identified antimicrobial resistance (a term used widely in recent years that includes antibiotic resistance) as “one of the biggest threats to global health” in the fall of 2016. The World Health Organization recognizes misuse of antimicrobials in animal agriculture for the purpose of growth promotion as a major cause of global antimicrobial resistance.

CONCLUSION

The Public Health Amici urge this court to examine the record before the County, below. That record included ample scientific evidence to support an inference that the proposed facility would endanger public health. The evidence submitted to the County
demonstrated a significant risk of injury due to lowered air quality. It also demonstrated a significant risk of antimicrobial resistance and increasingly dangerous pathogens.

Where, as here, local officials are charged with protecting public health, such evidence must be given serious consideration. At a minimum, courts must require that local officials carefully review the submitted evidence, as well as any contrary evidence submitted by the applicant. Local authorities must be required to articulate the bases for their conclusions, so that courts may reasonably review their decisions. Any other process risks endangering the lives of the public living near these facilities.

Respectfully Submitted

Dated: October 11, 2016

/s/Jenneane Jansen
Jenneane Jansen (MN #0236792)
jenneane@jansenpalmer.com

Kris E. Palmer (MN # 0240138)
kris@jansenpalmer.com

Jansen & Palmer, LLC
4746 Elliot Avenue South
Minneapolis, MN  55407
612-823-9088 (office)
612-824-4970 (fax)

Attorneys for Amici
Dr. Jillian P. Fry, Ph.D., M.P.H.,
Dr. Robert S. Lawrence, M.D.,
Ms. Claire M. Fitch, M.S.P.H., and
Ms. Carolyn R. Hricko, M.P.H.
CERTIFICATION OF BRIEF LENGTH

I hereby certify that this brief conforms to the requirements of Minn. R. Civ. App. P. 132.01, subds. 1 and 3, for a brief produced with a proportional font. The length of this brief is 3,851 words. This brief was prepared using Microsoft Office Word 2010.

Dated: October 11, 2016

/s/Jenneane Jansen
Jenneane Jansen (MN #0236792)
jenneane@jansenpalmer.com
Kris E. Palmer (MN # 0240138)
kris@jansenpalmer.com
Jansen & Palmer, LLC
4746 Elliot Avenue South
Minneapolis, MN 55407
612-823-9088 (office)
612-824-4970 (fax)

Attorneys for Amici
Dr. Jillian P. Fry, Ph.D., M.P.H.,
Dr. Robert S. Lawrence, M.D.,
Ms. Claire M. Fitch, M.S.P.H., and
Ms. Carolyn R. Hricko, M.P.H.
i am writing on behalf of Dodge County Concerned Citizens in opposition to expansion of the Daley Farms operation in Winona County, Minnesota. Our family farm in Dodge County, Minnesota is surrounded by 11 swine factory farms in a 3-mile radius. The attached affidavits provide firsthand accounts of the dangers associated with area factory farms and the impact upon our rural way of life.

It's not fair. It's not right.

We stand with our friends in Winona County who are opposed to expansion of Daley Farms. Take action to protect rural farm families, not industry.

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizens
Lowell I. Trom, being first duly sworn on oath, deposes and states as follows:

1. I am one of the Plaintiffs in the above action and make this affidavit in support of our claims in this proceeding.

Procedural Improprieties by Dodge County

2. I am concerned about the process that was employed by Dodge County in approving the proposed hog confinement unit. My son, Brad, and I appeared at the Planning and Zoning Meeting on April 2, 2014. We arrived a few minutes late to the meeting, as I was attending to my wife's care that day. Upon arrival at the meeting, I was allowed to sign in at the meeting but was not given the opportunity to express any concern regarding the proposed hog confinement unit. I was informed that the record was closed and was not given any opportunity...
to state my objections to the project. I was denied the opportunity to comment on this huge project with far-reaching implications.

3. Subsequent to the Planning and Zoning meeting, my daughter, Sonja Trom Eayrs, attempted to contact each member of the Dodge County Board of Commissioners and voiced concern regarding the size, location, environmental impact and other concerns relating to this project. Sonja asked the Board of Commissioners to table discussions regarding this project for a period of two weeks. The board refused to take her request into consideration and plowed forward on April 8, 2014.

4. My son, Brad, and I attended the meeting of the Dodge County Board of Commissioners on April 8, 2014. The County Board addressed all of the routine matters on their agenda during the meeting and left a single item for consideration – the Masching/Toquam proposed hog confinement unit. The Commissioners took a brief break. When they returned 10 minutes later, they quickly voted to approve the proposed hog confinement unit without any discussion. Once again, I was denied the opportunity to comment on this huge project with far-reaching implications. The County Board did not allow any discussion nor did they even acknowledge that my son and I were present at the meeting. The board members were certainly aware that my son and I were present at the meeting as afterward, Commissioner Erickson approached me and stated that they did not have any choice and had to approve the project.

5. I served as a Dodge County Commissioner for eight years from 1973 to 1981. During my tenure as a Commissioner, I also served as Chairman of the Board. Over the years, I also served in a number of public positions, including Region 10 Board, Westfield Township Officer and other public offices. In each instance, I made every effort to listen to the concerns of all citizens and instill confidence in the public process – key components that were missing from the discussion and approval of this proposed hog confinement unit.
Huge Hog Confinement Facility Constitutes Nuisance

6. I reside at 12451 700th Street, Blooming Prairie, Minnesota, the Trom "home place." My parents, Elmer and Marie Trom, moved onto the Trom home place during the 1920's. My parents raised their ten children, Richard, Ralph, Bernice, Charles, Eugene, Verna, Lloyd, Kenneth, Darlene and me on the home place. We were all born on the home place.

7. I have lived my entire life on the family farm. When my older brothers Richard, Ralph and Charles departed the farm to serve in World War 2, I assisted my parents with the day-to-day operation of the farm. Since our marriage in 1953, my wife, Evelyn, the co-Plaintiff in this proceeding, has also resided at the home place. Together, we raised our six children on the farm - Randy, Shelley, Bradley ("Brad"), Sonja, Peggy and James ("Jim"). Our eight grandchildren, Rebekah, Kathleen, Michael, Andrew, Amanda, Rachel, Justin, Maggie as well as our great granddaughter, Evelyn, frequently visit the family farm.

8. The Proposed 2,400 Head Hog Confinement Facility Raises Significant Health Concerns. The proposed hog confinement unit raises significant health concerns which impair our continued use and enjoyment of the family farm. There are a number of individuals in the immediate area who have suffered from or died as a result of environmentally-related diseases. There is already concern that a cancer cluster exists in the immediate area which will be exacerbated by the construction of this huge confinement facility.

A. My wife, Evelyn, is now a resident at Prairie Manor Nursing Home in Blooming Prairie. Evelyn has suffered from Parkinson's Disease since 1995, a period of 19 years. Parkinson's Disease is frequently associated with exposure to environmental toxins, which may be present in the air and water. See articles attached as Exhibit A.
B. My son, Brad, was diagnosed with cancer on two separate occasions. Brad was initially diagnosed with cancer at the age of 25.

C. My first cousin, Darrel Trom, died in November 2013 from a cancerous brain tumor. His farm is approximately .5 mile southeast of the proposed hog confinement unit and is frequently referenced in this proceeding. Darrel was only 64 years of age at the time of his death.

D. My first cousin, Arlen Knutson, and his wife, Linda Knutson, both died from cancer in the past few years. Arlen and Linda were only in the 60's. Arlen and Linda's home was directly 1 mile south of the proposed hog confinement unit.

E. My cousin, Elaine Yentsch, died this summer from cancer. Elaine and her husband, Donald, lived 1 mile directly east of our farm (or approximately 1.5 miles from the proposed hog confinement unit).

9. The proposed hog confinement unit will only add to the already elevated concern of family members and neighbors that pollution to the air and water is directly affecting the health of local families.

10. **The Proposed 2,400 Head Hog Confinement Facility Interferes with Use and Enjoyment of the Trom Family Farm.** Our farm remains the central location for our children, grandchildren, great grandchildren as well as extended family members. My siblings as well as nieces, nephews and their children also frequently visit the family farm. The farm holds special significance for the entire Trom family and is a connection that binds the family together. Over the years, we have hosted numerous family events, including family reunions, picnics, barn dances, holiday celebrations, Baptisms, Confirmations, graduation parties and other activities. Because of the large number of attendees, we typically hold these events outside. At a recent Trom family reunion, over 100 family members attended this outdoor event.
11. Much of the day-to-day operation of the farm requires work outdoors. My sons, Brad and Jim, assist with the daily operation of the family farm and attend to the care of the land, the drainage ditches, the farm site (including the barn, machine sheds, Quonset building, grain storage bins, garage and 100-plus year home) as well as maintenance and repair of farm equipment.

12. The majority of work performed occurs in the open air – preparing machinery for planting and harvesting, picking rock, repairing and cleaning machinery, pulling weeds out of the beans, tilling the land and preparing it for spring planting, filling the planter boxes with seed, harvesting soybeans and corn each fall, transporting soybeans and corn from the fields to the farm site where the grain runs through the dryer and is then stored, transporting grain to the local elevator, and a myriad of other outdoor activities. Our ability to perform these tasks will be significantly compromised if we are confronted by the daily stench associated with this huge hog confinement facility directly west of our farm. The prevailing winds will transport the stench directly over our farm to the east and will undoubtedly interfere with our farming operation.

13. Construction of the proposed hog confinement unit will only add to the already noxious odors from other hog confinement units in the immediate area. Dodge County is already saturated with 227 feedlots in the county. Exhibit B. Within a 3-mile radius of our farm, there are at least 10 hog confinement units, several of which exceed 2,000 head. The stench from these units is unbearable. The odors from these neighboring hog confinement units interfere with the daily use and enjoyment of our farm. When the air is still, the stench hangs in the air for hours and it is impossible to know which facilities are producing the noxious odors. The stench is overwhelming. The window vents to these facilities are frequently opened and on those days that the barns are being cleaned, these facilities create such extreme and noxious odors that it is impossible to be outside. The pungent smell of hog manure permeates the area – there is no
escaping the stench. The numerous hog facilities which are already in the immediate area are offensive to the senses. I frequently have to cover my nose and mouth to prevent inhaling and smelling these noxious odors. Several neighbors have complained that frequently it is not possible for them to be outside due to the stench from these facilities. If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area. The combination will be intolerable.

14. This proposed hog facility not only will create noxious odors and pollute the air, it undoubtedly will pollute the groundwater. This proposed facility is located within the Cedar River Watershed District, and there is a drainage ditch only a few hundred feet from the proposed facility. The project raises significant concerns for runoff to ground water or surface water. This same drainage ditch runs through our land less than .5 mile directly to the east.

15. In addition, this project raises concerns regarding depletion of the groundwater supply. These facilities use millions of gallons of water per year and will surely impact the water table. My nephew, Doug Trom, lives just 1 mile south of our farm. Following construction of two large hog confinement facilities directly west of his farm, he had to replace his well. I fear that we will face the same fate if this project is allowed to proceed – digging a new well due to depletion of the groundwater supply.

16. Not only will this proposed hog facility interfere with our use and enjoyment of our family farm, it will interfere with our free use of the property, including the township road that leads to our farm. This township road likely will serve as the primary access road to the proposed hog facility.

17. Roger Toquam, one of the Defendants in this proceeding, lives approximately 1.5 miles north of our farm on County Road 3. Roger has two large hog confinement facilities on his farm (the “North farm”). Just a few years ago, Roger acquired the 300-acre parcel directly
west of our farm (the “West farm”) which will serve as the site for the proposed hog facility. Following acquisition of the 300-acre West farm, Roger hired two or three semi drivers in the spring of the year to transport hog manure from his North farm to his West farm. The semis traveled back and forth continuously for two or three days with semi-load after semi-load of hog manure from his North farm to his West farm. The semis traveled back and forth on the township road that leads to our farm and did extensive damage to the road. The semi trucks created 3-foot frost boils to the road, making it impossible to travel on the road for several days. The roads are especially soft in the spring as the frost is going out of the ground. I could not leave the farm on a Sunday morning and attend church services as the road was impassable. This township road does not have the capacity to handle extensive daily truck activity and will obstruct our use of this road, making it difficult to operate farm machinery on this road in order to access our farmland.

18. The proposed hog confinement unit will detrimentally affect our continued use and enjoyment of our family farm and raises concern for the continued operation of the Trom family farm by future generations.
FURTHER YOUR AFFIANT SAYETH NOT.

Subscribed and sworn to before me this 7th day of April, 2014.

[Signature]

Notary Public

Lowell I. Trom

SONJA TROM EAYRS
Notary Public
Minnesota
My Commission Expires January 31, 2015
Parkinson's Disease and the Environment Factsheet

Browse CHE's Portal to Science, preselected for nervous system and neurological health resources.

last updated 14 February 2007

What is Parkinson’s disease?

Parkinson’s disease (PD) is a chronic, progressive neurological disease that affects a part of the brain that produces dopamine, a chemical that tells muscles how to move. Generally, by the time the disease is diagnosed, up to 80 percent of the dopamine-producing neurons are no longer functioning.

Loss of dopamine leads to a variety of symptoms such as:

- Tremors (shaking)*
- Slowness of movement ("bradykinesia")*
- Loss of facial expression- also called "masking"*
- Slower voice and/or slurred speech
- Muscle rigidity (stiffness)
- Poor balance ("postural instability")*
- Loss of sense of smell
- Small, cramped handwriting

* These are the four hallmark signs that doctors look for to diagnose Parkinson’s disease. Not all people with Parkinson’s experience all these signs, especially early in the disease.

Named after Dr. James Parkinson, who first described the symptoms of "shaking palsy" in 1817, the cause of PD remains unknown.

Parkinson’s disease (PD) affects 500,000 to 1.5 million Americans—more people than the combined numbers of patients with amyotrophic lateral sclerosis (ALS), muscular dystrophy, multiple sclerosis, and myasthenia gravis. Alzheimer's disease is the only neurological disease that affects more people. There are no good statistics on the number of cases because the difficulty of diagnosis in its early stages; lack of lab tests to confirm the diagnosis; and absence of national registry or tracking system.

Who gets Parkinson’s disease?

Parkinson’s disease affects people of all races, geographic areas and socioeconomic levels. Rates are higher in men than women, although studies dispute by how much. The average age of diagnosis is 60. Eighty percent of people with PD are diagnosed between the ages of 40 and 70, but five percent are diagnosed between 30 and 40 years old. (Weiner, et al)

What causes the primary symptoms of Parkinson’s disease?

A part of the brain called the substantia nigra is responsible for producing dopamine. Dopamine is one of the neurotransmitters (chemical messengers) that controls muscle movement. In Parkinson’s disease (PD), the brain cells (neurons) that make dopamine are damaged or die.

What causes the degeneration or death of dopamine-producing neurons?

No one knows for certain what causes these brain cells to degenerate or die in a large majority of cases, but there are a number of theories.

http://www.healthandenvironment.org/parkinsons_disease
One theory is that molecules called free radicals damage neurons in a process called oxidation. Free radicals are missing electrons and "steal" them from other molecules. When the body is functioning properly, molecules called antioxidants intercept and neutralize free radicals before they can cause damage. The brain of a person with Parkinson's disease may have more free radicals, fewer antioxidants or both.

Others think that premature aging makes the neurons die long before they normally would. This may be genetic or may be caused by a chemical or a pathogen (germ). Inflammation of these neurons early in life may change their "programming," triggering premature death. Some chemical contaminants are known to kill neurons outright.

A protein called alpha-synuclein may be involved in the development of Parkinson's. Researchers have found clumps of this protein in the autopsied brains of PD patients. At this time, the exact role alpha-synuclein may play in causing the disease is unknown.

What are some of the risk factors that might increase the chance of developing PD?

Researchers have identified a number of risk factors for developing Parkinson's disease. These include:

- Having had a head injury
- Living in a rural area
- Being a farmer, rancher, fisher or welder
- Having a history of depression
- Drinking well water
- Being frequently exposed to solvents

Studies of twins suggest that Parkinson's disease is not inherited. However, with a younger age of onset, genetic factors appear to be important. Thus far, six genes have been identified that appear to have a role in the onset of certain cases of PD. In some families, PD is present in more than one generation and research is attempting to define the role of genetics and the shared environmental exposure that may explain the clustering of disease.

Many neurologists tell their patients "genetics loads the gun, but the environment pulls the trigger." "Environmental factors" are often suggested as possible causes of PD. In this case, the term "environment" really refers to the entire world around the individual and thus includes several sources, such as pathogens (e.g., viruses, bacteria), toxic chemicals and heavy metals.

The standard against which other chemicals are evaluated when assessing causal links to Parkinson's is MPTP. In the 1980s, some San Francisco drug users mistakenly took MPTP—a compound chemically similar to the pesticide paraquat—instead of heroin. Within weeks or months, many of them developed irreversible Parkinson-like symptoms. The chemical has a consistently similar effect in lab animals.

That trigger could be something other than toxic chemicals, but there is ample evidence to implicate a role for chemicals in the body fostering conditions that destroy dopaminergic neurons.

Some chemicals seem to be directly toxic to neurons. Others may create inflammation in the brain, which reduces the body's resistance to toxins. Another theory is that toxins affect gene expression, meaning that the chemical changes the instructions that the gene gives a particular cell about cell processes, such as cell death. [Myers]

Contracting a viral infection early in life is another risk factor for Parkinson's. Inflammation from such infections could affect the brain's ability to respond to other exposures as the individual gets older. Or it could be that the early viral infection affected the number or the quality of dopamine-producing neurons, making any reduction later in life much more noticeable. Tracking exposure to viruses is also difficult; people may not recall what childhood illnesses they experienced or may not have even been aware that they were sick, especially if illness occurred when they were young. Also, new studies indicate there may be a connection between chronic inflammation caused by allergies and the later development of PD. [Bower, et al.]

A number of pesticide products have been strongly linked to PD in animal studies. Some of those pesticides include:

http://www.healthandenvironment.org/parkinsons_disease
• Rotenone, a commonly used plant-based pesticide that is believed to cause both inflammation of the brain, which leads to death of dopamine-producing neurons. [Bin Liu, et al] This compound is often used to kill fish that are considered undesirable or a threat to recreational or commercial fisheries.

• Paraquat, an insecticide, is chemically similar to MPTP, a compound that induced Parkinson-like symptoms in some individuals who had been attempting to synthesize heroin but made MPTP instead. MPTP is used as a prototype against which the toxicity of other chemicals is measured. Paraquat is applied to a number of food crops, including corn and soybeans – both commonly grown in the Midwest – as well as cotton and fruit. Maneb is used on corn and other vegetables, such as potatoes, lettuce and tomatoes. [University of Rochester]

• Some fungicides – mane, for example -- contain manganese, a heavy metal that has long been associated with Parkinson-like symptoms. [Zhou, et al.]

When laboratory mice are exposed to paraquat and mane at the same time, many of them develop nearly all of the physical signs of PD seen in humans. Corn is one crop that frequently receives application of both products.

Organophosphate pesticides such as chlorpyrifos (Dursban™) and organochlorine compounds such as lindane – a highly toxic pesticide still used in the U.S. to treat head lice – and polychlorinated biphenyls (PCBs) may also have lethal effects on dopamine-producing neurons. [Carpenter, et al.]

Several heavy metals have been implicated as possible contributors to PD. These include aluminum, iron, lead and manganese. Autopsies on the brains of PD patients have found elevated levels of aluminum and iron. Because of the known neurotoxicity of manganese, many people have expressed concern about the potential health risks of the manganese-based gasoline additive MMT [Dobson, et al.]

Welding fumes contain many metals, including manganese, and some studies indicate that exposure to welding fumes may cause Parkinson-like symptoms. [Cersosimo and Koller; Park, et al.]

How could I be exposed to these risk factors?

Exposure to these various risk factors occurs in a number of ways. Clearly, germs travel from person to person quite readily, in many cases. Food, groundwater and surface water may all contain pesticide residues. Airborne pollen may be another source of exposure.

Some parts of the country have high levels of heavy metals that are naturally occurring in their water supply. Fertilizer products that contain hazardous industrial waste are another potential source of heavy metals in the environment. Sewage sludge, which is land-applied to farmland as a fertilizer in many parts of the country, can contain pesticide residues and other chemicals, heavy metals and pathogens.

Your occupation or workplace may place you in contact with some of these contaminants. As stated earlier, some studies indicate that being a welder or farmer increases your risk of developing PD.

What can I do to minimize my exposure to environmental contaminants for overall better health?

• Know where contamination sources are. Find out what chemicals are in the products you use every day at home, school and work. Also learn about where community sources of pollution might be, such as hazardous waste sites, incinerators, etc.

• Buy organic food whenever possible. Shop at farmer’s markets or purchase produce, meats and dairy products from local vendors when you can – ask them about the methods they use to grow their crops or raise their livestock.

• Minimize your exposure to pesticides and heavy metals by using organic gardening methods in your yard and garden. Use non-toxic or least-toxic pest control methods to deal with insects or other pests in and around your home.

• Use non-toxic cleaning products around your home and workplace.

http://www.healthandenvironment.org/parkinsons_disease
If I am concerned about the links between pollution in the environment and chronic diseases, such as Parkinson's disease, what can I do?

You can join the CHE Working Group on Parkinson's Disease and the Environment. To learn more about the work group, visit www.healthandenvironment.org/workinggroups/parkinsons/

Become a CHE Partner today! It is free and there is no obligation to participate, although we hope that you will discuss your concerns about environmental links to disease with your family, friends, neighbors, co-workers and policymakers.

The Collaborative on Health and the Environment (CHE) is a nonpartisan partnership of individuals and organizations concerned with the role of the environment in human and ecosystem health.

CHE seeks to raise the level of scientific and public dialogue about the role of environmental contaminants and other environmental factors in many of the common diseases, disorders and conditions of our time.

Established in 2002, participation is open to health professionals, researchers, health-affected and patient groups, advocacy organizations and indeed anyone concerned about protecting the health of current and future generations from environmental harm.

Find out more about CHE at http://www.healthandenvironment.org/.

The Collaborative on Health and the Environment
PO Box 316
Bolinas, CA 94924

References


Myers, J.P. Gene Expression and Environmental Exposures: New Opportunities for Disease Prevention. San Francisco Medicine, Opinion. April 15, 2004


Nichols, W.C. Genetic screening for a single common LRRK2 mutation in familial Parkinson's disease LANCET. www.thelancet.com Published

http://www.healthandenvironment.org/parkinsons_disease
<table>
<thead>
<tr>
<th>Registration</th>
<th>No.</th>
<th>*PC</th>
<th>PC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Feedlots in shoreland with 10 - 299 AU:</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - Feedlots outside shoreland with 50-299 AU:</td>
<td>119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - Non-NPDES sites ≥300 AU</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 - Feedlots with NPDES permits:</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - Total:</td>
<td>227</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 - Feedlots with 10 AU or more in shoreland:</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 - Feedlots with 10 AU or more that are both in shoreland and in a Drinking Water Supply Management Area (DWSMA):</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 - Feedlots with 50 AU or more that are in a DWSMA and are not in shoreland:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Sites Inspected</td>
<td>9 - Feedlots inspected with 10 - 99 AU:</td>
<td>9</td>
<td>0.75</td>
</tr>
<tr>
<td>10 - Feedlots inspected with 100 - 299 AU:</td>
<td>5</td>
<td>1.25</td>
<td>6.25</td>
</tr>
<tr>
<td>11 - Non-NPDES sites ≥300 AU inspected:</td>
<td>10</td>
<td>1.5</td>
<td>15</td>
</tr>
<tr>
<td>12 - NPDES sites inspected:</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13 - Total feedlots inspected required to be registered:</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 - Feedlots that were inspected and found not in compliance with water quality discharge standards:</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - Feedlots not required to be registered that were inspected as the result of a complaint or referral:</td>
<td>5</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>16 - Feedlots required to be registered that were inspected as the result of a complaint:</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Application Inspections</td>
<td>17 - Non-NPDES sites ≥300 AU (or &gt;100 AU located in a DWSMA) where a Level I land application review was conducted and the determination was **NC:</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>18 - Non-NPDES sites ≥300 AU (or &gt;100 AU located in a DWSMA) with land application records where a Level II review was conducted and the determination was compliance:</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>19 - Non-NPDES sites ≥300 AU (or &gt;100 AU located in a DWSMA) with land application records where a Level II review was conducted and the determination was **NC:</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>20 - Feedlots where a Level III land application inspection was conducted and the determination was compliance:</td>
<td>8</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>21 - Feedlots where a Level III land application inspection was conducted and the determination was **NC:</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Specialty Inspections</td>
<td>22 - Feedlots constructing (new or modifications) where 2 or more on-site producer contacts and/or inspections were done:</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>23 - Feedlots with OLAs where 2 or more on-site producer contacts and/or inspections were done:</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>24 - Feedlots with an interim permit where 2 or more on-site producer contacts and/or inspections were done:</td>
<td>4</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>25 - Feedlots inspected with 10 AU or more in shoreland:</td>
<td>6</td>
<td>0.25</td>
<td>1.5</td>
</tr>
<tr>
<td>26 - Feedlots inspected with 10 AU or more that are both in shoreland and in a DWSMA:</td>
<td>0</td>
<td>0.25</td>
<td>0</td>
</tr>
<tr>
<td>27 - Feedlots inspected with 50 AU or more that are in a DWSMA and are not in shoreland:</td>
<td>0</td>
<td>0.25</td>
<td>0</td>
</tr>
</tbody>
</table>

*PC = performance credits **NC = non-compliance ***RTC = return to compliance

December 2013
<table>
<thead>
<tr>
<th>Permits</th>
<th>No.</th>
<th>PC</th>
<th>PC Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>28 - 30-day construction/expansion notifications received:</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29 - Interim permits issued for feedlots with &lt; 300 AU:</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>30 - Interim permits issued for Non-NPDES sites ≥ 300 AU:</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>31 - Short-Form permits issued for Non-NPDES sites ≥ 300 AU:</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>32 - Short Form (≥ 300) or interim permit revisions conducted:</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>33 - Public meetings held for construction/expansion to &gt; 500 AU:</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Emergency Response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34 - Pollution events where an emergency response was conducted:</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Production Site Scheduled Compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 - Feedlots &lt; 300 AU in shoreland where a partial environmental upgrade was achieved in the current year:</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>36 - Feedlots &lt; 300 AU in shoreland where a complete environmental upgrade was achieved in the current year:</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>37 - Feedlots &lt; 300 AU not in shoreland where a partial environmental upgrade was achieved in the current year:</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>38 - Feedlots &lt; 300 AU not in shoreland where a complete environmental upgrade was achieved in the current year:</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>39 - Non-NPDES feedlots ≥ 300 AU where a complete environmental upgrade was achieved in the current year:</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Land Application Scheduled Compliance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 - Non-NPDES sites ≥ 100 AU where Level 1 land application **NC was found and ***RTC was documented:</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>41 - Non-NPDES sites ≥ 300 AU (or &gt; 100 AU located in a DWSMA) where Level II land application **NC was found and ***RTC was documented:</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Owner Assistance Goals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 - Feedlots ≥ 100 AU where Level III land application **NC was found and ***RTC was documented:</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Staffing Level and Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 - Workshops or trainings hosted and/or co-sponsored by the CFO:</td>
<td>5</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>44 - Feedlot owners attending feedlot producer workshops, training events or information meetings:</td>
<td>110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45 - Mailings to feedlot owners: (Please describe newsletters/mailings on provided on Supplemental Form.)</td>
<td>806</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46 - Feedlot articles placed in local newspapers: (Please list article title(s) on the Supplemental Form.)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please use whole numbers and decimals (such as 1 or .25 or 1.25) to record FTE values.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47 - FTEs (Full Time Equivalents) supplied by the CFO:</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48 - FTEs supplied by other county staff, including administrative and support, assigned by the county to the feedlot program:</td>
<td>0.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49 - FTEs supplied through contract to other LGUs:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 - Total No. of FTEs positions that supported county program:</td>
<td>1.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51 - CFO-training hours: (Enter total training hours earned; the Excel formula will deduct 16 hours required training; PCs earned will be zero for total hours earned ≤ 18.)</td>
<td>68</td>
<td>0.25</td>
<td>12.5</td>
</tr>
<tr>
<td>52 - New CFO in-office mentoring units provided (List location &amp; dates on Supplemental Form):</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>53 - New CFO on-site mentoring events provided (List location &amp; dates on Supplemental Form):</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>EAW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54 - EAW (environmental assessment worksheets) petitions received:</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>55 - EAWs prepared by the county:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Quality Notifications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56 - Notifications received from feedlot owners claiming air quality exemptions:</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enforcement Actions Taken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57 - Letters of warning issued:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58 - Notices of violation issued:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59 - Court actions commenced:</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Program Activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 - Feedlots where a FLEval/MinnFARM was conducted:</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>61 - Meetings with other local government and producer groups: (Please provide meeting details on Supplemental Form.)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62 - Feedlot Ordinance Revisions: (Please describe ordinance revision and/or adoption proceedings on Supplemental Form.)</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Credits</td>
<td>119</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
STATE OF MINNESOTA

COUNTY OF DODGE

CASE TITLE:

State of Minnesota, by Lowell Trom and Evelyn Trom, Lowell Trom, and Evelyn Trom,

Plaintiffs,

v.

County of Dodge, Dodge County Board of Commissioners, Nick Masching, and Roger Toquam,

Defendants.

STATE OF MINNESOTA )
COUNTY OF DODGE )

Bradley L. Trom, being first duly sworn on oath, deposes and states as follows:

1. I am the son of Lowell and Evelyn Trom, the Plaintiffs in this proceeding and make this affidavit in support of the claims in this proceeding.

2. I assist my parents with the day-to-day operation of our family farm and am very familiar with their farming operation as well as the immediate area.

Procedural Improproprieties by Dodge County

3. I am concerned about the process that was employed by Dodge County in approving the proposed hog confinement unit. My father and I appeared at the Planning and Zoning Meeting on April 2, 2014. We arrived a few minutes late to the meeting, as my father was attending to my mother’s care that morning. Upon arrival at the meeting, my father was allowed to sign in at the meeting. Neither my father nor I were given the opportunity to express
any concern regarding the proposed hog confinement unit. We were informed that the record was closed and were not given any opportunity to state any objections on the record.

4. Because the Planning and Zoning Committee had only a 1-page application available at the hearing on April 2, 2014, I understand that the Committee approved this project based, in large part, upon the reputation of the Applicant’s family, the Maschings. If this family is so skilled at operating hog confinement units, why did one of their facilities in Westfield Township explode in 2009? I understand that the explosion caused over $500,000 in damages to the facility and the Applicant’s father, Scott Masching, was thrown 40 feet into the air. See article attached as Exhibit A.

5. On April 8, 2014, my father and I attended the meeting of the Dodge County Board of Commissioners. During the meeting, the commissioners took a brief break. When they returned 10 minutes later, they immediately voted on the proposed hog confinement unit and did not allow any discussion. The board members were certainly aware that my father and I were present at the meeting. They ignored us and made no effort to ask for our input regarding the proposed hog confinement facility.

Huge Hog Confinement Facility Constitutes Nuisance

6. I grew up on the Trom “home place” with my siblings Randy, Shelley, Sonja, Peggy and Jim. I lived on the farm most of my life. Although I currently live in Blooming Prairie, I return to the farm daily to assist with the farming operation and to care for my rare breed dogs.

7. The Proposed 2,400 Head Hog Confinement Facility Raises Significant Health Concerns. The proposed hog facility raises significant health concerns for the health of my rare breed dogs (Chinese Foo dogs). Several years ago, I noticed that my dogs vomited around dusk. This is the time of day that the numerous hog confinement facilities in the
immediate area open their windows and allow fresh air into the unit(s). My dogs are kenneled outdoors much of the year. With their highly sensitive sense of smell, they are especially sensitive to the stench and noxious fumes from these facilities.

8. As detailed in my father’s affidavit, Dodge County is saturated with 227 feedlots already in the county. Within a 3-mile radius of our family farm, there are at least 10 hog confinement units, several of which exceed 2,000 head. The stench from these units is unbearable and interferes with operation of my dog business. Regardless of the stench, I must go outside daily to attend to the care of my dogs – feeding and watering my dogs and cleaning their pens and dog houses.

9. Although I offer dog boarding and grooming services, my clients comment about the offending smell of hogs and oftentimes do not return. The overwhelming stench of hog manure interferes with the breeding process, so I have had to employ artificial breeding methods. I held dog shows at the farm but had to curtail this activity due to the horrid smell of hog manure from neighboring farms.

10. The proposed hog facility also raises significant health concerns for humans, thus impairing our continued use and enjoyment of the family farm. As detailed in my father’s affidavit, there are a number of individuals in the immediate area who have suffered from or died as a result of environmentally-related diseases. There is concern that a cancer cluster exists in the immediate area which will be exacerbated by the construction of this huge confinement facility. Personally, I am a 2-time cancer survivor. I was originally diagnosed with cancer in 1982 and was diagnosed a second time with cancer in 2005. This proposed hog confinement unit will add to the already elevated concern among family members and neighbors that pollution to the air and water is directly affecting the health of local families.
11. The Proposed 2,400 Head Hog Confinement Facility Interferes with Use and Enjoyment of the Trom Family Farm. Much of the day-to-day operation of the farm requires work outdoors. My brother, Jim, and I assist with the daily operation of the family farm and attend to the care of the land, the drainage ditches, the farm site (including the barn, machine sheds, Quonset building, grain storage bins, garage and 100-plus year home) as well as maintenance and repair of farm equipment.

12. The majority of work performed occurs in the open air – preparing machinery for planting and harvesting, picking rock, repairing and cleaning machinery, pulling weeds out of the beans, tilling the land and preparing it for spring planting, filling the planter boxes with seed, harvesting soybeans and corn each fall, transporting soybeans and corn from the fields to the farm site where the grain runs through the dryer and is then stored, transporting grain to the local elevator as well as a number of other outdoor activities. I personally assist with the maintenance and upkeep of the flowers, the garden and the 7-acre farm site. During winter months, I assist with snow removal. Our ability to perform these tasks will be significantly compromised if we are confronted by the daily overpowering stench associated with this huge hog confinement facility just .5 mile west of our farm. The prevailing winds will transport the stench directly over our farm to the east and will undoubtedly interfere with our farming operation.

13. The stench from the numerous hog confinement units in the immediate area is unbearable and interferes with the daily use and enjoyment of our farm. Regardless of the wind direction and air speed, we must work outdoors. When the air is still, the stench hangs in the air for hours and it is impossible to know which facilities are producing the noxious odors. The stench is overwhelming. The window vents to these facilities are frequently opened around dusk and, on those days that the barns are being cleaned, these facilities create such extreme and noxious odors that it is impossible to be outside. The pungent smell of hog manure permeates
the air – there is no escaping the stench. The numerous hog facilities which are already in the immediate area are offensive to the senses. The odors take your breath away at times. If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area.

14. Manure from the neighboring feedlot operations has been applied on top of frozen ground and dumped along roadside ditches. Some of the huge hog operators in the immediate area have no regard for their neighbors and spread manure anytime and anywhere they please. The manure lays for days and is not worked into the ground and, as a result, the stench continues for days and days.

15. A few years ago, Roger Toquam, one of the Defendants in this proceeding, acquired the 300-acre parcel directly west of our farm which will serve as the site for this huge hog facility. In the spring of the year, he sent huge manure tankers back and forth on the township road that leads to our family farm. This heavy equipment caused extensive damage to the township road, including 4-foot frost boils. It was difficult to drive to and from my parent’s farm for several days. This township road does not have the capacity to handle daily heavy truck activity and will obstruct our use of this road, making it difficult to operate our farm and get our own farming equipment to and from the field.

16. This proposed hog facility not only will create noxious odors and pollute the air, it undoubtedly will pollute the groundwater. This proposed facility is located within the Cedar River Watershed District, and there is a drainage ditch only a few hundred feet from the proposed facility. This same drainage ditch runs through our land less than .5 mile directly to the east. The project raises significant concerns for runoff to ground water or surface water.

17. In addition, this project raises concerns regarding depletion of the groundwater supply. These facilities use millions of gallons of water per year and will surely impact the water
table. My cousin, Doug Trom, lives just 1 mile south of the proposed project. Following
construction of two large hog confinement facilities directly west of his farm, he had to replace
his well.

18. Our family farm is the site of extensive wildlife, including Snowy Owls, Trumpeter Swans, Tundra Swans, Bald Eagles, Wild Turkeys and other wildlife.

19. The proposed hog confinement unit will detrimentally affect our continued use
and enjoyment of our family farm and raises concern for the continued operation of the Trom
family farm by future generations.
FURTHER YOUR AFFIANT SAYETH NOT.

Subscribed and sworn to before me this 27th day of Sept., 2014.

Notary Public

Bradley L. Trom

[Signature]

SONJA TROM EYRES
Notary Public
Minnesota
My Commission Expires January 31, 2016
by Kerry Klatt

Explosion at hog farm near Hayfield

Posted: Oct 14, 2009 7:20 PM CDT

WEST FIELD TOWNSHIP, MN (KTTC-DT) — Emergency crews arrived at the scene of an explosion around 11:45 Wednesday morning. No injuries were reported at the hog farm and no pigs were injured, but the owner, Scott Masching was launched about 40 feet in the air when part of his facility exploded.

The hog farm is located about four miles west of Hayfield in West Field Township. Masching says all the pigs had been removed because he was cleaning the barn. He had been agitating the pit for about 20 minutes and says there must have been gas in the pit that sparked some sort of explosion.

Masching says at the time of the flash, he was outside, on the west side of the facility, and the burst tossed him across his yard into the nearby gravel road.

He was able to walk away, but was shaken from the experience.

Scott Masching says, “Just for other hog farmers to be careful of this type of deal. I’ve never seen it, and never had it happen ever before, but there’s always a first I guess.”

Masching says most of the damage occurred inside, destroying the ceiling, the rafters and siding.

He says the explosion caused about 500-thousand-dollars in damage. The building was insured.
STATE OF MINNESOTA
COUNTY OF DODGE

CASE TITLE:
State of Minnesota, by Lowell Trom and Evelyn Trom, Lowell Trom, and Evelyn Trom,

v.
County of Dodge, Dodge County Board of Commissioners, Nick Masching, and Roger Toquam,

Defendants.

STATE OF MINNESOTA )
COUNTY OF DODGE )

James L. Trom, being first duly sworn on oath, deposes and states as follows:

1. I am the son of Lowell and Evelyn Trom, the Plaintiffs in this proceeding and make this affidavit in support of the claims in this proceeding.

2. I assist my parents with the day-to-day operation of our family farm and am very familiar with their farming operation as well as the immediate area.

3. The Proposed 2,400 Head Hog Confinement Facility Interferes with Use and Enjoyment of the Trom Family Farm. Much of the day-to-day operation of the farm requires work outdoors. My brother, Brad, and I assist with the daily operation of the family farm and attend to the care of the land, the drainage ditches, the farm site (including the barn, machine sheds, Quonset building, grain storage bins, garage and 100-plus year home) as well as maintenance and repair of farm equipment.
4. The majority of work performed occurs in the open air – preparing machinery for planting and harvesting, picking rock, repairing and cleaning machinery, pulling weeds out of the beans, tilling the land and preparing it for spring planting, filling the planter boxes with seed, harvesting soybeans and corn each fall, transporting soybeans and corn from the fields to the farm site where the grain runs through the dryer and is then stored, transporting grain to the local elevator as well as a number of other outdoor activities. During winter months, I assist with snow removal. Our ability to perform these tasks will be significantly compromised if we are confronted by the daily overpowering stench associated with this huge hog confinement facility just .5 mile west of our farm. The prevailing winds will transport the stench directly over our farm to the east and will undoubtedly interfere with our farming operation.

5. As detailed in my father’s affidavit, Dodge County is saturated with 227 feedlots already in the county. Within a 3-mile radius of our family farm, there are at least 10 hog confinement units, several of which exceed 2,000 head. The stench from the numerous hog confinement units in the immediate area is unbearable and interferes with the daily use and enjoyment of our farm. Regardless of the wind direction and air speed, we must work outdoors. When the air is still, the stench hangs in the air for hours and it is impossible to know which facilities are producing the noxious odors. The stench is overwhelming. The window vents to these facilities are frequently opened around dusk and, on those days that the barns are being cleaned, these facilities create such extreme and noxious odors that it is impossible to be outside. The pungent smell of hog manure permeates the air – there is no escaping the stench. The numerous hog facilities which are already in the immediate area are offensive to the senses. The odors take your breath away at times. If this proposed hog confinement facility is allowed to proceed, it will significantly add to the level of noxious odors from the numerous facilities in the immediate area.
6. A few years ago, Roger Toquam, one of the Defendants in this proceeding, acquired the 300-acre parcel directly west of our farm which will serve as the site for this huge hog facility. In the spring of the year, he sent huge manure tankers back and forth on the township road that leads to our family farm. This heavy equipment caused extensive damage to the township road, including 4-foot frost boils. It was difficult to drive to and from my parent’s farm for several days. This township road does not have the capacity to handle daily heavy truck activity and will obstruct our use of this road, making it difficult to operate our farm and get our own farming equipment to and from the field.

7. This proposed hog facility not only will create noxious odors and pollute the air, it undoubtedly will pollute the groundwater. This proposed facility is located within the Cedar River Watershed District, and there is a drainage ditch only a few hundred feet from the proposed facility. This same drainage ditch runs through our land less than .5 mile directly to the east. The project raises significant concerns for runoff to ground water or surface water.

8. Our family farm is the site of extensive wildlife, including Snowy Owls, Trumpeter Swans, Tundra Swans, Bald Eagles, Wild Turkeys and other wildlife.

9. The proposed hog confinement unit will detrimentally affect our continued use and enjoyment of our family farm and raises concern for the continued operation of the Trom family farm by future generations.
FURTHER YOUR AFFIANT SAYETH NOT.

Subscribed and sworn to before me this 7th day of Sept., 2014.

Notary Public

James L. Trom
STATE OF MINNESOTA
COUNTY OF DODGE

CASE TITLE:
State of Minnesota, by Lowell Trom and Evelyn Trom, Lowell Trom, and Evelyn Trom,

v.
County of Dodge, Dodge County Board of Commissioners, Nick Masching, and Roger Toquam,

Defendants.

STATE OF MINNESOTA )
COUNTY OF HENNEPIN )

Sonja Trom Eayrs, being first duly sworn on oath, deposes and states as follows:

1. I am the daughter of Lowell and Evelyn Trom, the Plaintiffs in this proceeding and make this affidavit in support of the claims in this proceeding.

2. I had the privilege of growing up in southern Minnesota on the Trom “home place,” together with my siblings Randy, Shelley, Bradley, Peggy and James. The family farm has been a source of pride for all family members, including our father and his 9 siblings, all of whom were born on the home place. As children, we knew that our farm was a special place as our Trom aunts and uncles frequently returned to the farm with our cousins – all 45 of them! Sunday was family day and the day that we enjoyed seeing our cousins – playing in the hay mow and building forts, riding our bikes, playing softball (and trying to find the ball in the bean field), playing on grandpa’s old-fashioned buggy, playing with the dogs and cats and other activities.
3. The Trom home place remains the central location for our family and several generations. Because the Trom family is so large, many of our family events over the years have occurred outdoors, including numerous family reunions, picnics, barn dances, holiday celebrations, Baptisms, Confirmations, graduation parties and other activities. At a recent Trom family reunion, over 100 family members attended this outdoor event. Just a few weeks ago, we played kickball in the yard with my three year old granddaughter (Lowell and Evelyn’s great granddaughter). The farm yard has a park-like feeling and served as the site for wedding receptions for my brother, Randy and his wife, Karen, as well as my husband, Douglas and I. My brother James and his wife, Dee, were married on the farm and the reception also occurred on the farm.

4. The garden has served as my mother’s pride and joy over the years. Each year, she planted hundreds of flowers and maintained a beautiful perennial garden, in addition to mowing the 7-acre farm site. Although my mother is now a resident at Prairie Manor Nursing Home in Blooming Prairie due to the progressive effects of Parkinson’s Disease, we take her home each weekend to enjoy the farm. She loves to look at the farmland and scolds my father if she sees any weeds in the bean fields. She still enjoys the flowers, perennial garden and just sitting outside enjoying the farm.

5. Over the years, my father has been a true steward of the land and has meticulously maintained the family farm. I frequently refer to the family farm as my father’s “garden” as he loves the land. My father, who is assisted in the day-to-day operation of by my brothers, Brad and James, take special care of the land, the drainage ditches, the farm site (including the barn, machine sheds, Quonset building, grain storage bins, garage as well as the 100-plus year home) and the farm machinery.
6. The majority of work performed by family members and others on the farm occurs in the open air – preparing machinery for planting and harvesting, picking rock, repairing and cleaning machinery, pulling weeds out of the beans, tilling the land and preparing it for spring planting, filling the planter boxes with seed, harvesting soybeans and corn each fall, transporting soybeans and corn from the fields to the farm site where the grain runs through the dryer and is then stored, transporting grain to the local elevator, and a myriad of other outdoor activities. How will my family continue to perform these outdoor tasks if they’re confronted by the daily stench associated with this huge hog confinement facility?

7. My parent’s farm was featured in a 7-page article in the Rochester Post-Bulletin in 1989 (copy attached as Exhibit A). The Trom “Home Place is Showplace” according to the article. The article, which includes several pictures of the farm, illustrates the beauty of the farm and genuine use and enjoyment that we have experienced on the family farm over the years.

8. Although 25 years have elapsed since this article appeared in the Rochester Post-Bulletin, the farm remains in the same pristine condition today. My family continues to meticulously maintain the farm. Two brothers, Bradley and James, assist my parents with the day-to-day operation of the farm.

9. Construction of the proposed hog confinement facility will shatter our continued use and enjoyment of the family farm which has been in the Trom family for nearly 90 years. Each day, we will have to worry about the stench of this operation interfering with our use and enjoyment of the farm. Will my family be able to take my mother home from the nursing home, so she can sit outside and enjoy her garden? Will I be able to take my granddaughter to the farm and watch her play kick ball? Will my family be able to schedule family reunions, recognizing that the stench from this proposed hog confinement unit will spoil this special event? Will my
father and brothers, who operate the farm on a daily basis, be able to attend to the extensive farm chores, or will the stench interfere with their ability to perform these tasks?

10. Construction and operation of the proposed hog confinement facility (with over 2,400 head) will, with reasonable certainty, produce noxious odors and certainly create air and water pollution that will make their way onto my parent’s farm just .5 mile away. This facility will cause irreparable harm to our family farm – an operation which we intend to keep in the Trom family for many more years.

FURTHER YOUR AFFIANT SAYETH NOT.

Subscribed and sworn to before me this 8th day of September, 2014.

Notary Public

Shelly D. Parker
Notary Public

Minneapolis

Expiration Date: January 31, 2015
Inside...
A Farm Blooming With Color
Home Security Systems
A House Made Of Glass
An Elegant Recreation Room
Ceilings With A Point
Home Place’ is Showplace

Grand View Farm is a meticulously kept Dodge County operation. Working farm has been in the Trom family for more than 60 years.

...continued to add to the land he already farmed, and in 1968 bought what his father had farmed all those years.

Grand View is impressive by anyone’s standards. The seven acres around the farmhouse include a full complement of farm buildings — barn, huge machine sheds, a quonset building, storage bins and silos, plus a four-car garage, all painted and so clean that they glisten in the afternoon sun.

A tour through the buildings brings to mind the axiom “Cleanliness is next to godliness.” Not a speck of dirt from the fields is anywhere to be seen on the tractor tires or on the cement floors of any of the buildings.

Continued on Page 6
Grand View is impressive by anyone’s standards. The seven acres around the farmhouse include a full complement of farm buildings — barn, huge machine sheds, a quonset building, storage bins and silos, plus a four-car garage, all painted and so clean that they glisten in the afternoon sun.

Even as full-time farmers, Lowell and his wife Evelyn find time for civic and community duties.

Spotless operation

Leroy Toon and his collie in the farm yard of the 850-acre working farm

“Lowell is a hard worker and keeps everything — his machinery and his buildings — in mint condition,” Evelyn says. His four-car garage would be the envy of most, immaculate, not cluttered with bikes, sports equipment, garden tools and other implements which seem to grow and multiply in most people’s garages. His is like another house, complete with blinds on the windows and mementoes of his political days framed on the wall, as well as aerial photographs of the farm.

Continued on Page 5

NOW OPEN! THE TILE CENTRE

- Excellent Ceramic Tile and Marble Selection
- Professional installation
- Experience Assistance
- Installation Warranty
- Assistance For the Do-It-Yourself Person

Residential Installation is Our Specialty
- Free Estimates
- Beautiful and Clean Showroom
- Open: Mon. Thu. 8am - 9pm
  Fri. 8am - 6pm
  Sat. 9am - 5pm
  Sun. Closed
- (507)281-0244

Helping Rochester Buy, Build & Sell

NOW OPEN!

Ready to make a move? Call a specialist to help you with:
- financing & qualifying
- marketing & sale of your home
- labs, plans, builders
- finding your new home

#1 in Sales & Listings in 1988!

Jean Meyer, CRS
A Certified Residential Specialist

Merrill Lynch Realty
507-281-4200 or 1-800-328-4827 ext. 5002

401 - 16th Avenue North West
Rochester, Minnesota 55901
Troms' loft gives new meaning to the term 'Barn Dance'

Evelyn Troms on the stairs leading to the loft of the converted dairy barn where dances, family reunions and political gatherings are held

Continued from Page 6

The barn is a child's paradise. Built in 1950 as a dairy barn, the Troms gave up that part of farming in 1980. A flush cement floor was added, and during winter seed has been stored in it. Now, long tables, chairs, children's trinkets and toys give an idea of the fun they have in there. It is like a giant playroom. It is also the ideal place for family reunions, barbecues, political gatherings and wedding dances, all of which have been held here regularly. The upstairs storage room, complete with a raised platform, is a perfect place for dances.

While Lowell has maintained the farm, Evelyn's pride and joy is her garden. In summer, more than 300 petunias line the walkways, the gardens and the patio, giving the grounds surrounding the house the feel of a park.

Perennial gardens are planned so that there is always something in bloom. She has also added pieces of marble statuary, fountains, bird baths, a trellised gazebo and several little plaques with appropriate garden sayings.

continued on Page 9

THE BEST IS A BIS FIREPLACE
WHY SETTLE FOR LESS?
E.P.A. CERTIFIED - NO OTHER TRUE AIRTIGHT FIREPLACE CAN MATCH IT.

★ NON-CATALYTIC ★
★ EPA set the standards for the woodburning industry July 1, 1988 and BIS Fireplaces met them. Other fireplaces come close - but BIS delivers.
★ The fireplace is a permanent fixture in your home - don't compromise. Your furnace isn't 40% efficient and your windows aren't single pane. Make your fireplace decision the right one.
★ Solid brass doors - not plated.
★ 25 yr. warranty on fireplace.
★ Aluminized steel fireplace - better heat transfer & doesn't rust.
★ High heat 2100° chimney, with a 10 yr. warranty.

Brekke Fireplace Shoppe
1904 S. Broadway, Rochester
282-4608

QUALITY YOU CAN COUNT ON!
Farm is sharing place; Troms gracious hosts

The barn is a child’s paradise. Built in 1950 as a dairy barn, the Troms gave up that part of farming in 1960. A flush cement floor was added, and during winter seed has been stored in it. Now, long tables, chairs, children’s trikes and toys give an idea of the fun they have in there. It is like a giant playroom.

Above left, the old barn is a paradise for youngsters.

Mrs. Trom stands in the livingroom of her home displaying a site plan of Grand View Farms.

THE BOARD STORE

East Coast: Craftsmanship now available to you. 28 years furniture building experience.

112 N. Broadway
Rochester, MN

FREE ESTIMATES

HOURS: Monday-Friday 8:00 a.m. - 5:00 p.m.
Saturday 8:00 a.m. - 2:00 p.m.

281-0362

At The Board Store we have handcrafted furniture, cabinets and mouldings of distinction. We will design and build your projects to your exact specifications. Stop in to see us for a pleasant surprise!

- Free Estimates & Designing
- Dealers in Exotic & Domestic Hardwoods
- Mantles • Mouldings • Cabinets
- Handcrafted Furniture
- Over 28 Years Experience
The garden statuary has special significance for Mrs. Trom which highlights intense plantings on the ground.

Gardens are Evelyn's joy

Continued from Page 7

Serving as the background to this setting are a wide variety of bushes, hedges and trees. Everything from double stands of Black Hills spruce trees to crab apple trees, towering maples and ashes as well as honeysuckle and lilac bushes surround the property.

The significance of each piece of statuary is important to her. For instance, cherubs on a pedestal are said to protect heart and home — one brings good fortune, two twice the blessings. So, she has placed two cherubs next to the cement patio at the back of the house.

Evelyn is particularly fond of the gazebo, which was built especially for her garden. It was used as the altar for

Continued on Page 10

GRAND OPENING SALE

THIS AD IS WORTH $500

Buy these six top-of-the-line appliances and save $500! You get Riverside's dependable service and quality appliances with the features you desire.

$2,495 Special Package Price
- $500 Rebate

$1,995 Your Cost After Rebate

Limited time offer
One Year Free Financing
(to qualified buyers)

RIVERSIDE
TV & APPLIANCE • ROCHESTER
1318 Apache Dr. SW • 289-2315

Riverside is on your side.

New Hours: Monday-Friday 9 am - 8 pm; Saturday 10 am - 5 pm
Philosophy of close to nature, close to God

Couple has time to enjoy the home place despite busy schedules

Holly Ebel
Holly Ebel is a freelance writer who has written and published organizational books and a Christmas book. She also has served as advisor and editor on three privately published cookbooks in Minneapolis.

Photos by Jim Welch

Save Over $3,300*
In Real Estate Fees.

"Is this a big savings for you? It is for most people, and you can count on Corban Marketing to assist you in the sale of your home at the low fee of 2.8%. (Other Realtors charge 7%) Isn't it time to consider selling your home by owner with the professional assistance of Corban Marketing? Russ Meier, broker, has over 15 years of real estate experience—call today and find out how you can save money!

Corban Marketing
282-4442

the wedding of their son in 1988 and serves as a retreat for her. During the holiday season the gazebo is lit up and is the scene of the Nativity with a star above it. A plaque at the gazebo entrance reads “Open to sunshine, friends and God.”

She is as neat and particular about her garden as Lowell is about the rest of the farm. Her feelings, she said, are best summed up by this little poem. Also on a plaque in the garden.

There's something about a garden
That's peaceful and lovely too,
Something that makes you certain
All is well and God's with you.

That's why when I have a problem I go out and work in the sod.

Continued from Page 8

Lowell and Evelyn outside their home

Farm yard has park-like feeling

New cottage, rustic, Shapiro's orange tomato
Dear MPCA,

I am a rural resident of southeast Minnesota. I am concerned about industrial scale agriculture and its effect on the resources and processes that life depends on. I observe that these large operations have a negative impact on our landscape, on our air and water resources, and on our communities especially on these karst landscapes. I observe the regulations placed on these large operations are not properly adhered to or enforced. Specific to the Daley EAW supplement, I am concerned about the amount of greenhouse gases will be released if this expansion is permitted. As a society, we need to curb our emissions. As an agency, the MPCA is required to understand the effect these emissions will have as a result of permitting this proposal. The people have a right to know the effects of this proposal and the right to be protected from them by their government. Please require an EIS for this proposal before permitting it. Finally, I ask that the MPCA revamp the feedlot regulatory/oversight/enforcement system so that it protects the people from the negative effects of industrial agriculture, such as those that stand to be caused by this proposal. Thank you for your consideration.

Jake Stacken
Resident
Fillmore County
Please do not allow the expansion of the Daley Farms in the karst region of Winona County. I believe factory farms will harm the environment.

Thanks,

Jerry Lelou
Dear Kim,

Regarding the Mega-Dairy Expansion, as well as all CAFO operations, we need to require the manure to be composted, not processed as liquid manure. Composting eliminates the contamination of air and ground-water, while creating a valuable fertilizer to sell. Composting technology and equipment are readily available at a cost comparable to liquid manure installations. Just remember compost doesn't stink. Your neighbors will thank you.

Sincerely,
Keith F. Johnson
Please Consider the potential for DISASTER if the mega-dairy is allowed to expand even more. Thank you for listening to reason and use your common sense. I beg you!

Mary Jo Bibby
Alexandria, MN
Member Citizens Climate Lobby
Commissioner Bishop,
I'm writing to ask you to use your power to make right the wrong decision that was made by your predecessor regarding expansion of Daley Farms. We all know the EAW's recommendations are inadequate, inaccurate, and incomplete and that this system must be changed to look honestly at the environmental impacts it allows. Big policy change and how that affects those who profit from the status quo are difficult but we must be willing to make those changes if we mean to leave our children and grandchildren with water to drink and land to grow healthy food. I hope you will do everything you can to ensure that our policies reflect our need to care for the health of our land and our children.
Thank you.
Mary Weber
I ask that you include the following policy statement from the American Public Health Association (APHA) dated November 5, 2019 in the public record regarding the Daley Farms proposed expansion in Winona County. As indicated, this policy statement calls for a moratorium on the establishment of new CAFOs and expansion of existing CAFOs until regulation and enforcement conditions are in place to adequately protect the public's health. The Daley Farms expansion falls directly within the serious public health concerns addressed by APHA.

As noted in the policy statement:

1. The American Public Health Association (APHA) calls for a precautionary moratorium on the establishment of new CAFOs and expansion of existing CAFOs, including the Daley Farms expansion, in Winona County.

2. The Center for Disease Control and Prevention has determined that CAFOs pose risks to public health and the environment through the degradation of surface and groundwater resources. CAFO-generated manure can contaminate surface and groundwater, pose risks to public health and the environment through the degradation of surface and groundwater resources. CAFO-generated manure can contaminate surface and groundwater, pose risks to public health.

3. There is scientific consensus that antibiotics administered to food animals contribute to antibiotic resistance in humans. More than 37 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States. This represents 64% of all sales of these precious drugs, including for use in limiting growth in food animals.

4. In the United States,飞翔 antibiotics are used to treat or control disease to compensate for sub-optimized, poor environmental conditions characteristic of industrial agricultural systems.

5. CAFO-generated manure can contaminate surface and groundwater, pose risks to public health and the environment through the degradation of surface and groundwater resources. CAFO-generated manure can contaminate surface and groundwater, pose risks to public health.

6. Manure storage systems, such as liquid lagoons or cesspits, are vulnerable to breaches during heavy rainfall and flooding events, increasing the risk of environmental contamination. This is particularly concerning given that extreme weather events are predicted to increase in frequency and severity over the coming decades.

7. Despite these serious risks, current regulatory systems do little to ensure the safety of private wells. Private wells, which are used by an estimated 11% of the population, are not monitored by government agencies to ensure safe levels of pathogens. Manure storage systems, such as liquid lagoons or cesspits, are also vulnerable to breaches during heavy rainfall and flooding events, increasing the risk of environmental contamination. This is particularly concerning given that extreme weather events are predicted to increase in frequency and severity over the coming decades.

8. Antibiotics administered to food animals contribute to antibiotic resistance in humans. More than 37 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States. This represents 64% of all sales of these precious drugs, including for use in limiting growth in food animals.

9. Antibiotics administered to food animals contribute to antibiotic resistance in humans. More than 37 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States. This represents 64% of all sales of these precious drugs, including for use in limiting growth in food animals.

10. Antibiotics administered to food animals contribute to antibiotic resistance in humans. More than 37 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States. This represents 64% of all sales of these precious drugs, including for use in limiting growth in food animals.

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizens
Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations

Date: Nov 05 2019 | Policy Number: 20194
Key Words: Environment, Environmental Health, Agriculture

Abstract

Over the last six decades, food animal production in the United States has transformed from a system of small and medium-sized farms toward one characterized by much larger operations that concentrate large numbers of animals and their manure in relatively small geographic areas. These operations function with the high throughput and rapid turnover of an industrialized system and are often referred to as concentrated animal feeding operations (CAFOs). The enormous accumulation of manure and other untreated waste created by CAFOs is often stored and disposed of in a manner that pollutes the air, surface, and groundwater, posing risks to the environment and human health, particularly for CAFO workers and nearby residents. These operations also disproportionately affect low-income, disadvantaged communities with high proportions of racial and ethnic minority residents, raising serious social and environmental justice concerns. The current industrial system of food animal production has externalized the costs of environmental degradation and adverse health impacts, keeping retail meat prices artificially low while shifting health and environmental costs onto communities and individual Americans. Moreover, these negative, externalized costs are likely to mount in coming years. Despite the growing evidence that CAFOs pose health and environmental risks and negatively impact workers and communities, CAFO regulations and their enforcement have failed to adequately protect human health and the environment. This policy statement calls for a moratorium on the establishment of new CAFOs and expansion of existing CAFOs until regulation and enforcement conditions are in place to adequately protect the public’s health.

Relationship to Existing APHA Policy Statements

- APHA Policy Statement 201713: Establishing Environmental Public Health Systems for Children at Risk or with Environmental Exposures in Schools
- APHA Policy Statement 201712: Advancing a 'One Health' Approach to Promote Health at the Human-Animal-Environment Interface
- APHA Policy Statement 201711: Public Health Opportunities to Address the Health Effects of Air Pollution
- APHA Policy Statement 201777: Improving Working Conditions for U.S. Farmworkers and Food Production Workers
- APHA Policy Statement 201511: Impact of Preemptive Laws on Public Health
- APHA Policy Statement 201210: Promoting Health Impact Assessment to Achieve Health in All Policies
- APHA Policy Statement 201226: Anticipating and Addressing Sources of Pollution to Preserve Coastal Watersheds, Coastal Waters, and Human Health
- APHA Policy Statement 201110: Ending Agricultural Exceptionalism: Strengthening Worker Protection in Agriculture Through Regulation, Enforcement, Training, and Improved Worksite Health and Safety
- APHA Policy Statement 200998: Opposition to the Use of Hormone Growth Promoters in Beef and Dairy Cattle Production
- APHA Policy Statement 200712: Toward a Healthy Sustainable Food System
- APHA Policy Statement 200413: Helping Preserve Antibiotic Effectiveness by Demanding Meats Produced Without Excessive Antibiotics
Problem Statement

Over the last several decades, food animal production in the United States has shifted from an extensive system of small and medium-sized farms to one characterized primarily by large-scale industrial operations that concentrate large numbers of animals in small geographic areas.[1] These operations function with high throughput and rapid turnover fueled by specially formulated animal feeds, pharmaceutical inputs, mechanization of production, and highly specialized animal breeds. This production model is known as industrial food animal production (IFAP).[2] The Centers for Disease Control and Prevention has determined that these operations pose risks to public health and the environment.[3]

In addition, food animal production has become a vertically integrated system, particularly in the swine and poultry industries.[2] In this model, a processing company, known as an integrator, owns and controls all stages of the production process, from the animals to the feed to the slaughterhouses. The farmer, or grower, contracts with the integrator to raise the animals and is responsible for capital investments of equipment and facilities, as well as the management and disposal of animal waste. Growers often have little market power and little to no autonomy over their farming operations.[1] Accompanying the trends of vertical integration and concentration of animals is the consolidation of the livestock and poultry industries, with operations becoming larger in size and fewer in number than in years past. [4] For example, over the last five decades, the average number of hogs per farm increased from 37 to 1,044, while the number of hog farms has decreased from 1.85 million to 63,000.[5]

IFAP facilities, depending on their size and production methods, may be considered animal feeding operations or concentrated animal feeding operations (CAFOs) by the Environmental Protection Agency (EPA). The EPA defines animal feeding operations as facilities where “animals have been, are, or will be stalled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.”[6] To be considered a large CAFO, the facility must house at least 1,000 beef cattle, 700 dairy cows, 2,500 hogs, 125,000 broiler hens, or 82,000 laying hens.[7] Although the average size of these facilities is much greater, for example, the average cattle feedlot held 4,300 animals, and in some states the average poultry operation exceeded 500,000 birds. [8] CAFOs smaller than those designated as large by the EPA are regulated in the same way if they are determined by permitting authorities to be significant contributors of pollutants.[7] While the EPA has precise definitions for CAFOs, the term CAFO in this statement refers to operations that employ the IFAP methods and practices just described.

Raising animals in large, high-density operations leads to the routine accumulation of large volumes of animal waste, often at rates far exceeding the capacity of nearby farmland to absorb it.[9] As a result, these operations represent a significant public health and ecological hazard because the excess waste they produce is disposed of in a manner that can pollute surface and groundwater resources.[9] In the United States, CAFOs produce an estimated 369 million tons of animal manure a year, approximately 13 times the sewage produced by the U.S. population.[8] This animal waste is typically stored in open or covered pits or liquid lagoons and later spread or sprayed untreated on nearby cropland, posing additional risks to public health.[1] Workers in animal production can be exposed to airborne waste particles, drug residues, heavy metals, potentially harmful pathogens, and antibiotic-resistant bacteria, many of which can be transferred into neighboring communities by these workers.[9, 10] In addition, people living near CAFOs may have an increased risk of infection owing to the transmission of harmful microbes from CAFOs via flies or contaminated water and air.[10]

Close proximity to CAFOs is frequently associated with declines in local economic and social indicators (e.g., business purchases, infrastructure, property values, population, social cohesion), which undermine the socioeconomic and social foundations of community health.[11] Often in poor and African American rural communities.[12] There are disproportionate negative health impacts associated with CAFOs on low-income, disadvantaged, and economically distressed communities, as well as communities that are heavily dependent on groundwater and have high proportions of ethnic and racial minority residents, raising serious environmental justice concerns.[11–13] In addition, studies have shown that CAFOs are clustered in areas near low-income and non-White schools.[14, 15] Also, low wages, lack of healthy food options, and poor access to medical care may intensify the burden of disease in these communities.[13] Moreover, the negative health and environmental impacts associated with CAFOs can become concentrated in these communities due to their limited economic and political resources to address problems.[13]
In addition, while CAFOs produce large quantities of meat and other animal-source foods such as milk, eggs, cheese, and yogurt, their relatively low retail costs obscure the upstream, higher costs of industrial production. Externalized impacts, including environmental degradation and regressive health effects associated with CAFOs as well as taxpayer subsidies, cost the American public billions of dollars annually. Some of these externalized impacts include lower property values in communities located near CAFOs, costs associated with treating antibiotic-resistant disease, and costs associated with the cleanup and prevention of air and water pollution. Externalized costs of CAFOs also include those associated with climate change. Livestock production is the largest source of food system-related greenhouse gas emissions, accounting for an estimated 14.5% of such emissions worldwide. Studies have also shown that meat and dairy from ruminant animals are particularly emissions intensive.

Although animal manure is an invaluable fertilizer, waste quantities of the magnitude produced by CAFOs represent a public health and ecological hazard through the degradation of surface and groundwater resources. CAFO-generated manure has constituents and byproducts of health concern, including antibiotics, pathogens, bacteria, hormones, nitrogen, and phosphorus. Manure from these operations can contaminate ground and surface waters with nitrates, drug residues, and other hazards, and studies have demonstrated that humans can be exposed to waterborne contaminants from livestock and poultry operations through the recreational use of contaminated surface water and the ingestion of contaminated drinking water. This is of particular concern for the 34.2 million Americans, approximately 11% of the population, who rely on private wells for drinking water and household use, as private wells are not monitored by government agencies to ensure safe levels of pathogens. Manure storage systems, such as liquid lagoons or cess pits, are also vulnerable to breaches during heavy rainfall and flooding events, increasing the risk of environmental contamination. This is particularly concerning given that extreme weather events are predicted to increase in frequency and severity over the coming decades.

Pathogens in manure that are capable of causing severe gastrointestinal disease, complications, and sometimes death in humans include Campylobacter and Salmonella species, as well as Listeria monocytogenes, Yersinia enterocolitica, fecal coliforms such as Escherichia coli, and the protozoa Cryptosporidium parvum and Giardia lamblia. Studies have linked human disease outbreaks involving these pathogens to livestock waste. Of additional concern is exposure to pathogens that are resistant to antibiotics used in human medicine. Administering antibiotics to animals at levels too low to treat disease fosters the proliferation of antibiotic-resistant pathogens. There is scientific consensus that antibiotics administered to food animals contribute to antibiotic resistance in humans.

More than 12 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States. This represents 64% of all sales of these precious drugs, including for use in treating people. U.S. food animal production uses these antibiotics at nearly twice the intensity (measured as milligrams of antibiotic active ingredient per kilogram of meat produced) as the collective livestock industries in 30 European countries. In the United States, these antibiotics are used to treat livestock disease and to prevent disease in animals without any clinically diagnosed disease to compensate for the overcrowded, poor environmental conditions characteristic of industrial animal agriculture. Current APHA policy statements (2017/12, 2009/2007) register appropriate concern about agricultural use of medically important antibiotics.

Studies have demonstrated that antibiotic-resistant pathogens are found in animal operations that administer antibiotics for purposes other than treating or controlling veterinarian-diagnosed disease and are also found in the environment in and around production facilities. Pathogens can spread from animal production operations to surrounding communities, exposing workers, their family members, and community members to these resistant pathogens. In addition, numerous studies have shown that industrial food animal production workers and their family members, as well as those who are in residential proximity to CAFOs, face increased risk of antibiotic-resistant infections. A North Carolina study of industrial hog operation workers revealed that workers with nasal carriage of multidrug-resistant Staphylococcus aureus and livestock-associated Staphylococcus aureus were 8.8 and 5.1 times more likely to report recent skin and soft tissue infections than non-carriers, respectively. Additional studies have shown that residential proximity to CAFOs is associated with increased risks of antibiotic-resistant infection and colonization. Resistant infections in humans are more difficult and expensive to treat and more often fatal than infections with non-resistant strains.

Furthermore, land application of manure in excess of the land's absorptive capacity can lead to excess nitrogen and phosphorus in soil, water resource pollution, eutrophication of surface waters, and algae overgrowth, including some algae producing human toxins. Exposure to elevated levels of nitrates in drinking water is associated with adverse health effects such as cancer, birth defects and other reproductive problems, thyroid problems, and methemoglobinemia (blue baby syndrome). In addition, exposure to algal toxins has been linked to adverse health effects including gastrointestinal illness, liver inflammation and failure, severe dermatitis, respiratory paralysis, cardiac arrhythmia, and tumor promotion.
Workers and community members living near CAFO operations also face increased exposure to air pollution from these operations, which can cause or exacerbate respiratory conditions including asthma,[49] eye irritation, difficulty breathing, wheezing, sore throat, chest tightness, nausea,[50] bronchitis, and allergic reactions.[49] Toxic air emissions include particulates, volatile organic compounds, and gases such as hydrogen sulfide and ammonia.[51] One Pennsylvania study showed that living in close proximity to poultry operations may increase the risk of community-acquired pneumonia,[52] and another study in that state revealed an association between proximity to industrial animal agriculture operations and clinically documented asthma exacerbations.[53] Odors associated with air pollutants from large-scale hog operations have been shown to interfere with daily activities, quality of life, social gatherings, and community cohesion[11] and to contribute to stress and acute increased blood pressure.[54] It is important to note that many of these risks are borne disproportionately by low-income, minority communities where research has shown, CAFOs are often clustered.[14,15,55]

Evidence-Based Strategies to Address the Problem

While some federal, state, and local CAFO regulations exist, they are not sufficiently enforced and contain loopholes and deficiencies that limit their capacity to protect human and environmental health.[2] Many CAFOs are exempt from regulation, and monitoring and inspection are insufficient.[2] For example, CAFOs are exempt from hazardous air emissions reporting requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the EPA does not require reporting of air emissions from animal agriculture under the Emergency Planning and Community Right-to-Know Act (EPCRA).[56] Thus, the public is ill informed about the categories and quantities of hazardous substances released by CAFOs. In addition, as outlined in APHA Policy Statement 2011, preemption laws related to animal agriculture can prevent local governments from enacting ordinances to protect environmental and public health from CAFO air and water pollution.[57] This means local residents have little authority over the governance of CAFOs once they have been established in an area. Finally, the Safe Drinking Water Act does not apply to private wells, the EPA does not regulate private groundwater wells, and the Clean Water Act applies only to navigable, or surface, waters.[58–60] In light of these exemptions and loopholes, some states have proposed, and one has passed, CAFO moratoria in order to protect public health and the environment.[61,62]

Existing regulations must be strengthened, enforced, and applied to all CAFOs, as described below in the action steps, in order to adequately protect human and environmental health. Until such a time that this occurs, a moratorium on new and expanding CAFOs should be established.

Opposing Arguments

Without accounting for externalized costs, it can be argued that greater economies of scale can be achieved when raising large numbers of animals in CAFOs due to higher efficiencies and lower costs per unit.[2] A number of factors, including efficient animal feeding and housing, specialization of animals for food production, and large facility sizes, allow CAFOs to supply large quantities of animal-sourced foods such as milk, eggs, and meat,[1] CAFO technologies and practices that have reduced operating costs can mean bigger profits on less land and capital, and livestock systems have a global asset value of at least $1.4 trillion, providing food for individuals throughout the world.[1,63] In addition, animal manure, when applied appropriately, can be an effective, low-cost fertilizer for crops.[9] When CAFOs are being considered in particular areas, it is often argued that they can benefit the local economy by increasing demand for local materials and feed and can stimulate an increase in employment.[1] It is also argued that increased tax expenditures related to CAFOs will translate into greater funding for schools and infrastructure.[1]

As discussed earlier, however, the apparently low retail price tag for grocery items produced in CAFOs is due in large part to the substantial health and environmental costs of this production that have been "externalized" or deliberately ignored by this system. Rather than being the responsibility of CAFO operators, billions of dollars of these health and environmental costs have been paid by the American public each year.[16,17] In addition, the vertically integrated model characteristic of CAFOs has been found to contribute less to local economies than locally owned and controlled farms.[2] CAFO integrators are often not rooted in the local farming community, and thus profits from CAFO businesses leave the community.[2] In the United States (where the proposed moratorium would take effect), meat is consumed at more than three times the global average, which enhances the risk of chronic diseases and has major negative consequences with respect to land use, water use, and environmental change.[64] Also, as CAFOs are established and expanded in communities, the operations often rely more on technology than on additional labor to function, and as a result fewer jobs are available to local people.[2] In addition, the jobs that are available are often low paid and itinerant and filled by migrant laborers willing to work for low wages.[2] Furthermore, the potential for economic benefits should not be prioritized at the expense of human and environmental health. As described in the problem statement, wide-ranging human and environmental health impacts such as air and water pollution, environmental degradation, increased risk of exposure to pathogens, and increased risk of antibiotic resistance result from CAFO establishment and expansion.
Action Steps

In light of the wide-ranging negative health and environmental impacts associated with CAFOs, as well as serious environmental justice concerns, APHA urges federal, state, and local governments and public health agencies to impose a moratorium on new and expanding CAFOs until additional scientific data on the attendant risks to public health have been collected, uncertainties have been resolved, and the following action steps have been taken:

1. The federal government brings the use of medically important antibiotics in U.S. poultry and livestock production into compliance with the 2017 recommendation of the World Health Organization that producers stop using these precious antibiotics in healthy animals. Federal regulators should end approval of such drug use in food-producing animals for the prevention of infectious diseases where disease has not been clinically diagnosed. This approval practice is currently allowed and is deemed “therapeutic” by the Food and Drug Administration.

2. The federal government removes CAFO exemptions from reporting of environmental emissions of hazardous materials under CERCLA and EPCRA reporting requirements.

3. The federal government enforces the Clean Water Act as it pertains to CAFOs.

4. The federal government strengthens CAFO regulations under the Clean Air Act by developing mechanisms to better monitor air emissions and collecting air emissions data to improve understanding of community exposure risks.

5. The federal government and state governments prohibit the installation of new liquid manure handling systems, including waste lagoons, and phase out their use in existing operations to reduce the risk of public health and environmental disasters.

6. The federal government and state governments, in coordination with the National Pollutant Discharge Elimination System and Natural Resources Conservation Service Comprehensive Nutrient Management Plans, develop and implement strict oversight protocols for the application of dry manure so that it does not exceed agronomic standards.

7. Develops baseline federal zoning guidelines for food animal production facilities that set a framework for states and require a rigorous, pre-permit environmental impact study and a health impact assessment; such requirements should not prevent states and counties from enacting more comprehensive zoning laws. Impact studies should include assessments of the cumulative effects of food animal production facilities located in vulnerable low-income, minority, and economically distressed communities.

8. The federal government removes exemptions for agricultural operations from the Occupational Safety and Health Act, including exempting agricultural operations from inspection and enforcement of labor laws based on their number of employees.

9. The federal government and state governments increase funding for research on and dissemination of food animal production practices that will be beneficial to the environment, public health, and rural communities and offer funding and technical assistance to farmers to adopt these practices.

10. The federal government eliminates waste management subsidies CAFOs receive under the Environmental Quality Incentive Program (EQIP).

11. The federal government directs EQIP funding and Farm Service Agency loans to small and medium-sized operations rather than CAFOs and requires a rigorous environmental and public health assessment as part of the approval process.

12. The federal government addresses environmental equity issues in permitting decisions for projects with the potential to disparately impact communities protected by Title VI of the Civil Rights Act of 1964.

References


2020 © American Public Health Association
I hope you will take the initiative to get an EIS advised for the Daley Dairy expansion in Winona Co. We have got to start being concerned for the health of our water supply in this state. So many people have been affected by "Under ground" water contamination in this area. Above ground is easily seen, underground is not normally not noticed, That is the problem I believe! ...We are sticking our heads in the sand cause we don't see the damage!

I am a life long farmer in Dodge county (8 decades) and can see so many things that have changed.... a lot of it is not to the advantage of the environment either. We are polluting in ways like never before in the air, water and soil. It's time we make a statement for change, right now, for the safety of all three in calling for this EIS.

We need to re-activate this "Citizens Board" in this state To help with this.

Evan Schmeling
Hayfield, MN.
If the Jordan Aquifer is contaminated where do we go for water and at what cost?

Jim Mickelson
Rochester MN
February 2, 2020

Kim Grosenheider
Resource Management and Assistance Division, MPCA
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Grosenheider:

The Minnesota Pollution Control Agency must properly do its duty, enforce regulations, and prevent industrial affronts that damage our climate, air, land and water and air in Minnesota and, as a consequence, our health and that of other species as well.

I am strongly opposed to the Daley Farms expansion in my Senate District 28 region which is an area of karst topography which cannot be emphasized enough. That alone certainly warrants an EIS whose outcome should also certainly warrant denial of expansion permits.

Why should Minnesota allow one family to damage some of our most sensitive ecology to mainly benefit them? Bigger is certainly not always better for all of us as in this instance. The community and ecological area must be protected from any one family whose desires would be damaging to others, and the most robust and careful science should be used or obtained in all decision-making.

As has been shared with many by others who are also ethically opposing the expansion, please note:

Daley Farm of Lewiston's "dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows, from 2,275 animal units (AUs) to 5,968 AUs."

"The typical dairy farm in Minnesota has cow numbers fewer than 200 (about 86%) to 500 (about 10%). This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy, and it would be concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water."
"The proposed industrial-scale animal factory expansion would be 4 times the animal unit cap in Winona County; an Environmental Impact Statement is imperative."

Therefore, please respect the larger community's proper wishes and use your regulatory power to prevent the Daley Farms expansion immediately or after reviewing the results of an accurate Environmental Impact Statement.

Thank you,
Janette Dean
Environmental Policy and Human Rights Advocate & Organizer
MN/WI + NV/CA + Nat'l.
507.725.3012

Home Address:
103 N. Gjere Avenue #5, Caledonia, MN 55921
To: Kim Grosenheider, Resource Management and Assistance Division, MPCA

Thank you for extending the public comment period regarding the proposed Daley mega-dairy farm in Winona County. The proposed industrial-scale animal factory expansion would be 4 times the animal unit cap in Winona County; an Environmental Impact Statement is imperative.

The karst region is SE Minnesota has already been besieged by elevated nitrate levels in many private wells and this proposal would endanger the drinking water and create hazardous air pollution. This area of Minnesota has experienced multiple 500 year rain events and this would create the perfect storm for an environmental catastrophe.

This mega-dairy farm should never been allowed in the first place so I urge you to reject this expansion proposal.

Sincerely,
Mike Menzel, MD
5410 York Ave S, Edina, MN 55410
MPCA Commissioner Bishop and staff must use MPCA power to conduct an Environmental Impact Statement (EIS) for Daley's proposal. This environmental review is what was intended by the authors of the Minnesota Environmental Protection Act. Without it, a proposal by the Daley farm will have lasting impacts on land, water and air, and on the health and quality-of-life of whole communities.

I am CEO of People's Food Co-op in Rochester, MN. We prioritize the availability of locally raised foods for sale in our grocery store so that consumers and growers can have high quality lives. The lands surrounding the Daley farm are the lands farmed by people who supply People's Food Co-op with food. From dairy to produce to meats, people all over southeast MN are growing food on land which MUST be protected. Without protections, the yields of crops go down, the cost of inputs go up, and the quality of life for my farmers goes down.

We are not the only retailers in this region to purchase from area farms: HyVee, Fresh Thyme, Natural Grocers and Bluff Country Co-op are all grocery retailers with a stake in protecting our lands. Additionally, dozens of restaurants in our area rely on sources for foods grown on lands with clean water and with low-input methods. The growers of these foods cannot afford to mitigate the effects what the Daleys are proposing.

Southeastern Minnesota's rural residents and rural communities are already in crisis. High nitrate levels in drinking water and high costs for drilling new wells and paying for systems to clean it up are already a reality in the karst region where Daley Farms is located.

- If Daley Farms were to be allowed to go ahead with its expansion, it would be the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy.

- The EAW's recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can't "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph)

- "Estimates of potential emissions" are unsubstantiated. We don't know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: "The Project will release air and odor emissions typically associated with a dairy farm" (6A). The typical dairy farm in Minnesota has cow numbers fewer than 200 (about 86%) to 500 (about 10%). This expansion would make this mega-dairy 9 to 23 times bigger than the typical
Minnesota dairy, and it would be concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water.

- Daley Farms has been out of compliance with state regulations for run-off and other aspects of operations, with violations filed by the MPCA's feedlot division that have gone unenforced over 23 years. And yet, the EAW assumes Daley will comply with the MPCA's recommendations if a permit is granted.

An Environmental Impact Statement is imperative to our community.

On behalf of my customers and producers in southeast Minnesota, we thank you for following this important process.

Lizzy Haywood
CEO
People's Food Co-op

507.289.9061, ext. 1000

If you are not the intended recipient you are notified that disclosing, copying, distributing or taking any action in reliance on the contents of this information is strictly prohibited.
I am sad to see the pollution of our air and drinking water and bodies of water in rural Minnesota.

**This EAW supplement is as flawed as the original.**

- If Daley Farms were to be allowed to go ahead with its expansion, it would be the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy.

- The EAW's recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can't "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph)

- "Estimates of potential emissions" are unsubstantiated. We don't know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: "The Project will release air and odor emissions typically associated with a dairy farm" (6A). The typical dairy farm in Minnesota has cow numbers fewer than 200 (about 86%) to 500 (about 10%). This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy, and it would be concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water.

- Daley Farms has been out of compliance with state regulations for run-off and other aspects of operations, with violations filed by the MPCA's feedlot division that have gone unenforced over 23 years. And yet, the EAW assumes Daley will comply with the MPCA's recommendations if a permit is granted.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that "Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public." The Daley operation will have no control over the spreading of manure on acres owned by others (about 42% of the MMP acreage), since the EAW only applies to the Daley land.

Thank you.

--Mark M Giese
Sad News For Meghan Markle And Prince Harry
track.volutrk.com
http://thirdpartyoffers.juno.com/TGL3142/5e378c258c173c25075fst02duc
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA has recently published a report that describes 21 agricultural management practices, some of which could be used to reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Good Morning,

I am writing to you this morning in regards to the EAW related to potential greenhouse gas emissions for the Daley Farms of Lewiston expansion project. I would like to express my full support for the Daley project and their efforts to pass on their sixth generation dairy farm to the next generation.

There seems to be a lot of people (none of which are in any way connected to a dairy farm) that have opinions on how Daley's family farm should be able to grow and be operated. This is extremely unfortunate to say the least.

I could not find in any other livestock facility case where MPCA (or any other court) required any analysis of greenhouse gas emissions. It is simply not appropriate for a single feedlot.

Having lived and worked in Winona County's dairy industry for my whole life, I find it hard to watch how our county's dairy cow numbers have dwindled in recent years. The Daley project will replace a fraction of the number of cows that have left. How could there be an impact on greenhouse gasses?

The greater concern should be soil health. The Daley farm will have more alfalfa and pasture utilization than most other farms. They have already agreed to use proper manure application practices. Which will greatly reduce the use of chemical fertilizers.

MPCA has publicly stated there will be no effect on water quality. The additional environmental benefits are numerous.

I strongly support the Daley family and their project. This project has been held up for too long!

Regards,

Paul Tveten
This letter is in support of the Daley Expansion. We need to do all we can to help and support this family so we all can keep family farming alive while improving the ways we farm. As already good stewards of our environment and animal care I'm very proud to have them as my neighbor. I have no doubt in my mind that with this expansion they will be able to do even greater things with using new technology and practices that will add high benefit to not only our economy but as examples of good farming.

Sincerely,

Charlie Matzke
Dear Kim Grosenheider,

First, I want to thank you for all your hard work and efforts working in the MPCA. My grandfather was Commissioner of Conservation many years ago and he educated me as to the sometimes overwhelming demands of working in and for the public. I appreciate all that you do.

I have been reading a bit about the Daley Dairy farm near Winona and do have some concerns regarding their current size and possible future size.

I was in Winona last fall helping to facilitate a meeting with county board members, the local community members, and various commissioners. I didn't know anything about the nitrate/karst problems until that night.

It alarmed me, as I live near Taylors Falls and there is growing concern in my community regarding nitrate levels in water.

I am asking you to please look into the Daley Farms more deeply and conduct a thorough vetting of all aspects of the environmental effects that increasing this already quite large dairy farm will have on that region. Of course, this might set precedent for future environmental concerns - we no longer have the luxury to put off into the future what is a problem today.

Again, thank you for you and all the department's hard work, I truly value it.

Sincerely,

Heron Diana

cynosuremn@gmail.com
herondiana.com
https://www.linkedin.com/in/heron-diana-a77498179
612.205.6080
Dear Ms. Grosenheider. As a lifetime resident of Minnesota and a frequent visitor to the southeastern corner of the state, I would like to comment on the proposed mega-dairy expansion project and the Daley EAW Supplement on GHG. The very idea of allowing an industrial scale animal facility to expand beyond the animal unit cap set by the county is baffling to me. We have regulations in place for a reason. At the very least, let's stick to those, especially in an environment as sensitive to groundwater contamination as is this corner of the state with its Karst terrain. The impacts on the environment and hence to the quality of life for nearby residents and visitors to the region, where such a large scale dairy operation is proposed, will be significant. To ignore that impact is unacceptable.

I have read the EAW supplement and the vague language that is used to address the concerns of increased GHG production is not adequate. To address the potential problems created by housing thousands of animals in a small concentrated area, not to mention dealing with their manure in an environmentally responsible manner, would take specific plans and ways to make sure that those plans were implemented accordingly. To simply say that wind direction and humidity would be considered before spreading manure or that certain mitigating steps "may" be taken is not good enough. These vaguely worded solutions are unenforceable because nobody is out there from a regulatory standpoint making sure that compliance is occurring. For the sake of the other residents in the area and for the future of the air and water quality long term, an EIS is needed. We are facing a climate crisis. We can not roll back regulations and rubber stamp permits for polluters to go ahead with exacerbating the problem.

Please require an EIS for this proposed expansion.

Yours truly,
Judith Derauf
3422 E. 1st ST
Duluth, MN 55804
Dear Ms Grosenheider,

I am writing in support of the Daley Farm dairy expansion.

How many good Minnesota dairy farm families must be sacrificed under the pretense of environmental concerns? I firmly believe that MPCA’s thorough review process is more than adequate to safely permit this project! In fact, the rigorous permitting process in Minnesota has earned such a reputation for chewing up good families and their projects that the vast majority of families don’t even try any more. Those who do try to expand a dairy know they not only have to be prepared for the battle of their lives, but realize that they will be farming under intense scrutiny if they are able to achieve their dreams. The permitting process itself isn’t the problem. The problem comes when activist groups are able to manipulate the process with strategies and lawyers aimed only at killing projects.

My family went through a similar battle 20 years ago. We are still farming, but were never able to achieve the efficiencies we had intended. Our original three-family unit ended up spread across two counties trying to raise crops in one county to be fed to a dairy herd twenty miles away in the next county. We’ve also never been able to achieve a manure management system that was financially as well as environmentally sound – we spend too much money attempting to get the manure back to our crop acres. Our original goal had been to work closely as a multi-generation family farm with crops and cattle all within a three mile radius – we had to give that up. The science was in our favor. But when activist groups get involved and play out their scripted dramas, science goes out the window. These kind of organizations have found their niche playing upon the personal vendettas, jealousies, and generations-old grudges that exist in rural areas. Sure, some people may have legitimate concerns – but rather than allowing for learning and understanding – the activist groups stir the pot, drive the wedges deeper, and, oh yes, gather new dues-paying members to pay the salaries of those whose job it is to rid our rural areas of animal agriculture that they deem too large. Ultimately, our rural communities will be the losers.

Dairying drives rural economies and sustainable environments! Dairying needs forages – like alfalfa and cover crops – the very things that are ideal for Southeast Minnesota’s topography and karst geology. For our herd, we raise an acre of alfalfa per cow. When cows leave the equation, those acres are replaced with corn and beans which are worse for soil erosion. Dairies also drive local school districts – dairy families are usually young families with kids in the school district!

As far as concerns over greenhouse gases, the dairy industry is on this. There are more and more
methods and technologies emerging to manage manure in ways that control or eliminate methane.

Sincerely,

Christine K. Sukalski, Reiland Farms, LLP
13698 755th Ave, LeRoy, MN 55951
507-251-0871 cell
Dear Ms Grosenheider,

Regarding the EAW / EIS for the Daley Mega-dairy in southeastern Minnesota.

I sincerely appreciate that MPCA Commission Laura Bishop has extended public comment on the Daley EAW supplement on greenhouse gases.

Please advise the MPCA's Environmental Review division to use its power to conduct the full and complete environmental review as intended by the authors of the Minnesota Environmental Protection Act (MEPA).

The proposed industrial-scale Daley animal factory expansion would be 4 times the animal unit cap in Winona County; an Environmental Impact Statement is imperative. We have farmed. We know something about the environmental and human costs of animal production. We also see how badly it degrades water and air quality as well as quality of life for neighbors. Southwestern Minnesota must pipe in water from the Missouri River. We desperately need to learn how to farm in manners that don’t destroy our ability to live on the land in this great water rich state of Minnesota. Destroying our water is destroying our future. Please don’t allow this to happen. Here in Minnesota we have opportunity to show others what the right and just approach is to farming.

If permitted and built this Daley factory farm would have lasting impacts on land, water and air, and on the health and quality-of-life of whole communities, perhaps for generations. No industry should have the right to destroy the lives of it’s neighbors. The ONLY reason this would be approved is greed.

We need to find alternatives to offset the potential for significant environmental effects, OR if suitable alternatives don't exist, determining that the site is not right for the proposed plan and can't be permitted. Southeastern Minnesota's rural residents and rural communities are already in crisis. High nitrate levels in drinking water and high costs for drilling new wells and paying for systems to clean it up are already a reality in the karst region where Daley Farms is located.

Our MPCA Commissioner Bishop and staff need to realize that rural Minnesotans know that in light of already horrible environmental
effects from industrial-scale animal factories, the environmental review and feedlot regulatory/oversight/enforcement system is BROKEN. NOW is the time to fix it!

This EAW supplement is as flawed as the original. Please note:

If Daley Farms were to be allowed to go ahead with its expansion, it would be the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy.

The EAW's recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can't "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph)

"Estimates of potential emissions" are unsubstantiated. We don't know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

Faulty underlying assumptions: "The Project will release air and odor emissions typically associated with a dairy farm" (6A). The typical dairy farm in Minnesota has cow numbers fewer than 200 (about 86%) to 500 (about 10%). This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy, and it would be concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water.

Daley Farms has been out of compliance with state regulations for run-off and other aspects of operations, with violations filed by the MPCA's feedlot division that have gone unenforced over 23 years. And yet, the EAW assumes Daley will comply with the MPCA's recommendations if a permit is granted.

Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that "Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public." The Daley operation will have no control over the spreading of manure on acres owned by others (about 42% of the MMP acreage), since the EAW only applies to the Daley land.

Thank you for your time and using your WISDOM to deny this permit for the Daley industrial farm. Approval would be disastrous for the environment, for neighbors and for the entire state on Minnesota.

Sharon Kutter

10917 County 47

Grey Eagle MN 56336
Dear Ms. Grosenheider,

Please lead the MPCA to use its power to conduct an environmental review of the mega-dairy expansion in Winona County, as intended by the authors of the Minnesota Environmental Protection Act (MEPA). I’d like to see you find alternatives to offset the potential for significant environmental effects, OR if suitable alternatives don’t exist, determine that the site is not right for the proposed plan and can’t be permitted.

Thank you.

Sincerely,

Elizabeth Jarrett Andrew

www.spiritualmemoir.com
www.elizabethjarrettandrew.com

Aliveness springs from our making something of what we experience and receiving what experience makes of us. --Ann Belford Ulanov
Dear Ms. Grosenheider,

I am a farmer near Duluth, MN. I’m not a dairy farmer, but I have neighbors who are. In fact, I purchase milk for my family directly from one of them. My neighbors are being adversely affected by low milk prices caused by mega-dairies like Daley Farms in SE MN which is trying to expand its dairy herd from 2275 AUs to 5968 AUs. My neighbor supports his family by milking 150 cows.

In addition to threatening the livelihoods of many small dairy farmers, the Daley proposal should be denied because of environmental concerns. The Karst geology of the area is very porous, and drinking water wells are already at risk, with many already having nitrate levels far above safe limits. The Daley Farms proposal would generate over 46 million gallons of manure per year. Even though Daley Farms plans to legally apply manure to croplands, spills into the environment are inevitable. Air pollution is another problem, both for neighbors and for the environment, because of the release of methane and other greenhouse pollutants and because of the overpowering smell (of 46 million gallons of manure).

Please deny the permits necessary for this expansion.

John Fisher-Merritt  
2614 County Rd. 1  
Wrenshall, MN 55797  
218-384-3356
<table>
<thead>
<tr>
<th>From:</th>
<th>Mike Tauber</th>
</tr>
</thead>
<tbody>
<tr>
<td>To:</td>
<td>Grosenheider, Kim (MPCA)</td>
</tr>
<tr>
<td>Subject:</td>
<td>Daley EAW</td>
</tr>
<tr>
<td>Date:</td>
<td>Monday, February 03, 2020 10:11:49 PM</td>
</tr>
</tbody>
</table>

**This message may be from an external email source.**
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Hello Kim,
As someone who has been petitioner’s representative for Environmental Review a couple times in the Pineland Sands, I understand the political liabilities for agencies that perform their job well, primarily in this case protecting water quality, and the industry pressure to look the other way. At some point the benefits to a few must be outweighed by the threats to the many as regards contamination of drinking water especially. The cumulative aspect of this issue is undeniable, and for such a long period of agency foot dragging to have occurred between the establishment of source problems and the first meaningful steps to be taken to address said problems is a travesty. Minnesota environmental law and statute has been made a mockery by such government/industry sacrifice of public trust.
Occasionally life offers the chance at redemption, I would ask that all please consider how many people could be aided by proper environmental review of the Daley CAFO specifically, and by the effort to retain or regain drinkable well water in the Karst Region. This is a chance to direct our society away from poisoning one another to regenerating natural systems, particularly through regenerative farming. It may cost you your job but it could save your conscience, and your neighbors.

I trust you will relay these comments to Commissioner Bishop and enter them into the record regarding the Daley Farm EAW.
Thank you for your time,
Mike Tauber
mjtauber42@outlook.com
218 675 5717
Sent from Windows Mail
Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency

To all concerned,

This letter regards the family farm dairy expansion permits for the Daley Farm located near Lewiston. It is my understanding that the Minnesota Court of Appeals has directed the Minnesota Pollution Control Agency to evaluate the need to determine whether greenhouse gas emissions from this expansion permit should be further investigated.

As a dairy farmer myself, I suspect greenhouse gas emissions from a dairy farm originate from the cow itself, the generation of inputs to produce feed for the cow, transportation of milk produced, etc. In order to minimize these emissions, our society should be encouraging production from top producer operations that have greater milk output per unit of input such as the Daley Farm and their expansion project. Greenhouse gases are a global concern versus a local concern. Food for our world population will be produced. Society should encourage food production in Minnesota on highly efficient dairy farms versus low efficiency farms in other countries. The greenhouse emission from the cow itself on a highly efficient farm with lower cow numbers will be the same as the cow on a highly efficient farm with higher cow numbers. The difference would be the higher cow farm would have a smaller greenhouse emission footprint because of the efficiency with delivering inputs to the cow and transporting milk from the farm. All dairy farms should be considered as part of the solution for greenhouse gas emissions with crop rotation, manure management replacing commercial fertilizer, converting local produced grains into higher value products such as milk versus shipping these grains vast distances to be converted.

Lastly, I strongly support the family dairy farm. The family farm has evolved at times to include several family members and multiple generations within the family farm. With the enormous financial investment and shrinking margins in farming today, it has become
continually more difficult for the single household family farm to be successful. Without society adapting to family farm structural change, a continued increase of our younger generation will leave the family farm because of lack of opportunity.

Respectfully,
Tom Sedgeman
Dairy Farmer, Sauk Centre, Mn.
Ms. Grosenheider,

I am a resident of SE MN. It is a beautiful karst area. I am very concerned that the Daley Farm expansion will have horrible effects to our environment in our area! Common sense tells me that if the herd is more than doubled this will emit too much green house gases. 2000+ cows is already too much but now they want 5000+ cows! MPCA needs to help keep our air and water quality healthy for us in the karst region. You know our ground water can get contaminated from this expansion. Another concern is that many people can’t afford the cost of a new well. MPCA needs to do the right thing by ordering an EIS for this expansion!
Karen Swanson Lanesboro MN

Sent from my iPhone
Kim,

I wanted to send you an email as I am unable to make the public hearing this evening as I am out of the country.
I would like to speak on behalf of the City of Altura as its Mayor. Hopefully I speak on behalf of many small rural towns and cities in Minnesota. The economic impact due to low Ag commodity prices over the past 5 years have been devastating to small town Minnesota. As many people including politicians weigh in on the impact at the farm level; the fact that Minnesota lost over 300 dairy farms and our neighboring State of Wisconsin lost over 800, each of these have the “trickle” effect through the community. We are loosing storefronts hand over fist and this needs to be addressed, and VERY SOON. Our town of 500 is dependent on agriculture, not only for the businesses and their survivability but the people it brings to us. These people are our local volunteers on our fire and ambulances. This is just an example but truly an extremely important one. Our ambulance, which I have proudly been a member of for more than 15 years, services the entire NW corner of Winona County.
The point I would like to make is that we need RURAL economic growth to be a sustainable community. MPCA can help with this by approving Daley Farms request to increase their animal numbers. Let the politicians along with your superiors decide the issue of greenhouse gases. Do not delay Daley’s request due to a concern by a minority group that does not represent the majority of Minnesotans.
Winona County Commissioner’s need revisit animal agriculture before they destroy it in Winona County and only then will the rest of there residents be left with a business climate that does not sustain the final goal of all; protect our lands and ecosystems in a method that is science based and common sense.

Thank you

Robert J Schell DVM
Mayor; City of Altura, MN

Robert J. Schell DVM
CalfStart LLC
203 1st Ave SE
Altura, MN 55910
DrBob@CalfStart.com
www.CalfStart.com
507-458-5624
Sent from my iPhone
Hi Kim,

Please forward these comments to Laura Bishop and the environmental review staff. Thanks,

Hi Laura Bishop and environmental review staff. I expect you to use the power given to you through the Minnesota Environmental Protection Act (MEPA) to order an in-depth Environmental Impact Statement (EIS) or deny permitting on an industrial-scale animal factory (1,000 animal units and above) where there exists the "potential for significant environmental effects" (Minn. Statute 4410.1700, subpart 1), ESPECIALLY when it is proposed in an already polluted, sensitive area. The Daley Farms expansion meets the aforementioned requirements for an in depth EIS or permit denial.

Thank you,
Milo Oien-Rochat
Ms. Grosenheider, thank you for the opportunity to speak briefly at the meeting last evening in Lewiston, Minnesota regarding the Daley Farms dairy factory farm expansion in Winona County.

I am supplementing my prior written comments dated February 2, 2020, due to limitation of public comments relating to air emissions only. As noted in the attached policy statement from the American Public Health Association (APHA) dated November 5, 2019:

Externalized impacts, including environmental degradation and negative health effects associated with CAFOs as well as improper subsidies, cost the American public billions of dollars annually. Some of these externalized impacts include lower property values in communities located near CAFOs, costs associated with treating antibiotic-resistant disease, and costs associated with the cleanup and prevention of air and water pollution. Externalized costs of CAFOs also include those associated with climate change. Livestock production is the largest source of food system-related greenhouse gas emissions, accounting for an estimated 14.5% of such emissions worldwide. Studies have also shown that meat and dairy from neonatal animals are particularly nutritious.

The APHA is calling for a moratorium on new and expanding CAFOs, such as the proposed expansion in Winona County. Is the MPCA considering a moratorium on new and expanding CAFOs consistent with the APHA recommendations? If not, why not?

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizens

On Sun, Feb 2, 2020 at 10:33 AM Sonja Eayrs <sonja.eayrs@gmail.com> wrote:

I ask that you include the following policy statement from the American Public Health Association (APHA) dated November 5, 2019 in the public record regarding the Daley Farms proposed expansion in Winona County. As indicated, this policy statement calls for a moratorium on the establishment of new CAFOs and expansions of existing CAFOs until regulation and enforcement conditions are in place to adequately protect the public's health. The Daley Farms expansion falls directly within the serious public health concerns addressed by APHA.

As noted in the policy statement:

[1] The Center for Disease Control and Prevention has determined that these operations pose risks to public health and the environment.

[2] Although animal manure is an invaluable fertilizer, water quantities of the magnitude produced by CAFOs represent a public health and ecological hazard through the degradation of surface and groundwater resources. CAFO-generated manure has been linked to products of health concern, including antibiotics, pathogenic bacteria, hormones, viruses, and pathogens. Disposal of manure and excess nutrients from CAFOs has been demonstrated that these can be imported into water bodies contaminated from livestock and poultry operations through the movement of air or contaminated surface and groundwater flows. Such a concentration of waste on the 102.2 million acres, approximately 23% of the population, who rely on private wells for drinking water and household use, as private wells are not monitored by governments agencies for more than half of all facilities. Animal manure systems, such as liquid lagoons or pens, are also vulnerable to leakage during heavy rainfall and flooding events, increasing the risk of environmental contamination. This is particularly concerning given that extreme weather events are predicted to increase in frequency and severity over the coming decades.

[3] There is scientific consensus that antibiotics administered to domestic animals contribute to antibiotic resistance in humans. More than 12 million pounds of antibiotics important to human medicine are sold annually for use in both animal production in the United States. This represents 60% of all sales of these precious drugs, including for use in humans, but antibiotics are used to treat or control disease to compensate for the overcrowded, poor environmental conditions characteristic of industrial animal agriculture.
Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations

Date: Nov 05 2019 | Policy Number: 20194

Key Words: Environment, Environmental Health, Agriculture

Abstract

Over the last six decades, food animal production in the United States has transformed from a system of small and medium-sized farms toward one characterized by much larger operations that concentrate large numbers of animals and their manure in relatively small geographic areas. These operations function with the high throughput and rapid turnover of an industrialized system and are often referred to as concentrated animal feeding operations (CAFOs). The enormous accumulation of manure and other untreated waste created by CAFOs is often stored and disposed of in a manner that pollutes the air, surface, and groundwater, posing risks to the environment and human health, particularly for CAFO workers and nearby residents. These operations also disproportionately affect low-income, disadvantaged communities with high proportions of racial and ethnic minority residents, raising serious social and environmental justice concerns. The current industrial system of food animal production has externalized the costs of environmental degradation and adverse health impacts, keeping retail meat prices artificially low while shifting health and environmental costs onto communities and individual Americans. Moreover, these negative, externalized costs are likely to mount in coming years. Despite the growing evidence that CAFOs pose health and environmental risks and negatively impact workers and communities, CAFO regulations and their enforcement have failed to adequately protect human health and the environment. This policy statement calls for a moratorium on the establishment of new CAFOs and expansion of existing CAFOs until regulation and enforcement conditions are in place to adequately protect the public’s health.

Relationship to Existing APHA Policy Statements

- APHA Policy Statement 201713: Establishing Environmental Public Health Systems for Children at Risk or with Environmental Exposures in Schools
- APHA Policy Statement 201712: Advancing a ‘One Health’ Approach to Promote Health at the Human-Animal-Environment Interface
- APHA Policy Statement 201711: Public Health Opportunities to Address the Health Effects of Air Pollution
- APHA Policy Statement 201777: Improving Working Conditions for U.S. Farmworkers and Food Production Workers
- APHA Policy Statement 201511: Impact of Preemptive Laws on Public Health
- APHA Policy Statement 201210: Promoting Health Impact Assessment to Achieve Health in All Policies
- APHA Policy Statement 201226: Anticipating and Addressing Sources of Pollution to Preserve Coastal Watersheds, Coastal Waters, and Human Health
- APHA Policy Statement 201110: Ending Agricultural Exceptionalism: Strengthening Worker Protection in Agriculture Through Regulation, Enforcement, Training, and Improved Worksite Health and Safety
- APHA Policy Statement 200998: Opposition to the Use of Hormone Growth Promoters in Beef and Dairy Cattle Production
- APHA Policy Statement 200712: Toward a Healthy Sustainable Food System
- APHA Policy Statement 200413: Helping Preserve Antibiotic Effectiveness by Demanding Meats Produced Without Excessive Antibiotics
Problem Statement

Over the last several decades, food animal production in the United States has shifted from an extensive system of small and medium-sized farms to one characterized primarily by large-scale industrial operations that concentrate large numbers of animals in small geographic areas.\(^1\) These operations function with high throughput and rapid turnover fueled by specially formulated animal feeds, pharmaceutical inputs, mechanization of production, and highly specialized animal breeds. This production model is known as industrial food animal production (IFAP).\(^2\) The Centers for Disease Control and Prevention has determined that these operations pose risks to public health and the environment.\(^3\)

In addition, food animal production has become a vertically integrated system, particularly in the swine and poultry industries.\(^2\) In this model, a processing company, known as an integrator, owns and controls all stages of the production process, from the animals to the feed to the slaughterhouses. The farmer, or grower, contracts with the integrator to raise the animals and is responsible for capital investments of equipment and facilities, as well as the management and disposal of animal waste. Growers often have little market power and little to no autonomy over their farming operations.\(^1\) Accompanying the trends of vertical integration and concentration of animals is the consolidation of the livestock and poultry industries, with operations becoming larger in size and fewer in number than in years past.\(^4\) For example, over the last five decades, the average number of hogs per farm has increased from 37 to 1,044, while the number of hog farms has decreased from 1.85 million to 63,000.\(^5\)

IFAP facilities, depending on their size and production methods, may be considered animal feeding operations or concentrated animal feeding operations (CAFOs) by the Environmental Protection Agency (EPA). The EPA defines animal feeding operations as facilities where "animals have been, are, or will be stalled or confined and fed or maintained for a total of 45 days or more in any 12-month period, and crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or area.\(^6\) To be considered a large CAFO, the facility must house at least 1,000 beef cattle, 700 dairy cows, 2,500 hogs, 125,000 broiler hens, or 82,000 laying hens.\(^7\) Although the average size of these facilities is much greater. One report revealed, for example, that the average cattle feedlot held 4,300 animals, and in some states the average poultry operation exceeded 500,000 birds.\(^8\) CAFOs smaller than those designated as large by the EPA are regulated in the same way if they are determined by permitting authorities to be significant contributors of pollutants.\(^7\) While the EPA has precise definitions for CAFOs, the term CAFO in this statement refers to operations that employ the IFAP methods and practices just described.

Raising animals in large, high-density operations leads to the routine accumulation of large volumes of animal waste, often at rates far exceeding the capacity of nearby farmland to absorb it.\(^9\) As a result, these operations represent a significant public health and ecological hazard because the excess waste they produce is disposed of in a manner that can pollute surface and groundwater resources.\(^9\) In the United States, CAFOs produce an estimated 369 million tons of animal manure a year, approximately 13 times the sewage produced by the U.S. population.\(^8\) This animal waste is typically stored in open or covered pits or liquid lagoons and later spread or sprayed untreated on nearby cropland, posing additional risks to public health.\(^1\) Workers in animal production can be exposed to airborne waste particles, drug residues, heavy metals, potentially harmful pathogens, and antibiotic-resistant bacteria, many of which can be transferred into neighboring communities by these workers.\(^9,10\) In addition, people living near CAFOs may have an increased risk of infection owing to the transmission of harmful microbes from CAFOs via flies or contaminated water and air.\(^10\)

Close proximity to CAFOs is frequently associated with declines in local economic and social indicators (e.g., business purchases, infrastructure, property values, population, social cohesion), which undermine the socioeconomic and social foundations of community health.\(^11\) Often in poor and African American rural communities.\(^12\) There are disproportionate negative health impacts associated with CAFOs on low-income, disadvantaged, and economically distressed communities, as well as communities that are heavily dependent on groundwater and have high proportions of ethnic and racial minority residents, raising serious environmental justice concerns.\(^11-13\) In addition, studies have shown that CAFOs are clustered in areas near low-income and non-White schools.\(^14,15\) Also, low wages, lack of healthy food options, and poor access to medical care may intensify the burden of disease in these communities.\(^13\) Moreover, the negative health and environmental impacts associated with CAFOs can become concentrated in these communities due to their limited economic and political resources to address problems.\(^13\)
In addition, while CAFOs produce large quantities of meat and other animal-source foods such as milk, eggs, cheese, and yogurt, their relatively low retail costs obscure the upstream, higher costs of industrial production. Externalized impacts, including environmental degradation and negative health effects associated with CAFOs as well as taxpayer subsidies, cost the American public billions of dollars annually.[16,17] Some of these externalized impacts include property values in communities located near CAFOs, costs associated with treating antibiotic-resistant disease, and costs associated with the cleanup and prevention of air and water pollution.[16] Externalized costs of CAFOs also include those associated with climate change.[17] Livestock production is the largest source of food system-related greenhouse gas emissions, accounting for an estimated 14.5% of such emissions worldwide.[18] Studies have also shown that meat and dairy from ruminant animals are particularly emissions intensive.[19]

Although animal manure is an invaluable fertilizer, waste quantities of the magnitude produced by CAFOs represent a public health and ecological hazard through the degradation of surface and groundwater resources.[9] CAFO-generated manure has constituents and byproducts of health concern, including antibiotics, pathogens, bacteria, hormones, nitrogen, and phosphorus.[9] Manure from these operations can contaminate ground and surface waters with nitrates, drug residues, and other hazards.[9] and studies have demonstrated that humans can be exposed to waterborne contaminants from livestock and poultry operations through the recreational use of contaminated surface water and the ingestion of contaminated drinking water.[20,21] This is of particular concern for the 34.2 million Americans, approximately 11% of the population, who rely on private wells for drinking water and household use.[22] As private wells are not monitored by government agencies to ensure safe levels of pathogens,[24] manure storage systems, such as liquid lagoons or cesspits, are also vulnerable to breaches during heavy rainfall and flooding events, increasing the risk of environmental contamination.[21] This is particularly concerning given that extreme weather events are predicted to increase in frequency and severity over the coming decades.[25]

Pathogens in manure that are capable of causing severe gastrointestinal disease, complications, and sometimes death in humans include Campylobacter and Salmonella species, as well as Listeria monocytogenes, Yersinia enterocolitica, fecal coliforms such as Escherichia coli, and the protozoa Cryptosporidium parvum and Giardia lamblia.[9] Studies have linked human disease outbreaks involving these pathogens to livestock waste.[26,27] Of additional concern is exposure to pathogens that are resistant to antibiotics used in human medicine. Administering antibiotics to animals at levels too low to treat disease fosters the proliferation of antibiotic-resistant pathogens.[2] There is scientific consensus that antibiotics administered to food animals contribute to antibiotic resistance in humans. [1,2] More than 12 million pounds of antibiotics important to human medicine are sold annually for use in food animal production in the United States.[28] This represents 64% of all sales of these precious drugs, including for use in treating people.[29] U.S. food animal production uses these antibiotics at nearly twice the intensity (measured as milligrams of antibiotic active ingredient per kilogram of meat produced) as the collective livestock industries in 30 European countries.[30,31] In the United States, these antibiotics are used to treat and control disease and to prevent disease in animals without any clinically diagnosed disease to compensate for the overcrowded, poor environmental conditions characteristic of industrial animal agriculture.[2,32] Current APHA policy statements (2017/12, 2009, and 2007) register appropriate concern about agricultural use of medically important antibiotics.[33–35]

Studies have demonstrated that antibiotic-resistant pathogens are found in animal operations that administer antibiotics for purposes other than treating or controlling veterinarian-diagnosed disease[36] and are also found in the environment in and around production facilities.[37–40] Pathogens can spread from animal production operations to surrounding communities, exposing workers, their family members, and community members to these resistant pathogens.[41,42] In addition, numerous studies have shown that industrial food animal production workers and their family members, as well as those who are in residential proximity to CAFOs, face increased risk of antibiotic-resistant infections. A North Carolina study of industrial hog operation workers revealed that workers with nasal carriage of multidrug-resistant Staphylococcus aureus and livestock-associated Staphylococcus aureus were 8.8 and 5.1 times more likely to report recent skin and soft tissue infections than non-carriers, respectively.[43] Additional studies have shown that residential proximity to CAFOs is associated with increased risks of antibiotic-resistant infection[44] and colonization.[45] Resistant infections in humans are more difficult and expensive to treat[46] and more often fatal[47] than infections with non-resistant strains.

Furthermore, land application of manure in excess of the land’s absorptive capacity can lead to excess nitrogen and phosphorus in soil, water resource pollution, eutrophication of surface waters, and algae overgrowth, including some algae producing human toxins.[9] Exposure to elevated levels of nitrates in drinking water is associated with adverse health effects such as cancer, birth defects and other reproductive problems, thyroid problems, and methemoglobinemia (blue baby syndrome).[48] In addition, exposure to algal toxins has been linked to adverse health effects including gastrointestinal illness, liver inflammation and failure, severe dermatitis, respiratory paralysis, cardiac arrhythmia, and tumor promotion[9]
Workers and community members living near CAFO operations also face increased exposure to air pollution from these operations, which can cause or exacerbate respiratory conditions including asthma,[49] eye irritation, difficulty breathing, wheezing, sore throat, chest tightness, nausea,[50] bronchitis, and allergic reactions.[49] Toxic air emissions include particulates, volatile organic compounds, and gases such as hydrogen sulfide and ammonia.[51] One Pennsylvania study showed that living in close proximity to poultry operations may increase the risk of community-acquired pneumonia,[52] and another study in that state revealed an association between proximity to industrial animal agriculture operations and clinically documented asthma exacerbations.[53] Odors associated with air pollutants from large-scale hog operations have been shown to interfere with daily activities, quality of life, social gatherings, and community cohesion[11] and to contribute to stress and acute increased blood pressure.[54] It is important to note that many of these risks are borne disproportionately by low-income, minority communities where research has shown, CAFOs are often clustered.[14,15,55]

Evidence-Based Strategies to Address the Problem

While some federal, state, and local CAFO regulations exist, they are not sufficiently enforced and contain loopholes and deficiencies that limit their capacity to protect human and environmental health.[2] Many CAFOs are exempt from regulation, and monitoring and inspection are insufficient.[2] For example, CAFOs are exempt from hazardous air emissions reporting requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the EPA does not require reporting of air emissions from animal agriculture under the Emergency Planning and Community Right-to-Know Act (EPCRA).[56] Thus, the public is ill informed about the categories and quantities of hazardous substances released by CAFOs. In addition, as outlined in APHA Policy Statement from 2015,[57] some states have enacted new laws related to animal agriculture that can prevent local governments from enacting ordinances to protect environmental and public health from CAFO air and water pollution.[57] This means local residents have little authority over the governance of CAFOs once they have been established in an area. Finally, the Safe Drinking Water Act does not apply to private wells, the EPA does not regulate private groundwater wells, and the Clean Water Act applies only to navigable, or surface, waters.[58–60] In light of these exemptions and loopholes, some states have proposed, and one has passed, CAFO moratoria in order to protect public health and the environment.[61,62]

Existing regulations must be strengthened, enforced, and applied to all CAFOs, as described below, in the action steps, in order to adequately protect human and environmental health. Until such a time that this occurs, a moratorium on new and expanding CAFOs should be established.

Opposing Arguments

Without accounting for externalized costs, it can be argued that greater economies of scale can be achieved when raising large numbers of animals in CAFOs due to higher efficiencies and lower costs per unit.[2] A number of factors, including efficient animal feeding and housing, specialization of animals for food production, and large facility sizes, allow CAFOs to supply large quantities of animal-sourced foods such as milk, eggs, and meat.[1] CAFO technologies and practices that have reduced operating costs can mean bigger profits on less land and capital;, and livestock systems have a global asset value of at least $1.4 trillion, providing food for individuals throughout the world.[1,63] In addition, animal manure, when applied appropriately, can be an effective, low-cost fertilizer for crops.[9] When CAFOs are being considered in particular areas, it is often argued that they can benefit the local economy by increasing demand for local materials and feed and can stimulate an increase in employment.[1] It is also argued that increased tax expenditures related to CAFOs will translate into greater funding for schools and infrastructure.[1]

As discussed earlier, however, the apparently low retail price tag for grocery items produced in CAFOs is due in large part to the substantial health and environmental costs of this production that have been "externalized" or deliberately ignored by this system. Rather than being the responsibility of CAFO operators, billions of dollars of these health and environmental costs have been paid by the American public each year.[16,17] In addition, the vertically integrated model characteristic of CAFOs has been found to contribute less to local economies than locally owned and controlled farms.[2] CAFO integrators are often not rooted in the local farming community, and thus profits from CAFO businesses leave the community.[2] In the United States (where the proposed moratorium would take effect), meat is consumed at more than three times the global average, which enhances the risk of chronic diseases and has major negative consequences with respect to land use, water use, and environmental change.[64] Also, as CAFOs are established and expanded in communities, the operations often rely more on technology than on additional labor to function, and as a result fewer jobs are available to local people.[2] In addition, the jobs that are available are often low paid and itinerant and filled by migrant laborers willing to work for low wages.[2] Furthermore, the potential for economic benefits should not be prioritized at the expense of human and environmental health. As described in the problem statement, wide-ranging human and environmental health impacts such as air and water pollution, environmental degradation, increased risk of exposure to pathogens, and increased risk of antibiotic resistance result from CAFO establishment and expansion.
Action Steps

In light of the wide-ranging negative health and environmental impacts associated with CAFOs, as well as serious environmental justice concerns, APHA urges federal, state, and local governments and public health agencies to impose a moratorium on new and expanding CAFOs until additional scientific data on the attendant risks to public health have been collected, uncertainties have been resolved, and the following action steps have been taken:

1. The federal government brings the use of medically important antibiotics in U.S. poultry and livestock production into compliance with the 2017 recommendation of the World Health Organization that producers stop using these precious antibiotics in healthy animals. Federal regulators should end approval of such drug use in food-producing animals for the prevention of infectious diseases where disease has not been clinically diagnosed. This approval practice is currently allowed and is deemed “therapeutic” by the Food and Drug Administration.

2. The federal government removes CAFO exemptions from reporting of environmental emissions of hazardous materials under CERCLA and EPCRA reporting requirements.

3. The federal government enforces the Clean Water Act as it pertains to CAFOs.

4. The federal government strengthens CAFO regulations under the Clean Air Act by developing mechanisms to better monitor air emissions and collecting air emissions data to improve understanding of community exposure risks.

5. The federal government and state governments prohibit the installation of new liquid manure handling systems, including waste lagoons, and phase out their use in existing operations to reduce the risk of public health and environmental disasters.

6. The federal government and state governments, in coordination with the National Pollutant Discharge Elimination System and Natural Resources Conservation Service Comprehensive Nutrient Management Plans, develop and implement strict oversight protocols for the application of dry manure so that it does not exceed agroeconomic standards.

7. Develops baseline federal zoning guidelines for food animal production facilities that set a framework for states and require a rigorous, pre-permit environmental impact study and a health impact assessment; such requirements should not prevent states and counties from enacting more comprehensive zoning laws. Impact studies should include assessments of the cumulative effects of food animal production facilities located in vulnerable low-income, minority, and economically distressed communities.

8. The federal government removes exemptions for agricultural operations from the Occupational Safety and Health Act, including exempting agricultural operations from inspection and enforcement of labor laws based on their number of employees.

9. The federal government and state governments increase funding for research on and dissemination of food animal production practices that will be beneficial to the environment, public health, and rural communities and offer funding and technical assistance to farmers to adopt these practices.

10. The federal government eliminates waste management subsidies CAFOs receive under the Environmental Quality Incentive Program (EQIP).

11. The federal government directs EQIP funding and Farm Service Agency loans to small and medium-sized operations rather than CAFOs and requires a rigorous environmental and public health assessment as part of the approval process.

12. The federal government addresses environmental equity issues in permitting decisions for projects with the potential to disparately impact communities protected by Title VI of the Civil Rights Act of 1964.

References


2020 © American Public Health Association
Thanks for sharing!

On Wed, Feb 5, 2020 at 9:11 AM Sonja Eayrs <sonja.eayrs@gmail.com> wrote:

Ms. Grosenheider, thank you for the opportunity to speak briefly at the meeting last evening in Lewiston, Minnesota regarding the Daley Farms dairy factory farm expansion in Winona County.

I am supplementing my prior written comments dated February 2, 2020, due to limitation of public comments relating to air emissions only. As noted in the attached policy statement from the American Public Health Association (APHA) dated November 5, 2019:

Externalized impacts, including environmental degradation and negative health effects associated with CAFOs as well as taxpayer subsidies, cost the American public billions of dollars annually. Some of these externalized impacts include lower property values in communities located near CAFOs, costs associated with treating antibiotic-resistant diseases, and costs associated with the cleanup and prevention of air and water pollution.

Externalized costs of CAFOs also include those associated with climate change. Livestock production is the largest source of food system-related greenhouse gas emissions, accounting for an estimated 14.5% of such emissions worldwide. Studies have also shown that meat and dairy from confinement animals are particularly emissions intensive.

The APHA is calling for a moratorium on new and expanding CAFOs, such as the proposed expansion in Winona County. Is the MPCA considering a moratorium on new and expanding CAFOs consistent with the APHA recommendations? If not, why not?

Sonja Trom Eayrs
On behalf of Dodge County Concerned Citizens

On Sun, Feb 2, 2020 at 10:33 AM Sonja Eayrs <sonja.eayrs@gmail.com> wrote:

I ask that you include the following policy statement from the American Public Health Association (APHA) dated November 5, 2019 in the public record regarding the Daley Farms proposed expansion in Winona County. As indicated, this policy statement calls for a moratorium on the establishment of new CAFOs and expansion of existing CAFOs until regulation and enforcement conditions are in place to adequately protect the public’s health. The Daley Farms expansion falls directly within the serious public health concerns addressed by APHA.

As stated in the policy statement:

[1] The Center for Disease Control and Prevention has determined that these operations pose risks to public health and the environment.

[2] Although animal manure is an invaluable fertilizer, unsafe quantities of the manure produced by CAFOs represent a public health and ecological hazard through the degradation of surface and groundwater resources. CAFOs generate manure in quantities and concentrations of health concerns, including antibiotics, parasites, hormones, greenhouse gases, nitrogen, and phosphorus. Slaughter from these operations can contribute to general and surface waters and to streams, rivers, and other sources, and studies have shown that human waste can contribute to groundwater contamination from livestock and poultry operations through surface and/or subsurface flow and the resulting contamination can be harmful to human health.

[3] There is scientific consensus that antibiotics administered to feed animals contribute to antibiotics resistant in humans. More than 75 million pounds of antibiotics important to human medicine are used annually for use in livestock and poultry production in the United States. This represents 50% of all sales of these precious drugs, including for use in treating people. In the United States, these antibiotics are used to treat or control disease to compensate for the overcrowded, poor environmental conditions characteristic of industrial animal agriculture.

[4] These antibiotics are administered to feed animals, and other livestock contribute to antibiotics resistant in humans. More than 12 million antibiotics important to human medicine are used annually for use in livestock and poultry production in the United States. This represents 50% of all sales of these precious drugs, including for use in treating people.
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA recently published a report that describes agricultural management practices that reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

As a Minnesota citizen, I want my state to actively limit its greenhouse gas emissions and
mitigate the emissions that we have not yet found ways to stop. Please require emissions mitigation as a high priority part of the permitting process.

Sincerely,
Karen Alexander
1081 Lafond Avenue
Saint Paul, MN 55104
To the MPCA Environmental Review Division,

I own a farm in Winona County. My concerns with the Daley dairy expansion is the long term effect for the environment in an already fragile and polluted ecosystem. When I purchased my farm house in 2001 the Nitrate level in my well water was 6.0 ppm. I've watched the levels rise slowly every year until exceeding 10 ppm in 2016. My well is relatively new, drilled in the 1990's. I'm not alone, and the financial burden on each family and community in this region is great when we are faced with continually rising Nitrate levels, drilling new and deeper wells, and then the tradeoffs of other problems that come with drilling into the deepest aquifers. Here in the karst region of SE MN, Nitrate levels continue to rise despite all of the education about proper fertilizer and manure applications. No livestock factory of the size proposed belongs in this landscape and at a minimum MPCA should require the strictest environmental review available.

Another reason for concern is the amount of manure production in a fragile ecosystem that is already polluted with Nitrates from fertilizer and manure that is applied at too high rates, in inappropriate areas and at the wrong time of year. The proposed industrial-scale animal factory expansion would be 4 times the animal unit cap in Winona County. Despite all the BMP plans in place we continue to see environmental degradation and it would be irresponsible to gamble with a animal operation this size if we can't even deal with the status quo.

We are already dealing with the effects of climate change with larger and more frequent large rain events and flooding. Allowing the Daley farm to become the 43rd largest greenhouse-gas emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy, would be irresponsible and fail to take into effect the long term consequences on this and future generations. An Environmental Impact Statement is imperative.

Sincerely,

Linda Dahl
Hello,

I am emailing in regards to the current review of the permit for the Daley Farm's feedlot expansion.

I think it would be unfair to deny the permit based on the results of a greenhouse gas emissions study. No other industries or businesses are subject to the same criteria.

I understand that it may be a worthwhile study, and perhaps we should consider studying all businesses and industries in Minnesota. Knowing the data can help set policy in the future. But to complete the study and deny the permit is unfair because there are no current rules or guidelines.

Thank you,
Cedric Speltz
Does the MPCA have any evidence that this project would have any measurable impact on climate change?

Carey Tweten
19725 Trestle Drive
Lewiston, Mn 55952
Dear Ms. Grosenheider,

I am writing in reference to the Daley Farms of Lewiston’s proposal to expand it’s mega-dairy.

The MPCA’s Environmental Review division needs to use its power to conduct an environmental review as intended by the authors of the Minnesota Environmental Protection Act (MEPA). This means MPCA either finds alternatives to offset the potential for significant environmental effects, OR if suitable alternatives don’t exist, determine that the site is not right for the proposed plan and can not be permitted.

Honestly, we are living in a world where the powers that be are allowed to run rampant. When the organizations that are supposed to protect the people and the land are no longer protecting anyone except the powers that be, something is very wrong! What is it that MPCA thinks they are going to get out of supporting Daley Farms mega-dairy expansion? Do you think you are going to get honor, prestige, and money from the powers that be? Do you think the people won’t notice your betrayal of them? Do you think yourself and your families will not be affected by bad choices?

Do you watch the news? Do you keep informed about environmental issues? How many cows do you think can be housed in one location without it having problematic effects on the environment, not to mention the cows? Do you think our water is going to magically clean itself when all we do is add more and more chemicals and corruption to the ground?

The typical dairy farm in Minnesota has cow numbers fewer than 200 (about 86%) to 500 (about 10%). This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy, and it would be concentrated in one, sensitive, karst area that continues to be plagued by high nitrate levels in drinking water.

Daley Farms has been out of compliance with state regulations for run-off and other aspects of operations, with violations filed by the MPCA’s feedlot division that have gone unenforced over 23 years.

I grew up in the city and still live in the city. I am concerned that more and more of our food, land, and water is getting corrupted. We need our small family farms, where farmers can provide good food for the world and where they can make a living doing it and taking care of the land in the process. We don’t need more big corporate farms. We don’t need more pollution in our air, water, bodies, and land.
How successful will MPCA be when no one is alive because you are one of the organizations that enables the powers that be whom are corrupt! How will you roll around in all your glory when you are on your death bed and look back and see that supporting the powers that be wasn’t worth it?

Take care of the earth, take care of the people, do your job and Control the Pollution!!!

Thank you!
Michelle Gobely
Hello Kim,

I am writing you today to express my support of Daley Family Farm's expansion. I do not take this lightly, and have thought a lot about this projects impact.

This family farm has done more for environment protection on their farm, than many of the farms I know. They are already a large farm, and with that being said, they have made me want to operate my small farm better. The bar has been set high already by Daley Farms, and I have no worries about a larger, more modernized dairy.

This expansion would ensure, for generations to come, that they would actually keep their soil, land, and ground water, in better shape than what most corn and soybean farmers do. More alfalfa and pastured land, is the best thing for our rolling land in SE MN. The complaints against, are simply emotional, and without focus. We should encourage such projects, instead of listening to fringe groups who only have narrow minded viewpoints. The family lives here, send their kids to the same schools, and are valuable members of the community here... They are obviously concerned about the environment as much as the rest of us are...

Thank you for considering my opinion,

Chad Theede
I own a farm in Minnesota and rent out acreage to an organic farmer. My land has been organic for the 15 years that I have owned it. I am appalled at the farming processes that are being allowed. The animals are kept in horrible conditions, all in one small space. They are fed foods that are not natural for them, they are given hormones to make them grow faster and antibiotics to keep them from getting sick because of the terrible conditions they live under. When we eat meat from these animals, or drink their milk, we ingest those chemicals.

We need officials who will stop is inhumane, unhealthy process!

Thank you

Lois Brink
Kim Grosenheider,

I would like to comment on the situation of Daley Farms of Lewiston and their attempt to expand their dairy herd.

They are a very hard working family and have been doing things the right way all the way through this process. They are good stewards of the land and support our rural economy and I believe that by them expanding their farm, it will not cause more greenhouse gas emissions, but actually help eliminate greenhouse gasses. The more manure they spread; the less chemical fertilizers they need to apply and they will also be planting a lot more crops to feed the extra cows and therefore capture more carbon in the soil. I support their expansion project.

-Wade from South East Minnesota
Evidence based reports from United Nations and NOAA (see below) state that the continued rise in greenhouse gasses in our planetary atmosphere are a serious environmental crisis which must be addressed immediately...actually more than 20 years ago. We cannot continue to pretend that we live and breathe in a previous age of ignorance about the effects of these activities on our world.

Air, the release of potent greenhouse gasses into the air, does not have boundaries. This continued expansion of livestock density is a major contributor to the degradation and demise of the ecosystem of our planet!

29 November 2006, Rome report published by the United Nations Food and Agriculture Organization, the livestock sector generates more greenhouse gas emissions as measured in CO2 equivalent – 18 percent – than transport. It is also a major source of land and water degradation...

Says Henning Steinfeld, Chief of FAO’s Livestock Information and Policy Branch and senior author of the report: “Livestock are one of the most significant contributors to today’s most serious environmental problems. Urgent action is required to remedy the situation.”...

According to the FAO report, Livestock’s Long Shadow – Environmental Issues and Options. “The environmental costs per unit of livestock production must be cut by one half, just to avoid the level of damage worsening beyond its present level,” it warns...

When emissions from land use and land use change are included, the livestock sector accounts for 9 percent of CO2 deriving from human-related activities, but produces a much larger share of even more harmful greenhouse gases. It generates 65 percent of human-related nitrous oxide, which has 296 times the Global Warming Potential (GWP) of CO2. Most of this comes from manure...

And it accounts for respectively 37 percent of all human-induced methane (23 times as warming as CO2), which is largely produced by the digestive system of ruminants, and 64 percent of ammonia, which contributes significantly to acid rain.
Tuesday, May 21, 2019

NOAA’s Annual Greenhouse Gas Index tracks the relative climate-forcing influence exerted by carbon dioxide, methane and other greenhouse gases since the start of the industrial revolution. This year it rose to a value of 1.43, meaning that the increase in the atmosphere’s heat-trapping capacity attributable to human activity has risen 43 percent since 1990…

Five greenhouse gases account for about 96 percent of the increased climate-warming influence since 1750, the onset of the industrial revolution. They are carbon dioxide, methane, nitrous oxide, and two chlorofluorocarbons that are strictly controlled by the Montreal Protocol because they damage Earth’s protective ozone layer. The AGGI also tracks 15 secondary greenhouse gases responsible for the remaining 4 percent.

By far the most important anthropogenic greenhouse gas is carbon dioxide, or CO₂, which is responsible for 81 percent of the increased warming influence on the atmosphere tracked by the AGGI. A preliminary estimate from the Global Carbon Project is that 37 billion tons of CO₂ were emitted in 2018. That would be the highest level of CO₂ emissions on record. NOAA measurements show the rate of increase of atmospheric CO₂ is accelerating. While it averaged about 1.6 ppm per year in the 1980s and 1.5 ppm per year in the 1990s, the mean growth rate increased to 2.3 ppm per year on average from 2009-2018. In 2018, carbon dioxide increased by 2.5 parts per million.

The rate of methane increase has also accelerated over the past five years, jumping 50 percent since 2007-2013. Methane is 28 times more potent than carbon dioxide in trapping heat in the atmosphere over 100 years and exerts the second largest influence on global warming behind carbon dioxide.

I urge you, on behalf of the life of our planet, to resist the economic arguments for the
continued acceleration of greenhouse gas emissions. Deny this permit for such an unprecedented expansion in a county where it has already been denied. And let this decision set a new precedent of environmental sustainability for livestock facilities in Minnesota and a model for our future.

Respectfully submitted,

MaryVlazny
2201 3rd Ave SW
Rochester, MN 55902

mhvlazny@charter.net
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA recently published a report that describes agricultural management practices that reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Sincerely,
Joseph Wenzel
93 Midwest Ave. N
Lake Elmo, MN 55042
Hello

I live in Winona MN and am very concerned about water pollution. Please do not allow this farm to expand and further pollute our water with nitrates. This is already a problem for safe drinking water.

Thank you
Dear MPCA,

The Minnesota Pollution Control Agency *must* require Daley Farms of Lewiston, MN to have an in-depth Environmental Impact Statement for their proposed expansion.

Already water from local wells has been tested and found to have nitrate levels higher than the "safe" drinking water standard. Lewiston is in a karst region, where the geology is such as to allow pollutants to go deep and wide.

An industrial dairy on the scale that's proposed by Daley Farms would emit a lot of methane, exacerbating the climate change crisis that we're now experiencing.

Please do what you're empowered to do for the public good; protect the land, water and air that we all depend on for life and health.

Sincerely,

Mary Ellen Frame

612 1st St. W.
Norhfield, MN 55057
Dear Kim,

My husband, Richard and I, live one mile east of Bailey Farms of Newton R.I.

We strongly oppose the garbage expansion under consideration for numerous reasons.

Here are the results of our well test taken on July 31, 2019. The nitrate level measured 13.33 ppm.

We consider this a matter of grave concern.

Trusting you to make a prudent decision.

Karen and Richard Ahren
Nitrate Results Explanation Handout
The Minnesota Department of Agriculture and Winona County SWCD would like to thank you for participating in this Nitrate Clinic. Below is general information regarding nitrate result ranges.

<table>
<thead>
<tr>
<th>7-31-2019 Nitrate Clinic Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
</tr>
<tr>
<td>Ahrre's Farm Well</td>
</tr>
</tbody>
</table>

THE METHOD USED AT TODAY'S TESTING CLINIC IS CONSIDERED A SCREENING TOOL. Ten parts per million (ppm) NO₃-N (nitrate-nitrogen) is the US Drinking Water Standard. The 10 ppm standard for nitrate is equivalent to 10 parts of nitrate-nitrogen in 1 million parts of water.

If the Nitrate result is between 0 to 4.9 mg/L:
- Continue to test your water for nitrate every year or every other year.
- Properly manage nitrogen sources when used near your well. Continue to monitor your septic tank. Sewage from improperly maintained septic tanks may contaminate your water.
- Private wells should be tested for bacteria at least once a year. A Minnesota Department of Health (MDH) certified water testing lab can provide nitrate and bacteria testing services. Search for the lab nearest you at www.health.state.mn.us/labssearch

If the Nitrate result is between 5 to 9.9 mg/L:
- Presently the nitrate nitrogen level in your water is below the nitrate health standard for drinking water. However, you have a source of contamination which may include: contributions from fertilized lawns or fields, septic tanks, animal wastes, and decaying plants.
- Test annually for both nitrate and bacteria. As nitrate levels increase, especially in wells near cropped fields, the probability of detecting pesticides also increases. MDA monitoring data indicates that pesticide levels are usually below state and federal drinking water guidelines. For more information on testing and health risks from pesticides and other contaminants in groundwater go to: https://www.mda.state.mn.us/private-well-testing-testing-laboratories-home-water-treatment
- In addition to pesticides, high nitrate levels may suggest an increased risk for other contaminants. For more information go to: https://www.health.state.mn.us/communities/environment/water/contaminants.html

If the Nitrate result is above 10 mg/L:
- Do not allow this water to be consumed by infants. Over 10 mg/L is not safe for infants younger than 6 months of age. Do not boil the water, this increases the nitrate concentrations in the remaining water.
- Pregnant women and people with reduced stomach acidity also may be at risk along with other people with specific metabolic conditions. Find a safe alternative water supply.
- Be sure to retest your water and have a licensed well contractor inspect your well prior to making any significant financial investment in your existing well system. See link to MDH certified labs listed above.

Over 10 ppm is not safe for infants younger than 6 months of age. Infants consuming high amounts of nitrates may develop Blue Baby Syndrome (Methemoglobinemia). This disease is potentially fatal and first appears as blue coloration of the fingers, lips, ears, etc. Seek medical assistance immediately if detected.

If you have questions about the Nitrate Testing Clinic, visit the MDA website at www.mda.state.mn.us/water-testing-nitrate or contact Eric Nooker at eric.nooker@state.mn.us or 651-318-6002. If you have additional questions about wells or well water quality in Minnesota, contact your local Minnesota Department of Health office and ask to talk with a well specialist or contact the Well Management Section Central Office at health.wells@state.mn.us or at 651-201-4600 or 800-383-9808.
January 29, 2020

Dear Laura Bishop and Environmental Review Staff,

Minnesotans expect you and your staff to use the power given to you through the MEPA to order an in-depth Environmental Impact Statement or deny permitting on an industrial-scale animal factories (1,000 animal units and above) where there exists the "potential for significant effects" (Minn. Statute 114.10, 1706, Subpart 1), especially when it is proposed in an already polluted, sensitive area.

Please, please take my letter to you into your serious consideration when making your critical decisions regarding this extremely important issue to Minnesotans.

Thank you for the opportunity to bring my concerns to your attention.

Best Regards,

Lydwine Sisson
LydwineSisson@gmail.com
476 Brinfall St, St. Paul, MN 55105

[Stamp: Jan 30 2020]

By
We need an in-depth Environmental Impact Statement on the industrial-scale Deley Farms in Lewiston. Their proposed massive expansion has terrible greenhouse gas emissions dangers + dangers to our clear water in this Kast area.

Kim Grosenheider
MN Pollution Control Agency
520 Lafayette Rd N F
St. Paul, MN 55135

6155899
We need an in-depth Environmental Impact Statement on the industrial-scale Daley Farms in Jersey. Their proposed massive expansion has terrible greenhouse gas emissions, and dangers to our clean water in this Karst area.

Cindy Scudiero
55487
Dear Mark P. Gernes, MN Pollution Control Agency:

This letter is to express my unequivocal opposition to the utterly preposterous expansion proposal by the Daley Farms of Lewiston MN, and the efforts of Ben Daley (and his cohorts) to avoid, or simply ignore, the anti-pollution requirements of the equivocating MPCA.

Greenhouse gases. Manure leakages - water (e.g. ground water), ground dispersion and pollution of farm land and ground water. Of course there will be pollution of ground water in spite of whatever ridiculous promises (e.g. pseudo-science, prayers, and astonishingly absurd "best environmental practices") Ben Daley and family/owners and their attorneys will devise. Can nitrate pollution of the water wells in Winona County be good for those of us who drink water? NO. Past runoff violations by the Daley farm has been a health mess in Winona County, and these runoff contamination of wells will be compounded and continued with the dairy cow expansion.

I want the MPCA to require a full and complete Environmental Impact Statement by the Daley Farms of Lewiston, LLP.

I do not know Ben Daley or anyone in the Daley family.

Cordially,

Richard Stephen Schwartz

Copies.

Richard Stephen Schwartz
1465 Park Lane
Winona, MN 55987
February 1, 2020

Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Grosenheider:

Please record our comments with the Public Comments on the Daley Farms of Lewiston LLP Dairy Expansion regarding the Green House Gas (GHG) emission problems as well as reiterating some of our concerns regarding ground water contamination and unfair competition with neighboring smaller farms. We have lived in Winona County since 1969 and are very protective of the beauty of the area. We want to keep it a healthy, safe place for others in the future as well.

It is the responsibility of the MPCA to follow Minnesota laws to protect the environment, water quality and quantity, air quality, health and quality-of-life for all citizens of Minnesota. It is also important for the MPCA to uphold Winona County Ordinances which would affect this farm and all others in the area.

Having lived a short time in St. Paul in the 1960s during the days of the stockyards, I can speak to air quality from methane when there is a temperature inversion. The whole city of St. Paul was affected by the odor and likely by the methane even though we weren't aware of other effects beyond the stench at that time. The stockyard didn't take up a large area of the city, but it affected us all. The same can be said about the concentration of methane coming from the number of cows and stored-or-spread manure that Daleys are asking for in their proposed expansion and the effect on people of Winona County (especially those living in Lewiston and on farms in the area). Methane also has 25 times the warming potential of CO2 over 100 years.

The Daley proposal never should have gotten this far and now the GHG issue is discovered. The big concern is the concentration of the methane in the air in a small area rather than over many square miles of smaller farms. How much information is needed before a full EIS is required of a proposal that never should be sited in the delicate karst topography of southeastern Minnesota. Once our land, ground/surface water, and air are despoiled, we may not be able to restore them to an acceptable standard.

Perhaps a factory dairy farm would work somewhere else, but not here. Expansion at a time when other farmers are going bankrupt and milk prices are down doesn't make any sense to allow. Please do your job in protecting the people and environment of southeastern Minnesota and require a full EIS or deny the proposal completely.

Sincerely,

Nancy and James Reynolds
4455 West 7th ST
Winona, MN 55987
Your comments matter

The Environmental Assessment Worksheet supplement for the proposed Daley Farm expansion is open for public comment. Please use this sheet to submit your comment. The more specific, the better. The Minnesota Pollution Control Agency (MPCA) will respond to all comments received by the deadline. To receive a response, please include your name and contact information.

Deadline for comments: 4:30 p.m. Feb. 20, 2020

Name: Impe C. Clark

Address: 391 DRESSER DR WINDA, MN 55987

Email: jstc/@charter.net

Section of draft Environmental Assessment Worksheet supplement:

My recommendation for additions and/or changes:

WE NEED TO CONSIDER
i. NITRATES ALREADY HIGH. WHAT ABOUT EXPENSE + HEALTH HAZARD TO LOCAL CITIZENS?

2. THERE ARE ALREADY AN OVER SUPPLY OF DAIRY PRODUCTS, DOUBLING DALEY PRODUCTION WILL JUST PUT SOMEONE ELSE OUT OF BUSINESS

Use back of sheet if needed.

Mail or email this comment sheet to:
Kim Grosenheider
MPCA
520 Lafayette Road N.
St. Paul, MN 55155-4194
kim.grosenheider@state.mn.us

More information: 651-757-2170

Note: The full Environmental Assessment Worksheet supplement is available online:
https://www.pca.state.mn.us/sites/default/files/p-ea2-143j.pdf
Dear MPCA,

Please accept this public comment on the Daley Dairy Farm expansion that is proposed in Winona County.

I am very opposed to any feedlot project of this size. Here are some of my personal reasons:

1. Water. We need clean water. This project will use large amounts of water. I don't know the exact figures for possible water usage, but over 4000 cows/calves are going to require a lot of water. What will happen to all of the manure? It will be spread on nearby fields as fertilizer. That is good to a point. There is only so much the soil can absorb, and the rest will filter down to the aquifer/ground water. Since this is karst country, it will be in the groundwater very quickly.

2. Air. People who live in or move to farming country expect to smell bad smells from time to time. A project of this size will undoubtedly stink all of the time. And...now I read in the Rochester paper that there are concerns
about greenhouse gas emissions. That's just one more reason to say NO to this expansion.

Winona County has limits placed on the number of animal units allowed on a feedlot. Those limits exist for a good reason. The Daley farm already exceeds that limit with their present facilities and herds. That "we" would ever consider a higher number is shocking, worrisome, and very unwise.

Please deny all permits for the proposed Daley dairy expansion. It's common sense.

Thank you for listening.

Sincerely,

Roxlyn Hjermstad
This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Please see attached.
Dear Ms. Grosenheider,

I write to you today regarding the Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions related Daley Farms of Lewiston dairy expansion and modernization project.

The Minnesota Pollution Control Agency (MPCA), following a detailed analysis—based on the facts and science—state that the Daley Family's project will not have any negative environmental impacts.

Not only do the manure basins not only meet, but far exceed, required engineering standards. Additionally, according to a study of air emissions from the Daley Farm expanded facility, it would meet air quality standards and odor guidelines.

During the hearing on February 4th there were references to high levels of GHG coming from modern dairy facilities. Studies indicate that resources used to produce the same amount of milk in 2012 vs 1944 use 21% of the cows, 35% of the water, 10% of the land and produce 37% of the carbon footprint. The average US dairy cow produces 4X the world average. The EPA released a study from 2016 that shows GHG emissions from animal agriculture represent less than 4% and crops 5%. Significantly lower than the 18%+ reported by others. Since consumers are concerned about GHG they may wish to consider their own food waste which was recently reported to be 12% loss at the retail level and 20% at the consumption level. It would appear that we have a great opportunity to reduce GHG by reducing our waste of food.

The consumer demand for cheese continues to grow, the cows will be milked, and the cheese produced somewhere in the US. How does changing the zip code of where the cow lives change its greenhouse gas emissions? Modern facilities and excellent management have a role in environmental impact. Daley farms are looking to upgrade the facility and have a long history of excellent management practices. Any additional delays and cost will continue to send signals to the dairy industry that the State of MN doesn't support modern agriculture and you would be wise to take your business and tax base to another state.

I strongly support the efforts of the Daley Family to pass their dairy farm to the next generation and believe their project have been held up for far too long.

Sincerely;

Darwin Droogsma

Milaca, MN
The federal Environmental Protection Agency (EPA) has been unable to create accurate models for livestock facilities' impact on air quality because there are too many variables in the process. Please allow Daley's to continue their family farm by allowing them to expand so next generation can be apart of the family business.

Thanks,

Becky Clark
Dear Ms. Grosenheider,

I am a dairy farmer's daughter, and am currently living here in Minnesota. My father was exceptionally active in issues that involved farming, especially after seeing the decline of the farming workforce after WWII. He worked tirelessly with the Farmer's Union throughout the 50's and '60's here in Minnesota, even making occasional trips to Washington D.C. to represent farmers' interests throughout the time he worked in the business. He taught me how important it is to address issues affecting farmers and the precious land resources in Minnesota.

I left for a while during the late eighties and nineties, returning to the state to help care for my father in 2004. I was appalled at how quickly the health of the land around me had changed significantly for the worse. Farmers who were my neighbors no longer can drink from the wells on their own farm due to nitrate pollution. The lake where my parents spent their retirement was no longer clear. There was a time when I could have even drank out of that lake in my youth. No more. Farming practices have negatively changed our landscape forever.

Now conscientious farmers are trying to save the land and water from more pollution, perhaps even enabling the land to return to the more pristine condition I knew in my youth. I have joined their fight and in this case, I'm asking for you to please put my comments into the pile of letters asking Commissioner Bishop to reconsider allowing the development of the Daley mega-dairy farm to not proceed in the southeastern part of Minnesota until a proper environmental impact study is done to show how a dairy of this size will affect the area's natural resources. It's bad enough that rural citizens around the state must clean up the wells that have been clearly negatively impacted by past farming methods. However, let's try to get those problems solved through the more modern farming practices and not contribute to the problem further. A decent environmental study should always be done before such a big farm is increased.

Thank you for considering my long term point of view on this subject.

Sincerely,

Beth Rose
Henning, MN
Please submit these as comments concerning the review of any and all related permits as well as the EAW for Daley Farms near Lewiston, MN..........

I am opposed to this project because of it's location on karst topography....and this is based on my previous experience living in a karst region with a large dairy CAFO in our St. Croix County, WI neighborhood. The experiences we had played a major role in our recent relocation to Minnesota because of the erosion of clean drinking water in that neighborhood. There is a reason the American Public Health Association has called for a nationwide moratorium on CAFOs due to their affect on public health, air quality, water quality, antibiotic use, etc. Read more at https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2020/01/13/precautionary-moratorium-on-new-and-expanding-concentrated-animal-feeding-operations

Our personal story..........

Emerald Sky Dairy had been in our neighborhood for 17 years, first starting at 1,000 cows, now requesting expansion permits to 3400+ cows. While this dairy for a time in 2009 had a reverse osmosis system to treat the manure and permits to release the purified water back to the environment, a couple of major digester fires that destroyed the water treatment system caused the owners to revert back to spreading the manure on bare ground at various times of the year.

Over the past 10+ years, various families within 3 miles of Emerald Sky Dairy have had contaminated wells..... E.coli, salmonella, and/or excessive nitrates. Our Emerald Town Hall sits across the road from Emerald Sky Dairy. When the new town hall's well was first drilled in 2007, the nitrates were at 6.9....now they recently reached a high of 33 ppm (3x the recommended limit of 10 ppm). St. Croix County's Public Health posted “do not drink the water” notices at our town hall. A reverse osmosis system has now been installed at that Town Hall. Two other town halls also cannot drink their water, one due to nitrates (Stanton Town Hall) and the other due to E.coli (Forest Town Hall). Within the square mile of my home at the time, five of the ten families had excessive nitrates and most couldn’t afford to dig a new well, so they rely on bottled water on a daily basis. The one family who did spend over $10,000 on a new well still had excessive nitrates at 200 feet and had to install a reverse osmosis system (~$1500) before they could sell their home. The new owners (who have small children) don't trust the water and still buy bottled water. Filters cost $80-100/month to keep the reverse osmosis system compliant with health standards.

Over the years, various concerns, complaints and notifications have worked their way through the Township, County, State and Federal systems.....government officials have taken little action due to threats from lawyers for Emerald Sky Dairy's owners and other reasons. Thus...nothing has changed
for those **90 families** living within 2 miles of Emerald Sky Dairy.

In March 2017, a massive manure spill behind Emerald Sky Dairy in their storm water pond (which drained into adjacent wetlands) was anonymously reported to authorities. The WI DNR and County staff confronted the owners, who finally admitted this had happened several months earlier and they had never reported it. Thus, the owners had to begin a several week process to clean out the storm water pond and apply the manure to surrounding fields in May/June 2017. The cleanup entailed over 3400 tons of manure solids and 8 million gallons of storm water pond liquids....all spread on area fields in May/June of 2017.

Per our open records request to DNR, we learned in June 2017, a cluster of homes downstream from the spill found E.coli in their drinking water (after visiting adult children got sick at their parent’s home). Local DNR staff requested advanced testing to find the source, in case it was a result of the massive manure spill. They were denied by Madison DNR management because the circumstances “didn’t fit their protocol.” The only thing done was to bleach the known contaminated wells and “let us know if you have more issues.” Thus no one knows for sure where this contamination came from. The first homeowner to discover the E.coli had been religiously testing their well water for 20 years and NEVER had contamination.....until June 2017.

Takeaways from our experiences......

- **Self-reporting from industrial farm operations is not working for citizens.** “Bad actors” take advantage of the system to the detriment of public health and need extra scrutiny and to be held accountable in a timely manner. There needs to be monitoring of all spreading activities to be sure water contamination does not occur and regulations are followed. Monitoring wells around the facility and the spreading fields are a “must” to keep industrial entities honest.

- **Swift actions to protect public health are needed when well contamination is found.** If E.coli had been found in a municipal water supply, it would have been “hair on fire” time – media notices, news reports, etc. to notify all potentially affected. That does not happen in rural areas – I had a neighbor who was pregnant and another receiving chemo....they needed to have the knowledge and thus option to protect themselves with bottled water ASAP (County notices didn’t go out until 3 weeks after spill was discovered)! Advanced groundwater studies should be done so officials know exactly where and how fast water moves through the landscape so those in harm's way can be notified in a timely manner. Actually having a system in place to do that notification prior to an event is imperative.

- **Transparency in government when violations are discovered** – the details on violations should be available to the public in a timely manner (not over 2 years later). Denying citizens their right to know what is going on with their drinking water and protecting industrial interests over people is not acceptable.

This broken system has affected our community. People have moved away, others have held off on building their dream homes or starting businesses, and many don't drink their water **ever**, relying on purchased bottled water. This has a local and regional economic as well as psychological impact on citizens individually and our community as a whole. (see newspaper articles).
Thus, I am opposed to projects of industrial animal agriculture, especially in karst regions, based on my experience living in a similar area just across the river in Wisconsin. Water knows no boundaries....and contamination can end up downstream VERY QUICKLY and WITHOUT WARNING to surrounding families. I believe rural families should have the same rights and protections for their clean drinking water as urban/suburban families. At the very minimum, and EIS should be conducted...and a Health Impact Study....but officials should also include advanced groundwater studies to protect public health when (not if) a major spill or other mishandling of manure occurs. Monitoring wells around such facilities keep industrial producers honest and the public informed of the status of their drinking water. A municipal style treatment system should be required on an operation of this size.

As a gardener, manure can be great for our soil.....but it is hazardous in our drinking water!

Thank you.

Kim Dupre
17835 Norell Ave N
Marine on St. Croix MN 55047
Ph: 651-491-2575
DNR Report: nearly 3,500 tons of manure removed from wetlands near Emerald Sky Dairy

By LeAnn R. Ralph
TOWN OF EMERALD — After a manure spill at Emerald Sky Dairy in December of 2016, nearly 3,500 tons of manure were removed from a nearby wetland the following summer, according to a report from the state Department of Natural Resources.

Kim Dufay, a Town of Emerald resident, made an open records request to the DNR for the report about the Emerald Sky Dairy manure spill and then shared the link to the online report with the Tribune Press Reporter.

Employees at Emerald Sky Dairy discovered that a clean-out riser pipe had burst earlier in December of 2016 and began repairing the pipe on December 19, 2016, according to the DNR’s 314-page report.

Emerald Sky Dairy did not report the manure spill to the DNR until three months later on March 30, 2017.

The manure transfer line from the Transition Management Facility (TMF) had burst at the clean-out riser pipe closest to the Waste Storage Facility (WSF). The TMF houses feeders and cows, and the waste storage facility, also sometimes referred to as a manure lagoon, had a capacity of nearly 14.5 million gallons.

At the point of discharge near the waste storage facility, the manure flowed west-southwest and deposited in a wetland area. A pond constructed between 2007 and 2008 contained the majority of the manure. The pond has an outlet to a manmade conveyance channel that flows to the dairy’s stormwater pond, the DNR report states.

Manure was present in the conveyance channel that flows to the stormwater pond. The stormwater pond was intended to fill with uncontaminated stormwater runoff from Emerald Sky Dairy’s production site. After the stormwater pond is filled to capacity, it drains through an outlet control structure to a delineated wetland. The stormwater pond is not designed to contain any contaminated runoff, such as manure or leachate, according to the DNR report.

Emerald Sky Dairy is classified as a Concentrated Animal Feeding Operation (CAFO) level 5. A CAFO is defined as 1,000 animal units or more, which translates into 750 milk cows, 1,000 beef steers, 2,000 pigs that are 55 pounds or larger, or 55,000 turkeys. A day cow is 1.4 animal units.

Emerald Sky Dairy’s current conditional use permit allows up to 4,300 dairy cows, or 4,760 animal units.

Residents living in the Town of Emerald noticed in December of 2016 what they described as a manure spill. The Tribune Press Reporter attended two meetings at the Town of Emerald Hall before the manure spill was officially reported, and both times, people talked about liquid manure “filing a ditch” near Emerald Sky Dairy.

Snow and cold

According to a report by Williams Engineering Services, a company hired by Emerald Sky Dairy, the extent of the manure spill was not apparent at the time it occurred because of snow on the ground.

The Williams Engineering report is included with the DNR report.

Significant snowfall/snowpack cover frustrated the timely discovery of the extent of the release in December of 2016, the Williams Engineering report states.


drewfrommuck.com/Pages/Aviation/Aviation-1.aspx

Wilson man guilty of criminal damage after killing Nest Bar in Boyceville and sexual assault

By LeAnn R. Ralph
MONMOUTH — A 21-year-old Wisconsin man pleaded no contest and has been found guilty of criminal damage to property, sexual assault, and misconduct in a public place.

Hunter T. Smith appeared in Dunn County Circuit Court on May 5 for a plea hearing before Judge James Petersen.

Smith was charged in Dunn County Circuit Court with one felony count of criminal damage to property, one count of sexual assault, and one count of misconduct in a public place.

Judge Petersen accepted Smith’s plea of no contest and found guilty of one count of sexual assault, one misdemeanor count of fourth degree sexual assault, and one misdemeanor count of fourth degree sexual assault.

A judge withheld sentencing and placed Smith on one year of probation with no court sanctions.

Smith met with a judge on July 1 at 5p.m.

Judges Petersen and LeAnn R. Ralph

Boyceville Village Board updates on construction projects

BOYCEVILLE — The Village Board received updates on street construction projects that are underway. In addition, the Village Board also approved a couple of land use permits.

It was also learned that the Village Board will return to the old feed mill property on Main Street in the Village.

A meeting with Eric Eveson of MCA Engineering was held to discuss the street construction projects.
Continued from page 1

The wetland area, the DNR report states.

The first pumping of the stormwater pond resulted in 1.6 million gallons being removed and spread on 114 acres at 14,000 gallons per acre. The liquid pumped and spread on farm fields included 34.86 pounds of nitrogen per acre; 26.6 pounds of phosphate per acre; and 55.72 pounds of potash per acre.

The DNR report notes that land spreading of material removed from Emerald Sky Dairy because of the manure spill was applied according to the Emerald Sky Dairy nutrient management plan. A total of 3,455.54 tons of solid manure were removed from the wetlands near Emerald Sky Dairy. The manure was spread at a rate ranging from 10 tons per acre to 50 tons per acre, depending on the field, according to the DNR report.

The total amount of manure removed from the wetlands was the equivalent of about 7,000 half-ton pickup truck loads or 6.91 million pounds of manure.

During the cleanup, a tear in the liner of the waste storage facility also was detected. A new section of liner was put over the tear, and then the liner was weighted down with a three-foot deep section of sand to seal the tear.

At the time of the remediation, representatives for Emerald Sky Dairy said they wanted to construct a new waste storage facility. In addition to the tear in the liner, excessive accumulation of manure solids had reduced the storage capacity, and the solids were unable to be removed from under the cover without damaging the structure, according to the DNR report.

Building a new waste storage facility would bring Emerald Sky Dairy into compliance with current state standards and would also address feed storage pad runoff, the manure solids stacking area and the calf shed runoff, the DNR report states.

According to information Dupre provided, a new waste storage facility has been built at Emerald Sky Dairy, and the old manure lagoon has been abandoned and filled in.

Foot deep

In some areas of the wetland, manure was 13 inches deep, and a yard stick was fully submerged without reaching the bottom of the discharged material on the south edge of the wetland pond, according to the DNR report.

Liz Griffith, safety director for Emerald Sky Dairy, reported the manure spill to the DNR hotline on Wednesday, March 29, 2017. The DNR had received an anonymous text message informing them of the manure spill at Emerald Sky Dairy on Tuesday, March 28. Steve Olson, a land use and conservation specialist with St. Croix County, had received an anonymous e-mail message regarding the manure spill and contacted the farm. Olson and Griffith conducted a site visit March 29, and Olson recommended Emerald Sky Dairy call the hotline about what he had discovered during his visit, according to the DNR report.

T.J. Tuls was not part of the Emerald Sky Dairy operation at the time of the manure spill, and the previous manager, Mark Tuls, was fired soon after the manure spill, although the reasons why Mark Tuls was fired were not known. Griffith also was not employed by Emerald Sky Dairy at the time of the manure spill, the DNR report states.

All together, Emerald Sky Dairy spent $152,519 on cleanup of the manure spill.

DOJ

The DNR made a referral to the Wisconsin Department of Justice on April 26, 2018, about the Emerald Sky Dairy manure spill for alleged violations of the dairy’s Wisconsin Pollutant Discharge Elimination System permit.

The alleged violations of permit conditions include production area discharge limitations; discharge prevention; duty to mitigate; spill reporting; and noncompliance 24 hour reporting.

A decision has not yet been made by the DOJ whether to take any enforcement action against Emerald Sky Dairy in the form of civil prosecution.

Emerald Dairy LLC was purchased by Emerald Sky Dairy on March 1, 2016.

In April of 2016, Emerald Sky Dairy submitted a preliminary application to modify the WPDES permit to expand the dairy facility.

DNR staff visited Emerald Sky Dairy August 30, 2016, to discuss the plans for expansion and noticed issues that required immediate action, such as stacks of manure, a pile of dead animals and a manure-laden sand building that was overflowing but with no runoff controls present.

Leah Nicoll of the DNR spoke by telephone with Emerald Sky Dairy owner Todd Tuls about the issues that had been found on the site visit on September 2, 2016, and on October 4, 2016, a letter regarding Emerald Sky Dairy’s incomplete application for a modification to the WPDES permit was mailed out.

The DNR did not receive final application materials to modify Emerald Sky Dairy’s WPDES permit for the proposed expansion, according to the DNR report.

DC Dems to meet May 22

Dunn County Democrats monthly meeting will be held Wednesday, May 22 at the Menomonee Valley Library, 600 Wolske Bay Rd, Menomonee, WI 54751 at 6:30 – 8:00 p.m. All are welcome to attend.

THE

Steinberger

SPECIALTY MEATS AND SAUSAGES

KESSLER

Burger Sale
EMERALD SKY DAIRY SPILL GIVES NEIGHBORS PAUSE

Dream home plans halted amidst uncertainty of spill’s, dairy’s impact

Editor’s note: This is the first in a series of stories exploring local and state issues related to dairy farms.

By John R. Russett and Maureen McMullen
news@rivertowns.net

Emerald, Wis.

After more than 20 years of living on their grassy acreage tucked between farms, Chad and Mary Enerson were mortgage-free and the dream of replacing their century-old farmhouse was in sight.

Their prospective house overlooked a pond pulsing with chirps and croaks, engulfed in a continuous buzz from the wildlife that gather at dusk.

The couple even explored avenues to earn some retirement income from the

SPILL: Page A4

Chad Enerson stands next to a pond on his property. Plans for a new home — which are now on hold in part because of Emerald Sky Dairy’s manure spill — had the back deck overlooking the pond.

Maureen McMullen / Rivertowns Multimedia
Tul's Dairies has had issues in Nebraska

By John R. Russell

Aside from the focus on Tul's Dairy in St. Croix County, Tul's Dairy has dealt with violations before. A search of public records showed violations:

- In June 2016, a worker at Double-Dutch Dairy in Nebraska was struck and injured by a front-end loader, leading to an OSHA inspection. The worker sustained serious injuries, including a broken arm.

OSHA's investigation found employee training deficiencies, such as lack of proper safety procedures and inadequate emergency response plans. The company faced penalties for the violation.

- In October 2016, Double Dutch Dairy received a Notice of Violation for mishandling of livestock waste. OSHA cited the dairy for not properly disposing of manure and waste products. The dairy faced fines for the violation.

The violations were found at Butler County Dairy or Rock Prairie Dairy.

Tul's Dairy has been a target of OSHA investigations due to concerns over employee safety and environmental compliance. The dairy has faced fines and corrective actions for various violations.
Dear MS Grosenheider:

Attached is a copy of my letter to you, by 1st class mail today.

Very respectfully,

John F. Campe
Kim Grosenheider  
Resource Management and Assistance Division  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, MN 55155  

RE: Daley Farms of Lewiston, LLP  
18714 Highway 14  
Lewiston, MN 55952  

Dear MS Grosenheider:  

Based on my physical observation over the past several years:  

1. The dairy facility have been well maintained.  
2. The applicant has managed the animal waste in prudent manner.  
3. The livestock have been treated in a humane and responsible manner.  

Livestock is important to Southeast Minnesota in maintaining soil fertility naturally thereby reducing the need for chemically based fertilizer.  

For the 3 reasons based on my physical observation and the need to maintain and build soil fertility I would respectfully request that your agency waive an EIS and approve the application.  

Very Respectfully,  

John F. Campe
Dear Kim,

I live in rural Fillmore County and have had to live with the shadow of possible frac sand mining in my backyard ( literally) for the past 3 years at least. Now the battle with MPCA has been going on for the project and I attended a meeting in St. Paul on the very topic. I was and still am very concerned about the impact mining would have on myself and my neighbors, and I really hope to have a voice in any future decisions regarding the opposition to mining projects like this.

I felt the same way about the Daley expansion project. When I first read about it I thought it was a misprint– Daley expansion in St. Paul! Since that time I have come to understand why a mining project is needed. I hope this is not going to be a case of too little too late. Who is going to pay if I find nitrates in my well water? I wager it won’t be Daley or the MPCA. I think it is important to be safe with the science in these types of expansion projects. That is why I feel an EIS is needed. I have few exceptions to this rule and I don’t think the Daley expansion project is one of them.

Thank you for your time.

Tom Barnes

Dear Tom,

I am very concerned about mining projects in rural and urban areas. I believe it is important to have a thorough EIS before any project is approved. Daley’s expansion project is currently being reviewed and a decision will be made soon. I hope that the MPCA will make a wise decision on this important issue.

Please remember to protect our environment and work towards a sustainable future.

Kim Grosenheider
MPCA
Hello,

Thank you for the opportunity to offer feedback-

I vehemently oppose Daley Dairy Farm's request to increase its dairy herd for two major reasons: **animal cruelty & environmental destruction!**

Dairy animals suffer immense pain and cruelty in this industry. Dairy cows are forcibly impregnated at least once per year by a farmer who inserts his arm all the way up in the cow's delicate tract with semen from bulls who are painfully ejaculated by electric rods. When the calf is born, it is stolen from the mother cow within hours. This is done so the farmer can take her breast milk to sell as dairy; if the baby nursed from mom and got to stay with her as nature intended, there would be no milk to sell. Mother cows often bellow for hours or days when their newborns are stolen from them. If the calf is male, it is put in a small hut, or the like, in order to keep its muscles soft so it can be slaughtered into veal. If the calf is female, she is grown up into a milk-producing robot like her poor mother and the vicious cycle continues... This is all standard practice in the dairy industry. It is one of the most inhumane, barbaric and sad institutions involving egregious animal cruelty.

*By the way, so-called "organic", "humanely-raised", "grass-fed", "pasture-raised" or similar titles still practice the same protocol. Fancy titles, picturesque labels, scenic commercials... it's all the same industry. Bottom line - if there is no baby; there is no breast milk to sell! Cruelty ensues...

As if the horrendous animal cruelty isn't enough reason to be adamantly opposed to dairy farms, the environmental destruction is the other. The amount of land (thousands of acres) that it takes to just grow the animal feed would be much better used to grow native prairie grasses and native forests in Minnesota and would help maintain our high standards of air and water quality. Unfortunately, these landscapes are in short supply these days due to factory farms and urban sprawl.

The pesticides used to grow GMO soybean and corn to feed cattle are killing our
precious pollinators. Monarchs have been threatened for a long time. Now The Rusty-Patched Bumble Bee has recently been placed on this list, unfortunately. These dangerous chemicals used in industrial farming have a devastating impact on pollinators and wild animals.

The amount of waste and manure from several thousand cows is mind blowing. The manure seeps into precious waterways and pollutes watersheds both locally and nationally. In fact, pesticide, fertilizer and manure run-off from the midwest is flowing down the Mississippi River Watershed and polluting the Gulf of Mexico and causing "dead zones", where ocean plants and animals cannot survive.

Factory farms in the midwest have also had a terrible impact in hurricane zones in the Gulf States. When the barrier vegetation dies off from pesticide, fertilizer and manure run-off, massive gulf storms and hurricanes do a lot more damage when they make landfall. Barrier vegetation and islands serve a great purpose to protect people and landscapes from massive destruction.

People who live near CAFO (confined animal feeding operations), or factory farms, often suffer from breathing issues and have more respiratory and health problems (headaches, dizziness, nausea). The smell of manure from thousands of cows can drift for miles into communities and affect their daily quality of life. When the liquid manure is sprayed as fertilizer onto fields, the smell could stop anyone in their tracks.

Thankfully, more and more people are learning about the animal cruelty and environmental impact of dairy (and meat). People are embracing the health benefits of a plant-based diet, which includes plant-based milk, cheese, yogurt and ice cream! Without government bailouts, cowboy welfare and factory farm subsidies from taxpayers, the dying dairy industry would already have met its demise. The only reason it still exists is because it is frozen into an archaic government system of overproduction and stockpiling of cheese, dumping of thousands of gallons of milk and government handouts each year. Plant-based milks, which are NOT government subsidized, are growing tremendously. More and more farmers are transitioning to plant-based foods (i.e. cashews, almonds, organic soy, oats, rice, pea protein etc) as their crops of choice.

In summary, I do NOT in any way support the expansion or creation of this or any dairy farm. I do, however, support farmers who are transitioning away from animal cruelty and toward crops and agriculture that supports plant-based diets and cruelty-free living.

Respectfully submitted,
Molly Nemec,
Minnesota Resident
651.402.8029
Supplying

Furniture for Army Officers.

What made him think of the furniture?

He sold it to an old friend of his.

He was overjoyed to receive the money.

He had saved the money for the purchase of the furniture.

He was thrilled to see his army friend again.

A few weeks later, he received a letter from his army friend.

He wrote back immediately.

He had been well.

He was looking forward to seeing his friend again.

He wished him all the best.
Kim Grosenheider  
Minnesota Pollution Control Agency  
520 Lafayette Road  
St. Paul, MN 55155

Kim:

I am writing concerning the pending proposal for expansion of the Daley Farm milking operation.

I believe it is a mistake for the MPCA to focus their review on the narrow topic of greenhouse gasses.

In the year since the Daley permit was remanded by the courts, the knowledge base around nitrates has expanded. I believe the review should be expanded to include groundwater, nitrates, and that new knowledge. To cite three examples:

1. The finding that 500,000 Minnesotans are drinking water from contaminated wells, reported by the Environmental Working Group in the Minneapolis Star Tribune on January 14, 2020.

2. The association between manure and well contamination with nitrates and coliform bacteria in areas with porous bedrock (the Driftless Region) as reported by a Department of Agriculture researcher, Dr. Mark Borchardt, at the 2019 Midwest Manure Summit, sponsored by the University of Wisconsin Extension Service. Dr. Borchardt has 88 publications to his name. This was widely reported; my source was the Winona Daily News of March 3, 2019.

3. The experience in LaCrosse County, Wisconsin, where Babcock Genetics was given a permit to operate a CAFO with 4,000 pigs. Within a few years of opening, 90% of wells in the area had nitrate levels above 10mg/liter. This information was reported in the LaCrosse Tribune on 5/8/17. While it is older information, I believe it is unknown to the MPCA staff. It is relevant because LaCrosse County shares the same karst geology as Winona County.

I believe the probability of contaminating wells in the Lewiston area is exceedingly high if the Daley operation is expanded as proposed.

Thank you for your consideration.

Charles A. Shepard, MD, FACP
February 12, 2020

Dear Kim Grosenheider,

We write to you today regarding the Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions related to Daley Farms of Lewiston dairy expansion and modernization project.

Our company has worked with Daley Family for over 10 years. The Daley's have always been environmentally conscious and in the forefront of using technology and best practices to manage and look out for the well-being of their animals, employees, and the environment. It is our understanding that this project was carefully engineered and reviewed by the MPCA, ensuring that the manure generated met requirements of all applicable laws and regulations.

The Daley's are trying to preserve their family farm and to continue to act as good stewards of the land and support our rural economy. We strongly support the efforts of the Daley Family Farm to pass their dairy farm to the next generation and believe their project has been held up for far too long.

Sincerely,

Mike Serum, co-owner
Komro Sales & Service
February 14, 2020

Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

RE: Daley Farms of Lewiston, LLP
18714 Highway 14
Lewiston, MN 55952

Dear MS Grosenheider:

Based on my physical observation over the past several years:

1. The dairy facility have been well maintained.
2. The applicant has managed the animal waste in prudent manner.
3. The livestock have been treated in a humane and responsible manner.

Livestock is important to Southeast Minnesota in maintaining soil fertility naturally thereby reducing the need for chemically based fertilizer.

For the 3 reasons based on my physical observation and the need to maintain and build soil fertility I would respectfully request that your agency waive an EIS and approve the application.

Very Respectfully,

John F. Campe
Dear Kim or Laura

Allowing Mega Farms in a Karst area is a wrong decision on so many levels.

But to cut to the chase and save your time and mine, here is my take on mega farms in the driftless.

We all drink the same water, breathe the same air, once its ruined we will never get it back. Make regulations that protect that to the utmost and don’t fudge on it. Thanks for your time.

George Lesnar
Spring Grove, MN
8706 State 44  
Caledonia, MN 55921  
February 21, 2020

Minnesota Pollution Control Agency  
Attn: Commissioner Laura Bishop  
520 Lafayette Road North  
St. Paul, MN 55155

Dear Commissioner Bishop:

I am writing on behalf of the Land Stewardship Project regarding the permitting of a mega-dairy farm in Winona County.

Bigger is not better as Agriculture Secretary Perdue has publicly stated. Rather bigger leads to consequential results that affect our environment and the future of our planet.

- Bigger herd sizes lead to a larger volume of manure generated, which must be disposed of.  
- Bigger herd sizes lead to an increased volume of methane generated, which is a known major contributor to global warming.  
- Bigger herd sizes concentrated in contained animal operations generate manure and the resulting smell is offensive to neighbors. The runoff that occurs from the containment facilities and the fields where the manure is spread leads to increased pollution of our streams and rivers.

These are not theories. They are common sense observations.

In Clark County, WI, my wife and I owned a lake home on beautiful Lake Arbutus. We had owned it for 25 years. In the last five years the quality of the water in the lake became noticeably different. It was the result of the increasing intensity of the rain storms that have resulted from climate change. Following a major rainstorm, we observed the west fork of the Black River flowing into our lake, and it appeared like “chocolate milk” due to all the sediment contained in the runoff from the agricultural operations upstream. The result was the lake lost its water clarity, and we no longer felt comfortable swimming in the filthy water. Clark County, WI, is the largest dairy producer in Wisconsin. Management of the large volume of manure, especially during the spring runoff is a challenge.

Before we sold our lake home large contained hog operations were being permitted in the county, similar to trends observed in the state of Illinois. I doubt any environmental impact studies were done. The Soil Conservation Departments at the county level simply followed the political leanings of the state government and stamped “approved” for all the permits that came in.
I fear the loosening of the regulatory process to simply approve what is bigger, without considering the consequences, will leave our environment more polluted and our future less sustainable. The regulatory process needs to say “NO” to bigger. Just because capitalism and the opportunity to make money is valued in our society does not mean it’s best for the common good. Should “bigger is better” be allowed to prevail against the rest of us, in my mind that is equivalent to saying “greed is good.” NO, GREED IS NOT GOOD FOR THE COMMON GOOD ... for the good of the majority of Americans who would like to live a happy life, pursue their passions, and live freely. Limiting the size of mega farms must be a strong stance we as a society take to protect our environment, and make living on this planet with clean water and a sustainable future possible.

My wife and I enjoy the beauty of southeast Minnesota. It has a fragile landscape and is susceptible to flash flooding. Because of the sandstone surface water easily infiltrates our underground aquifers. We cannot afford to see our ground water polluted with nitrates. We also cannot permit the massive contained animal operations we observe as we travel across the states like Nebraska and Colorado, that interestingly are located right alongside I-80. Unregulated capitalism, or should we call it as it is ... greed, cannot be allowed to prevail.

Sincerely yours,

Daniel C. Leaver  
Resident of Houston County, MN
To Kim Grosemans,

As residents of Denver Co we are concerned about the expansion of Dairy farms. The area they are in already has problems with water issues. Increasing a herd by what they want will only contribute to this issue and the more. What the water is meant for human consumption then what will happen to these nearby residents.

Run off from manure needs to be controlled and that has not been done. Where does this go? Back to water issues again.

Air quality is another problem. Who is regulating this area?

We have to have more control over these issues that will harm our future.

Sincerely,

Dan & Sharon Littler
10638 CO RD C
St Charles, MO 65902
Ms. Kim Groenendecker
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Groenendecker
and Commissioner Laura Bishop

I am writing to implore you to right a wrong regarding allowing one entity, Haley's Farm to use resources that are far more than its share in water contamination costs borne by the community, and excess waste costs also borne by the community without an environmental impact study.

We live in a democracy, where people affected by a decision have input.

Thank you for your service as an MPCA Commissioner.

Mary Polta
I got a letter from LSP and have seen articles in Rochester paper about this Daley Farms.

I grew up on a family dairy farm (Century Farm). We quit milking in 2003. We were milking about 40 cows.

These large farms have so much manure and feed concentration in a very small area. When they have problems it is a large scale problem.

S.E. Minnesota has karst subsurface and water is going to be a problem. It already is in a lot of areas. Wells are high nitrate and bottling companies are going to small towns to sell their water to bottle and sell else where. Someone wanted to pipe water from western Minnesota to S.W. USA. In the near future water is going to be more valuable than oil.
When we quit milking, I got a part time job in town. One of my duties was to take care of a commercial retail minnow tank. I learned a lot about minnows.

At home here on the farm, I buy a scoop of minnows to go fishing with now. I try to keep them in the basement with fresh water from our well. There seems to be something in our water now. I keep having 5 or 6 dead minnows every day.

Laurel Bammert has a hydrologist from the MN. Dept of Ag has done a thorough test on our well water the last 2 years. It seems to test out ok, but it seems to be slowly killing the minnows. We need to protect our water.

Everybody was better off when we had 40-50 cow dairies. More people had jobs. Small towns prospered. Machinery dealers sold many smaller implements.

Jim Schreader

James Schreader
48325 260th Ave.
Mazeppa, MN 55956
We live on Rice Lake, Steuben Co. When we moved here there 50 cows ½ mil., 50 cows ¾ ½ mi. now.

There are 2000 cows ½ mi. no. and 1500 ¾ ¼ mi.

We are taking water samples when there is a run-off rain event. 5 times the legal limit P has and N, triger in run-off into the lake. They have closed the intake and officers 20 St Paul is the only place.

We can complain to…

Ralph Klassen

612 365 9230 Vice Pres. Rice Lake
Kim

I live in Lac Qui Parle County, MN, and have the misfortune of having (2) Hog barns built near me on the West side of my place. One barn is 2 miles from me and the other is 3 miles. The odor is not every day but it still smells about the same as the other farm is going to be a big as is the dairy farm is going to be a big as is the dairy. I feel sorry for the neighbors who live there 1st and now are excepted to put up with the bad air smell and ruin their outdoor activities and their personal enjoyment of their living. In short, they do smell and don't belong in Minnesota!

Thanks

Paul Schumleman
Dear Ms. Bishop,

I’m writing to you today to ask that the MPCA deny permitting to Daley Farm in regards to their request for expansion.

I went to college in Winnona, and I know how beautiful that region of the state is. It is truly a natural treasure and we need to be advocates for Mother Earth and protect her. The residents in the area also deserve clean water and clear air which they are already at a disadvantage for.

It is not ethical for the Daley Farm to try and sneak by the system and avoid the due process that they are responsible for passing an EIS. I believe they know that they will not pass—they are already out of compliance with state regulations for run off and other issues, with unenforced violations by the MPCA feedlot division for 72 years. Because of this, I believe it is the right path...
to DENY the permit, Daley Farm is clearly cut for their profits & bottom line. They do not care about their community, the environment, or what is best for the state as a whole.

The public desperately needs their faith restored in government and in humanity. Lately everything seems to be favoring greed, money, & individual interests. This could be a turning point in the darkness & it could start with you Ms. Bishop! How exciting!

I'll be thinking of you & praying for your wisdom & guidance. Best wishes in 2020, & happy 1 year anniversary as commissioner!!

Best,
Martha Wittrock

[Signature]
February 21, 2020

Laura Bishop
Commissioner, MN Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Bishop,

I write regarding the impact of massive animal farms, particularly the case before the State of the Daley Farm proposed expansion to be an even larger mega-farm in Winona County.

A complete and thorough ERS is needed.

I live in a rural area and have for most of my life. I am a member and supporter of the Land Stewardship Project since its beginning. I am a retired biologist having done research and teaching in cell biology, environment, and plant sciences.

Every day the serious threats to health and our ability to survive the increasing stress to the environment, particularly to our water resources, air and soil become more real. The financial and human cost is immeasurable. Reports in Lancet and science journals highlight the uncertainties we face due to climate change and loss of biological diversity. Many birds and insects we saw often are now rarely seen if ever.

Concentration of thousands of animals in mega-farms is a disastrous demand on water resources, presents enormous problems of heavy use of antibiotics, waste disposal, harmful discharges to the rivers and underground water sources, unbreathable air and production of greenhouse gases such as methane and carbon dioxide. The soils and underground water resources of Winona region are particularly vulnerable.

Please act to protect our future and this beautiful state.

Sincerely yours,

Regina Birchem, Ph.D.
Dear Laura Bishop, MPCHA-Commissioner,

Please use your influence to oppose the expansion of the Daley farm. It must have an EIR.

I am a city dweller of a senior cooperative, and a longtime member of Land Stewardship Project.

The Daley Farm has been out of compliance with state regulations for over 20 years. As you are aware,

The problems of pollution will only get worse with this expansion. Thank you for your assistance.

Sincerely,

Carol Masters
Attention to Commissioner Laura Bishop

Southeastern Minnesota’s sensitive forest region is riddled with nitrate-laden drinking water. People in the area are already living with contaminated water and in some cases poor water quality.

As a citizen of Minnesota, I encourage you to use the power you have to order an EIS or deny permitting this massive animal factory proposal for expansion of Daley’s Mega Dairy farm by 3,000 cows on Daley’s mega dairy farm.

The court was correct in noting that the MPCA was remiss in not considering greenhouse gas emissions when it conducted its environmental review. But the court expected the customary “deference to the agency as expert” on all other points in this case, fails the public interest.

Minnesota law needs to protect all citizens, not just those seeking to create profit. It is time to stop the nitrate-induced drinking water crisis NOW!!!!!!!

MPCA must protect rural residents’ health and well-being.
February 20, 2020

Dear Commissioner Bishop,

I am writing regarding Dolley Farm’s proposal to expand its mega-decay in Winona County. The impact of greatly increasing the number of cows in one location in our sensitive Karst region in SE Minnesota is troubling — from the point of view of water quality, air quality, and greenhouse gas (methane) emissions.

Please — insist upon an Environmental Impact statement on this project before any further steps are taken.

Thank you —

Sharon Hileker
202 Clinton Ave. S #18
Minneapolis MN 55404
Dear Commissioner Bishop,

I have been made aware of the Dairy Farm proposal through Land Stewardship, of which I am a member. However, I am moved to write this request for other reasons.

My farmer father, and now my brother, ingrained on me a profound love and respect for the natural world, and our need to care for it. With them I have watched and experienced the changes and losses of family farms. I have watched them struggle for air quality threats from both dairy and pork farms, none not nearly the size of mega-farms. They have brought their concerns, nitrate and other contaminants from run-off, shear size and inhumane crowds of our animals, fairness and the common good, to name just a few worries.

It seems when two of our major political issues today are health and the environment (water, air, land), this farm proposal is absurd and even immoral. I am urging you to stand strong and asking for an EIS on this project. What kind of a world do we want us and our animals to live in?

Respectfully submitted,
Kathy Wallenta
Commissioner Laura Bishop
Minnesota Pollution Control Agency

Dear Ms. Bishop,

I am alarmed to learn that your predecessor at MPCA decided to allow Dairy Farmers in Winona County to expand its large dairy herd by 3,000 additional cows. As my husband and I have traveled thru the Midwest—we have seen firsthand the many overcrowded, hoop cattle operations of hundreds of cattle crowded together in filthy feedlots, also films of similar conditions for raising chickens & hogs in other parts of our country. We know these are unhealthy conditions for any animal necessitating feeding them antibiotics which have many deleterious effects on humans as well & create terrible waste disposal problems polluting the water, air & affecting the whole community.


I grew up on a small beef cattle farm in Mille Lacs County in a community of small dairy farmers. Although everyone had very modest incomes we lived well enough to enjoy a healthy environment. The farmers practiced what is now called “sustainable” farming practices. I joke that my father would love the packaging of beef from “grass fed” farms. Of course they were fed hay’s Folage during the long winter season, but this was much preferable for the health of the animals & people, & farmland.

Please make every effort to rectify this most undesirable permit to Haley Farms. And, do all you can during your time as Commissioner to deny the undesirable proliferation of “factory farms” in our state region & nation. Thank you.

Sincerely,

Sandra Bergman Wickstrom
533 Otis Avenue
Saint Paul, Minnesota 55104
Dear Commissioner Laura Bishop,

I am a long-time resident and a member of the Land Stewardship Project. As a citizen with concerns for the environment, food safety, and the farm economy, I am troubled by the approval by your predecessor, J. Stine, without an Environmental Impact Statement to allow expansion of the Daley Dairy farm in Winona county. Here are my reasons:

1) Environmental. I am especially concerned about water quality of this delicate Kast area. Already many wells, swimming streams, municipal water systems are unusable or costing much money to reduce the nitrate pollution.

2) The organic food movement is based on the desire for all agricultural production to be reducing chemical, antibiotic, and hormonal inputs to harvest food that is healthier for people, enhance the lives of animals in food production, and the environment.

3) Farm economy and rural life is enriched by smaller producers contributing to a better overall economy and cultural health of the state of MN.

Thank you for reading my letter and weighing my concerns. Please require an EIS prior to any approval considering the giant increase of animal units required which would be incompatible with the above concerns and goals.

Sincerely,

Coral P. Bastien
Dear Commissioner, Bishop,

My family runs a dairy farm passed down through 4 generations, and it's familiar with the struggle and devotion that it takes to manage a business that respects the land, the animals, and God's injunction to care for the earth.

But a C 6000 head mega-dairy is not a farm, it's a milk and manure producing factory. Just the thought of that much manure being stored in an earthen sided lagoon horrifies me. Doing so in a geologically vulnerable area like Winona County with its karst formation is irresponsible and immoral.

Winona County has already passed zoning regulations limiting factory farms to 1500 animals. This was done to protect farmers, protect the land and water, and protect the future.

The MPCA should value and reinforce such responsible local control. It is a public agency and as such must hold factory farms accountable to communities and to the land.

If you value the land and water, value the people who depend on it, and value the integrity
Of public service, you will correct the harmful decisions the MPRA made in the recent past - which turned our land & future over to people interested only in a quick profit.

I hope that you will do the right thing by upholding the charge of your agency to control pollution by vigorous review and enforcement of responsible laws & regulations that will prevent irreversible damage & endanger health for the surrounding communities.

Please show courage, and act in a way that will rebuild our confidence and trust in the MPRA.

Sincerely,

[Signature]

[Name]
Land Stewardship Project Member
Family member of dairy farmers
Proud Minnesotan.
2/12/2020

Laura Bishop, Commissioner
MN Pollution Control Agency

Dear Ms Bishop,

As a former farm girl and a long-time supporter of the Land Stewardship Project I would like to voice my concern about the proposed expansion of the Daley Farm in Winona County.

While I understand the economic reasons why dairy farmers feel they need to have bigger operations, I believe that the dangers of water pollution and overuse of ground water are of greater concern for your agency.

I would rather see state and federal economic support for our struggling dairy farmers. Loss of clean water will eventually hurt the Daley’s farm and all the rest of us as well.

Thank you for considering this letter and those from others who are concerned about water quality. Please deny this permit!

Sincerely,

[Name]
St. Paul, MN
Dear Commissioner Bishop,

As a longtime member of the Land Stewardship Project, I am writing to you to ask you to request an Environmental Impact Statement for Daley Farms in neighboring Winona County, especially concerning greenhouse gas emissions. This hilly area of SE. Minnesota has had and continues to have, problems with nitrate laden drinking water. To store the manure from over 4,000 cows in an earth-filled lagoon is simply not going to work. Poor air quality and worsening health conditions for Daley’s neighbors will surely be the result.

I realize milk is important but I am concerned about housing that many cattle! Cows were made to graze—not to be confined!

Thank you for your consideration of this matter.

Mary Ellen Trueman

Mary Ellen Trueman
Dear [Name],

Do not expand mega dairy operations. Preserve our farms - our land. Now.

[Signature]

2-21-2020
Dear Kim,

I am an organic produce farmer in Fillmore County and grew up on a small 30 head dairy/chicken/hog/grain farm in Iowa. We only had 160 acres and I was one of 13 children, but we had a great life and were taught the values of simple living and stewardship of the land. Today I continue to strive to live in harmony with nature as it is a cherished gift that provides for all of us. I am concerned about several things in regards to the Dakeley expansion.

1. I do not feel bigger is better. We need more farmers on the land in agriculture. Small operations are more suitable for care, diligence and sustainability.

2. Clean air and water is a serious responsibility for all of us. Here in the Kast region, we need to be especially vigilant of our water supply. We need to be good examples and set a precedent that larger farms and corporations are not above the law or receive special privileges.

3. We all need to have a long vision. Many times a solution that is sustainable takes more collaboration, dialogue and creativity. We cannot be afraid to be bold for what is best for all.

Thanks for all you do!

Norm 2020
Earth Dance Farm
Spring Valley, MN
55975
Dear Laura Bishop,  
(re: EIS for Daley Farm)

I'm a retired Horticulturalist - really, just a very good, big time, public gardener who spent my life, out of doors, growing stuff. I have also, fortunately, volunteered as a Vermillion River Watershed Planning Commissioner which introduced me to the process we have developed to ensure the health and safety of our lands, water and people.

In order to feel confident about what I know, I've spent my time reading everything our library can find for me, to help understand the scientific truths behind our environmental crisis. Feedlots and all industrial-scale animal factories are on the top of the lists of environmental hazards. Permitting the Daley Farm's expansion amidst the Karst topography and everything we're dealing with nitrate infiltration of our drinking water is NUTS. Not just local citizens would have to pay the price but all our children, too. With more knowledge (EIS) comes better decisions. Thank you.

Please help.

Jackie Dooley
313 Walnut St.
Farmington Mn. 55024
Dear Mr. Bishop,

I have been a LP member for a number of years because of my interest in farming although it has been about 65 years since I left my farm home where my oldest brother and his new wife moved in and began a farming life together. (Between Fountain & Wyckoff, MN)

Although I really haven't kept up with laws affecting farming, judging from the letter from Land Stewardship Project which I received today, written by Beth Bogen-Frank I think it would be best to deny permitting on this massive Animal factory proposal. If most of the people who write to you by March 6, 2020 wish to have you order an EIS that is all right with me, the Daley Farm could cut back to 1,500 AC and still make a good living, I believe.

Sincerely,

Lora Lorraine C. Doherty
Feb. 20, 2020

Dear Commissioner Bishop,

The need for appropriate environmental oversight at this time is paramount due to the devastating impacts that the Climate Crisis is exerting on our society.

The proposed expansion of the Dolay Mega Dam will potentially impact Minnesota's citizens locally and statewide.

Please require an Environmental Impact Statement for this project and for all proposed projects that come under your jurisdiction that can potentially contribute to environmental degradation that will negatively impact our citizens.

The EPA is tasked to "protect and improve the environment and public health." We are dependent upon the EPA to perform this vital public role. Sincerely,

[Signature]
Dear Commissioner Bishop:

We were appalled when the MPCA under John Shire granted the necessary permits for Daley Farm to greatly increase the size of its dairy herd. The Farm's current herd is very likely too large for the area in which it is located. The karst substrate is infamous for its susceptibility to waste contamination. Nitrate is the major concern, but other pollutants are a problem.

Considering that Daley Farm's present herd is excessive, it is extremely important that any increase in herd size requires a comprehensive EIS. It would seem reasonable given the geology of the area and the Farm's past environmental record that a reduction in herd size would be the outcome of this review.

Thank you for your consideration of the public health and environmental consequences of this decision.

Sincerely,

[Signature]
Commissions Bishop,

I am a member of the local conservation group. But, more importantly, I am a human being and a citizen of this country. I write to express my disapproval of enormous factory farms.

Think of it — 5,000 animals, shuttering and fouling, ruining the air and the soil. It is an unnatural, un-nature perversion of nature. Further, it is an economic force driving smaller operations out of business.

Please consider these facts, and deny the permits seeking for excessive agricultural concentration.

Thank you.

Donald M. Hall
Laura Bishop —

I am writing in support of the petition of the land. I feel it is important to save the land. I have lived most of my life in So. Min. — Machine Lake BE Co.

I am now in a Senior Home, 914 60
downtown in Blue Earth, Le Sueur & Ware Co. — handed down thru family.

I am concerned about the viability of the land for future family and the land. Women who work the land as needed.

Please listen to the 57 People &

take action as appropriate for the future of small farms that exist by 57.

Big concern to large cow farms —

land, water, air pollution

Frank G. Brown
960 19th St. S. St. Paul, Minn.
563 77
February 20, 2020

Minneapolis Pollution Control Agency:

I am concerned for the people of Winona County where theDALY Farm proposes an expansion of 3,000 more cows risking the safety of the water in the Headwater region. I taught at the high school in Houston, Minnesota for 5 years and am familiar with the geology of that part of the state. Also, I would support Winona County’s right to limit the size and maintain local control of the size of factory farms.

I grew up on a 400 acre diversified family farm in Goodhue County. That usually had 50 cows, 200 pigs, and 500 chickens. Those animals had a better life than the animals in concentrated confinement mega farms now. I am now an 84 year old grandma raising a herd of sheep by myself on 30 acres. I am a member of Land Stewardship.

I would ask that the Minnesota Pollution Control Agency lives up to its name and control pollution by enforcing these laws.

Sincerely, Nancy Ellison
Laura Bishop:

In reference to the Dakey Farm in particular and industrial agriculture in general we really need to start putting people first, environment second & profits last. Any proposed projects that meet these criteria have no reason to fear an EIS. Please do the right thing.

Don Koep
Ottetaill County Farmer
A Word From Pope Francis

Profit and capital are not a good over and above the human person; they are at the service of the common good. When the common good is used only at the service of profit and capital, this has a name: it is called exclusion, and through it the throwaway culture gets stronger and stronger.

—Homily in Ciudad Juárez, Mexico, February 17, 2016
Bryan Reagan
1778 Regatta Dr.
Woodbury, MN 55125

Dear Kim Groesenbeek,

I am writing to you on behalf of the landowners and people everywhere who are concerned about clean water. 

My family has farmed in the driftless area for generations. The topography simply cannot sustain intensive farming that pollutes the water table. It also stinks up the air and ruins everyone’s health.

The people need to conduct a proper environmental impact study.

The only Farm expansion.
Dear Commissioner Laura Bishop,

We are very concerned about the Daily Farms proposed expansion especially regarding drinking water and greenhouse gas (GHG) emissions.

In July 2019, some Lewiston residents received water testing reports finding nitrate levels in their drinking water at 13 mg/l. The “safe” drinking water limit for nitrates is 10 mg/l.

Daily Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA's fudicial division that have gone unenforced over 25 years.

Winona County's citizens along with all southeastern Minnesota's least region communities are in a nitrate-induced drinking water crisis.

Once the drinking water is polluted, it is gone - forever! We urge you to order an EIS or deny permitting the Daily Farms expansion proposal.

Sincerely,
John & Connie Roth
Commissioner Bishop,

I am writing to you as a physician, public health practitioner, and member of the Land Stewardship Project. Though I live in the city now, I grew up on a small family farm and still have family members who are farmers.

I am asking that the MPCA deny permitting the Daley Farms permission to extend their mega-dairy operation in Winona County. Communities in that region are already dealing with nitrate in their water, making it unsafe to drink. Daley Farms is out of state compliance with state regulations for run-off, and enlarging their operations would likely make this matter worse.

Air quality is also at stake - the "estimates of potential emissions" in the EAW are unsubstantiated and do not take into consideration variables such as weather events, humidity and temperature. Air quality obviously affects the health and lives of those who live in areas surrounding the dairy.

In order to preserve and improve the health of the land and its people, I am asking you to deny the permit for expansion.

Sincerely,
Kelley R. DeWitt MD, MPH, FAMA
3128 35th Ave. S
Mpls. MN 55406
February 20, 2020

Dear Commissioner Bishop,

we don't need another mega dairy farm in MN. we already produce too much milk. Prices are going down every month. Mega & Dairy Farms are part of the problem. They drive small family farms out of dairy every month.

Mega dairy farms do very little to help the local economy. They truck in most of their supplies from where ever it is cheapest.
The damage a mega dairy can do to the environment can't be overlooked. Just the methane released is enough to say no. All that waste has to go somewhere. If they have a major spill, the groundwater will be tainted for a long time.

I urge you to vote NO on the Daley mega farm proposal. And no to all future mega Dairy Farms. work to save the family farmer not destroy them.

LSP member
Dear Commissioner Bishop,

I currently reside in Houston County, but have lived in Winona County and was born in Houston County. I am deeply committed to preservation of the land in this unique area of Minnesota.

I am writing to request you take action to request an EIS on the Daley Farm Lappac project or better that the MPCA deny permit for this project which could severely adversely effect the land in this unique area. Once destroyed, there would be no way to retrieve the using of the land in Winona and Fillmore Counties and others downstream from the location of the Daley Farm.

Sincerely,

[Signature]

[Address]

Rochester, MN 55901
Dear Kim Grosenheider:

We write to you today in fervent support of Daley Farms of Lewiston’s dairy expansion and modernization project. Daley Farms represents a family business wishing to grow to maintain profitability and allow their family to continue the legacy they have built. Essentially, the Minnesota Center for Environmental Advocacy (MCEA) and the Twin Cities Land Steward Project (LSP) are effectively punishing these hard-working farmers for their desire to expand. Farmers are natural stewards of the environment. Their animals require clean water to drink and their crops require healthy and nutritious soil to grow. They are part of the community in which they operate, having raised families for over 6 generations. Ensuring their community remains environmentally pristine is of the utmost importance to this family farm. However, MCEA and LSP does not appear to want to work with farmers to grow in sustainable ways through collaboration, but rather stand in their way to do business at all.

As global population continues to rise, farmers are tasked with providing nutritious and affordable food for more mouths than ever before but with using less resources and with less impact on the environment. The Daley’s have risen to this challenge with ingenuity, teamwork, and have embraced science and technology to consistently improve. In fact, thanks to the family’s stewardship and utilization of best practices they work to continually improve negative impacts to the water we drink and air we breathe.

The proposed expansion project Daley Farms has submitted to the Minnesota Pollution Control Agency (MPCA) has concluded that, following a detailed analysis based on factual data and sound science, the project will not have any negative environmental impacts. The MPCA states the project will not have any adverse effects on water quality. The MPCA concluded the manure basins associated with the project not only meets but far exceeds required engineering standards and that manure generated adheres the requirements of all applicable laws and regulations including all air quality standards and odor guidelines. Since scientific review by the proper authorities determined the environmental soundness of this expansion project and approved the permits necessary- why are these same stringent standards not acceptable to MCEA and LSP?

In terms of Green House Gas (GHG) Emissions associated with dairy farming, in order to understand the impacts, we must use modern science- not old outdated ideas. The methane released to the environment from dairy cows is part of carbon cycle which sustains our planet. Cows consume grass, cows then produce methane as they digest this grass. The methane is released into the environment which oxidizes to CO2. CO2 is taken out of the environment through grass and other plants which then starts the cycle over again. All living, breathing beings are part of this cycle- including humans! This proposed expansion project includes 1,000 additional acres of land that will be used to raise alfalfa and
convert or retain additional acres of land for use as pasture. It has been scientifically demonstrated that alfalfa and pasture lands sequester carbon in the soil and reduce the amount of carbon in the atmosphere. In addition, the land application of manure replaces nutrients that farmers would otherwise provide to fields through chemical fertilizer application, thereby avoiding GHG associated with chemical fertilizer production (which are greater than the potential emissions from the land application of manure).

We must also ask ourselves- if we do not allow the Daley Farm to expand and utilize their land to produce one of the most complete and affordable dietary staples our food system can offer, then what else should this land be used for? Would these other projects provide the environmental benefits this expansion project will offer? Would any other project include a means to mitigate GHG emissions and sequester carbon within the soil like the Daley Farm expansion project will?

We ask you today to consider the outcome of this important expansion decision to represent more than the approval of permits. Rather, the outcome of the decisions made in regard to the Daley Farm project will set a dangerous precedent that puts environmental and animal rights activists directly in control of the fate of family farms. It is only through cooperation and ingenuity that we can uphold the standard of environmental stewardship and animal welfare the Daley Farm has set. If we do not allow them to expand to maintain profitability and financial success, we essentially tell farmers and rural communities that we do not want them to succeed. We do not want them to provide for future generations and we do not appreciate the great leaps they have made to protect the environment while providing safe and nutritious food for American consumers. The American Dairy Coalition is asking you to approve all necessary permits required and allow Daley Farm to expand according to their current plans.

Sincerely,

Laurie Fischer

CEO, American Dairy Coalition
810


Commissioner Laura Bishop
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Commissioner:

I am writing to you to request the MPCA deny permitting of the Daley Farm’s proposal to expand its mega dairy in Winona County.

Having grown up on a small dairy farm, I have first hand knowledge of this type of operation. However, because our herd was small (20 cows) my father did not need to routinely give the animals anti-biotics because of over crowding or unsanitary conditions. Nor, did he inject cows with growth hormones to increase milk production. I believe I am a healthier person today because of his natural practices, in harmony with the environment. We need more small farms raising healthy cattle, producing healthy products, to help grow healthy children! Not just a handful of mega dairies producing milk laden with drug residue.

In addition to my personal viewpoints above, the environmental threats to water in Winona County should be given proper consideration. It is my viewpoint, that polluters of ground water should be held accountable. However, because it is difficult to trace these contaminants back to the source, it would be
better to deny these types of permits now—then bear the cost of unfit water, in the future.

Thank you for your consideration.

Brenda Freer
Member of the Land Stewardship Project
February 22, 2020

To: Kim Grosenheimer
Resource Management and Assistance Division
MPCA
520 Lafayette Rd
St. Paul, MN 55155

MPCA

Thank you for the Public Comment on the manure permit for the proposed expansion of the Baeyer Dairy Operation in Winona County.

We live in Maplewood (MN Metro) and we have a home in Wabasha County.

The issue of the additional manure management needs of a large dairy in the Karst region is extremely important to our family. Setting a precedent in any MN county will open up possible expansions everywhere.

Because of the Karst drainage and the hilly terrain there are no guarantees that any manure will remain contained on the surface or injected into some soil.

Having the already large sized dairy as it is will be more manageable for agencies to monitor and also to cleanup spills.

Charlotte Brooker 651-777-4945
Gene Mannenga 507-642-4922
200 Alpine Ridges #2
Wabasha, MN 55981
BAH GAS FRACKING
YOU CAN'T BUY
FRESH WATER IF
IT ISN'T THERE
2200 105 Ave SE
St. Cloud, MN 56304

Kim Rosenheider
Attention: Commissioner Laura Bishop
Resource Management & Assistance Div.
MPCA
520 Lafayette Road North
Saint Paul, MN 55155

Dear Commissioner Bishop:

My confidence in the MPCA has been shaken by recent decisions. The Daley mega-dairy decision must be revisited. The level of topography in that area is too vulnerable to nitrates pollution to allow for the planned expansion.

An EIS needs to be completed that considers the effect of methane production. Climate change will be enhanced by release of methane and other gases. More data is needed that could be generated by an EIS.

Yours truly,
Denis P. Weis
320 333 8893
Dear Commissioner Laura Bishop,

I am writing in concern about the Daby Farm proposal to expand. I believe at this time that it would be a mistake to allow this to happen.

I have lived in rural Winona County all of my life. I question why an Environmental Impact statement was not ordered for this project. My neighbors are farmers and they had to comply.

I quote "Daby Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the M.P.C.A.'s feedlot division that have gone unenforced over 22 years."

Winona County has a cap of 1500 animal units, there must be a reason for this.

I do believe that upon failure the taxpayers would be required to pay the bill as with other failures. I urge for an E.I.S. or deny the project.

Thank you,
Bob Brommerich
22878 Pleasant Ridge Rd
Winona, Minn.
55987
Commissioner Laura Bishop

MPCA
520 Lafayette Rd.
St. Paul, Mn. 55155

Dear Commissioner Bishop:

Why has MPCAs never demanded an EIS for the mega-dairy Decker Farm? Attesting!
The people who reside in Winona County + in southeastern MN, first communities are now drinking water with nitrate contaminants. In addition, the air pollution created by this massive number of animals is stomach churning! The agency must no longer ignore the consequences to the communities that this behemoth factory farm presents. Please deal with this matter ethically, morally, and legally.

Thank you,

Leann Koski

816
Dear Commissioner Bishop,

Thank you for your service to Minnesota as a Commissioner of the MPCA. Your job is crucial to the health of our communities and right now our planet needs Champions! Please put community health interests before big agriculture when you consider Daley Farm's proposal to expand its mega dairy in Winona. Hold the line with integrity and do not allow them to expand and use more than their share of resources in the area! Please do not let them destroy the land, water and air that people and nature in that area depend on. I ask you to hold factory farms accountable to the land and local communities. It has also come to my attention, that the Daley Farm has been out of compliance with state regulations for run-off and other issues for years. Please hold them accountable!

As a resident of rural Southern Minnesota, I know farming can have a huge impact on water, air quality, wildlife and insects, like the bees we are worried about! Please be a champion for the health of our rural communities, land and resources! Do not let Daley expand! Don't issue...
a permit! Hold them and any others to be responsible!

Thank you for your integrity and careful consideration in this matter.

Land stewardship member

Robin Grothe
2-20-20

Minnesota Pollution Control Agency
Laura Bishop,

As a member of the Land Stewardship Project, I believe in the following:

Mega-dairy farms need to be limited in size. Winona County’s animal unit cap of 1500 should be enforced.

Minnesota’s southeastern karst region is not suitable for mega-dairy farms because of the imminent danger of drinking water pollution!

Do not let large corporate farms like Daley Farm bully the good rural citizens into problems with pollution in the water and air!

My three sisters and I own 80 acres of farm land that goes back three generations of our family near Luxemburg, Wisconsin. Our good neighbors operate an 1800 dairy cow operation which is their limit. Already in this limestone area of Kewaunee County a few neighbors are exceeding nitrate levels in their drinking water.

Thanks,

Gerald J Lelou
1628 Case Lane
St. Cloud, MN 56303
jerry.lelou@gmail.com
Dear Commissioner Bishop,

While I live in Grand Rapids, far from Winona County, I care deeply about preserving our water and protecting everyone, especially children, from contaminated water and unhealthy air.

I have a special interest in farming communities as my cousins still manage a moderate-sized family farm in Clovis, MN—our original family's farm.

The mission of the DNR is to "protect and improve the environment and human health," yet you ignored information from Dr. Alexander, an expert on the sensitive geology of the region along with 500 comments and cultural data submitted by the public. (I realize my printing is no easier to read than my handwriting—so sue me.)

4,800 head of cattle is an insane use of our land, air, and water.

You have all the facts, you need to see the damage this "locality farm" will do. I don't need to repeat them.

Deny permitting an EIS or the greenhouse gas supplements to the entire project must be undertaken.

Kathleen O’Haleoran Blake
I would hope that as head's increase that human staff is increased also that the staff relates to the animals increase retains the human management also increase so the human advocacy about knowing the animals are assured of the relationship to wisdom and assurance of their care. Having been around heads and their management teams should be ones sufficient to relate to them and their conditions continuously receiving contact from us humans.

[Signature]
Dear Commissioner Laura Bishop,

As an LSP member, I am writing to ask for an EIS on the greenhouse gas supplement and the entire project. If not this, then please, I ask the MPCA to deny permitting altogether.

We need to protect our air and water. Nothing is more important to me for our health and quality of life. Please do not let factory farms destroy our beautiful state to create profit.

Sincerely,

Kathen R Achberger
101 St. Olaf Avenue
Unit 414
Northfield, MN 55057
LAURA BISHOP

615 greenhouse

HAVE A GOOD ST. PAT'S ST. PATRICK'S DAY MARCH 17

MARCH 17TH OR KIM GROSENHEIDER CALL 651-757-2100

5005

IRISH 4 ETA

LSP member small town (1982)

FAITH, LOVE, HOPE (MY DED.)

PARENTS (MOB) birthplace

BROTHER (AL WOOD) lived 1949-1952 2nd grade 2nd grade

SISTER (AL WOOD) lived 1949-1952 2nd grade

FOREVER CREW COOK 1950-1952 H.S. 9-24-52
To keep farming a more sustainable and managed environment, manure compost is best for agriculture. The key is knowing what to do about the more growing and farming brought to other states. Daily needs of cows will power the intense labor.

County needs clean-up county citizens. Wimona county. From A North St. Louis.

1950s, 1960s. MTS.

Gallagher, 2019.
You need to do the right thing concerning the Daley Farm's attempt to expand its operation. Your predecessor was not requiring an $15 in this case.

The flood down there cannot sustain the nitrate in our drinking water. Everyone knows that. Yet it will occur unless you stop the project.

The MWA is supposed to protect Minnesotans from such hazardous endeavors. Sometimes I feel the Agency has lost sight of its mission and seems to be captured by those it should regulate.

Laura—do the right thing.
Dear Commissioner Laura Bishop,

My husband & I are rural Afton residents & Members of Land Stewardship Project. We are retired and living on a fixed income. How is it that we can make the huge personal sacrifice of putting in a $27,000 new septic system to keep the Kelly Creek watershed (that drains into the St Croix River) clean and environmentally healthy water while you, the MPCA Commissioner ask nothing of Daley Farm as they plan to pollute air and water by adding 2,275 head of cows?

Please see to it that Daley Farm permit is denied. Ask for an EIS on the greenhouse gas supplement and the entire project.

Individual land owners AND large Mega-dairy land owners all need to follow the law and keep our water.
and air clean. This is your duty as MPCA’s commissioner. My husband and I have taken responsibility for our 3 acres. We count on you to hold Daley Farm responsible for their environmental impact.

Sincerely,
Alice Journey
Paul Anderson
14935 45th St So
Afton, MN 55001
journeyanderson@msn.com

Alice Journey
Paul Anderson
Dear Commissioner Bishop,

I am deeply concerned about the Daley mega-dairy in SE Minnesota. Air and water quality in our state is extremely important both now and in the future. Please make sure all proper environmental reviews are followed.

Mark Weise
Dear Commissioner Laura Bishop,

My name is Marvin Boike. I live in rural Chippewa County, Minnesota. Corporate take over of the dairy, hog, turkey, and chicken agriculture have caused many farmers to be run out of business and ruined our small towns. A few years back, large hog setups began in my area. I was on the Gluek Coop Elevator board and we had a very good feed business. Within two years we were forced out of business because 97% of our customers could no longer make a profit because of low prices. Hog numbers at that time were about 180-200 thousand kills a day, now it is 460 thousand. Small dairies are going bankrupt from low prices and over supply. In the last few years, three large dairy operations have been built in my area, including one with 9000 head of cows! Large hog barns, where only one was to be built, now have seven barns. The odor and run off are awful when their pits become full and then they are allowed to apply manure over the frozen ground. These big farms are killing small family farms, towns, businesses, the air and water quality and will only get bigger it we let them! We will all become employees.
Dear Kim Grosenheider:

We write to you today in fervent support of Daley Farms of Lewiston’s dairy expansion and modernization project. Daley Farms represents a family business wishing to grow to maintain profitability and allow their family to continue the legacy they have built. Essentially, the Minnesota Center for Environmental Advocacy (MCEA) and the Twin Cities Land Steward Project (LSP) are effectively punishing these hard-working farmers for their desire to expand. Farmers are natural stewards of the environment. Their animals require clean water to drink and their crops require healthy and nutritious soil to grow. They are part of the community in which they operate, having raised families for over 6 generations. Ensuring their community remains environmentally pristine is of the utmost importance to this family farm. However, MCEA and LSP does not appear to want to work with farmers to grow in sustainable ways through collaboration, but rather stand in their way to do business at all.

As global population continues to rise, farmers are tasked with providing nutritious and affordable food for more mouths than ever before but with using less resources and with less impact on the environment. The Daley’s have risen to this challenge with ingenuity, teamwork, and have embraced science and technology to consistently improve. In fact, thanks to the family’s stewardship and utilization of best practices they work to continually improve negative impacts to the water we drink and air we breathe.

The proposed expansion project Daley Farms has submitted to the Minnesota Pollution Control Agency (MPCA) has concluded that, following a detailed analysis based on factual data and sound science, the project will not have any negative environmental impacts. The MPCA states the project will not have any adverse effects on water quality. The MPCA concluded the manure basins associated with the project not only meets but far exceeds required engineering standards and that manure generated adheres the requirements of all applicable laws and regulations including all air quality standards and odor guidelines. Since scientific review by the proper authorities determined the environmental soundness of this expansion project and approved the permits necessary- why are these same stringent standards not acceptable to MCEA and LSP?

In terms of Green House Gas (GHG) Emissions associated with dairy farming, in order to understand the impacts, we must use modern science- not old outdated ideas. The methane released to the environment from dairy cows is part of carbon cycle which sustains our planet. Cows consume...
grass, cows then produce methane as they digest this grass. The methane is released into the environment which oxidizes to CO2. CO2 is taken out of the environment through grass and other plants which then starts the cycle over again. All living, breathing beings are part of this cycle— including humans! This proposed expansion project includes 1,000 additional acres of land that will be used to raise alfalfa and convert or retain additional acres of land for use as pasture. It has been scientifically demonstrated that alfalfa and pasture lands sequester carbon in the soil and reduce the amount of carbon in the atmosphere. In addition, the land application of manure replaces nutrients that farmers would otherwise provide to fields through chemical fertilizer application, thereby avoiding GHG associated with chemical fertilizer production (which are greater than the potential emissions from the land application of manure).

We must also ask ourselves— if we do not allow the Daley Farm to expand and utilize their land to produce one of the most complete and affordable dietary staples our food system can offer, then what else should this land be used for? Would these other projects provide the environmental benefits this expansion project will offer? Would any other project include a means to mitigate GHG emissions and sequester carbon within the soil like the Daley Farm expansion project will?

We ask you today to consider the outcome of this important expansion decision to represent more than the approval of permits. Rather, the outcome of the decisions made in regard to the Daley Farm project will set a dangerous precedent that puts environmental and animal rights activists directly in control of the fate of family farms. It is only through cooperation and ingenuity that we can uphold the standard of environmental stewardship and animal welfare the Daley Farm has set. If we do not allow them to expand to maintain profitability and financial success, we essentially tell farmers and rural communities that we do not want them to succeed. We do not want them to provide for future generations and we do not appreciate the great leaps they have made to protect the environment while providing safe and nutritious food for American consumers. The American Dairy Coalition is asking you to approve all necessary permits required and allow Daley Farm to expand according to their current plans.

Sincerely

Laurie Fischer

CEO
American Dairy Coalition
PO Box 10976
Green Bay, WI 54307-0976
C: 920-366-1880
Dear Kim Grosenheider:

We write to you today in fervent support of Daley Farms of Lewiston’s dairy expansion and modernization project. Daley Farms represents a family business wishing to grow to maintain profitability and allow their family to continue the legacy they have built. Essentially, the Minnesota Center for Environmental Advocacy (MCEA) and the Twin Cities Land Steward Project (LSP) are effectively punishing these hard-working farmers for their desire to expand. Farmers are natural stewards of the environment. Their animals require clean water to drink and their crops require healthy and nutritious soil to grow. They are part of the community in which they operate, having raised families for over 6 generations. Ensuring their community remains environmentally pristine is of the utmost importance to this family farm. However, MCEA and LSP does not appear to want to work with farmers to grow in sustainable ways through collaboration, but rather stand in their way to do business at all.

As global population continues to rise, farmers are tasked with providing nutritious and affordable food for more mouths than ever before but with using less resources and with less impact on the environment. The Daley’s have risen to this challenge with ingenuity, teamwork, and have embraced science and technology to consistently improve. In fact, thanks to the family’s stewardship and utilization of best practices they work to continually improve negative impacts to the water we drink and air we breathe.

The proposed expansion project Daley Farms has submitted to the Minnesota Pollution Control Agency (MPCA) has concluded that, following a detailed analysis based on factual data and sound science, the project will not have any negative environmental impacts. The MPCA states the project will not have any adverse effects on water quality. The MPCA concluded the manure basins associated with the project not only meet but far exceed required engineering standards and that manure generated adheres the requirements of all applicable laws and regulations including all air quality standards and odor guidelines. Since scientific review by the proper authorities determined the environmental soundness of this expansion project and approved the permits necessary- why are these same stringent standards not acceptable to MCEA and LSP?

In terms of Green House Gas (GHG) Emissions associated with dairy farming, in order to understand the impacts, we must use modern science- not old outdated ideas. The methane released to the environment from dairy cows is part of carbon cycle which sustains our planet. Cows consume grass, cows then produce methane as they digest this grass. The methane is released into the environment which oxidizes to CO2. CO2 is taken out of the environment through grass and other plants which then starts the cycle over again. All living, breathing beings are part of this cycle- including humans! This proposed expansion project includes 1,000 additional acres of land that will be used to raise alfalfa and
convert or retain additional acres of land for use as pasture. It has been scientifically demonstrated that alfalfa and pasture lands sequester carbon in the soil and reduce the amount of carbon in the atmosphere. In addition, the land application of manure replaces nutrients that farmers would otherwise provide to fields through chemical fertilizer application, thereby avoiding GHG associated with chemical fertilizer production (which are greater than the potential emissions from the land application of manure).

We must also ask ourselves- if we do not allow the Daley Farm to expand and utilize their land to produce one of the most complete and affordable dietary staples our food system can offer, then what else should this land be used for? Would these other projects provide the environmental benefits this expansion project will offer? Would any other project include a means to mitigate GHG emissions and sequester carbon within the soil like the Daley Farm expansion project will?

We ask you today to consider the outcome of this important expansion decision to represent more than the approval of permits. Rather, the outcome of the decisions made in regard to the Daley Farm project will set a dangerous precedent that puts environmental and animal rights activists directly in control of the fate of family farms. It is only through cooperation and ingenuity that we can uphold the standard of environmental stewardship and animal welfare the Daley Farm has set. If we do not allow them to expand to maintain profitability and financial success, we essentially tell farmers and rural communities that we do not want them to succeed. We do not want them to provide for future generations and we do not appreciate the great leaps they have made to protect the environment while providing safe and nutritious food for American consumers. The American Dairy Coalition is asking you to approve all necessary permits required and allow Daley Farm to expand according to their current plans.

Sincerely,

Laurie Fischer

Laurie Fischer

CEO, American Dairy Coalition
What are the mortalities on the current farm?

I think the question is why is Daley Farms out of compliance and how much money would it take to bring them into compliance.

Maybe some areas can afford to haul water or buy bottled water.

Ken Lyons

Member LSP.

Sent from Mail for Windows 10
Kim, As a farmer and natural resource professional, I must speak out that these large feedlots in SE MN are a future disaster. Even when all BMPs are followed (which is not the case with the Daley Farm) this landscape just cannot be safeguarded. Our water resources are already greatly impaired! There are just way too many ways for large feedlots to do irreparable damage. In my opinion this should not be permitted. 
No response needed. 
Thank you. 
Val Green 
Brownsville MN
Commissioner Bishop,

Hi My name is Michael Martinson. I live in Winona County, about ten miles from the Daley farms. I milked cows for 25 years here on my farm. Yes it is a small farm, the main reason I sold my cows was the BIG dairy’s ran me out of business. I don’t believe in bigger is the answer to every thing.

In my opinion the country was better off before the big dairy’s came to be.

Question, How come Daley farms have gotten away with being out of compliance with the state regulations for run-off for over 22 years?

Question, How come Daley farms have exceeded the county zoning ordinances for years, for the number of cows that they have?

Question, Aren’t there laws about monopoly’s, big business running the little ones out. Well there should be.

Question, What are we going to do when more of our drinking water gets contaminated, (than it is now) with all the millions of gallons of manure from this big dairy?

I encourage you to follow Minnesota law to protect all people, do the right thing.

Sincerely

Michael Martinson
February 20, 2020

To Kim Grosenheider at MPCA:

According to the EPA, agriculture accounts for nearly 25% of human generated GHG emissions. The proposed expansion of the Daley farm will more than double their current tons of CO2 generated. The primary ways the Daley farm has offered to mitigate air and odor emissions are vague and require more scrutiny.

Keeping things clean, maintaining an organic crust on manure basins and manure land application measures are listed as a way to reduce emissions. I don’t believe these practices are a solution to emissions. Injecting manure into the soil may help with emissions but the amount of manure produced by this project, would seem to far outpace the ability to spread it across existing Daley farm land and third party land (unknown acreage or oversight) without over saturating the soil with manure and depleting the health of the soil.

Several other mitigation offerings such as planting cover crops to sequester carbon are listed as actions that Daley “may” take, not “will” take. And those are still not mitigating the GHG emissions.

Coupled with the fact that the Daley Farm has been out of compliance for run-off issues and faced little or no apparent repercussions from those infractions, approving this mega farm of an anticipated 5,968 animal units seem like a recipe for disaster. I am appalled that there was not a full Environmental Impact Statement done on this proposal. If this is not denied, it most certainly merits the EIS.

My other, higher concern is for the ground water of this region of Minnesota. My husband works in Lewiston (the closest community to the Daley Farm) and along with many of his coworkers, will not drink from the public water supply there. The contamination has been an issue historically in Lewiston and the MN Department of Health data shows the the incidence of all cancers in the last reporting cycle is higher for Winona County than the state average. The incidence of breast cancer even higher. We have to ask, what are the causes? Approval of this mega farm would only add to the health uncertainty and compromise natural resources Minnesotans so highly value.

According to the Daley Farm Environmental Assessment Worksheet, manure will be spread on land where Karst features exist (sinkhole, cave, resurgent spring, disappearing spring, karst window, blind valley, or dry valley), risking contamination of groundwater which can affect public drinking water. 46 million gallons of manure a year are expected to be produced at the expanded Daley Farm.

News reports from our area have chronicled pump failures, leaks, overturned tankers and stormwater overflows that have dumped hundreds if not thousands of gallons of manure into our waterways. This is an exponential risk considering southeast Minnesota’s porous landscape and the trout streams that criss-cross this area. Just last September there was another fish kill on upper Garvin Brook not far from the Daley farm and feeding into the Mississippi. The DNR was unable to determine what or who caused the kill but the MPCA was suspicious that a stockpile of manure waiting to be applied to nearby fields was a potential culprit and quite certainly it was caused by crop runoff of some kind. With wells in the area already testing high for nitrates, the risk from this project is too high. Additionally, the demand on resources will be great as the Daley Farm’s yearly water use alone is estimated to be 92 million gallons per year with the expansion.

I would ask that this permit be denied. If a complete EIS is not done for this project, it will be clear that big agriculture comes ahead of the health of SE Minnesota residents and our precious natural resources.

Respectfully,
Liz Wilson
460 Sunnyview Dr
Rollingstone, MN 55969
Dear Ms Kim Grosenheider,

I am a lifelong Mn resident and a member of the Land Stewardship Project. As a citizen with concerns for the environment, food safety, and the farm economy; I am troubled by the past approval of this project without an Environmental Impact Statement. Here are some on my concerns:

1. Environmental: I am especially concerned about water quality of this delicate Karst area. Already many wells, swimming streams, municipal water systems are unusable or costing much money to reduce the nitrate pollution.
2. Food quality: The organic food movement is based on the desire for all agricultural production to be reducing chemical, antibiotic, and hormonal inputs to harvest food that is heather for people, enhance the lives of the animals and the environment.
3. Economy: The farm economy and rural life is enriched by smaller producers contributing to a better overall economy and cultural health of the state of Mn.

Thank you for reading my letter and weighing my concerns; an original copy of this letter was sent to Commissioner Laura Bishop by mail.

Please require an EIS prior to any approval of this expansion considering the giant increase of animal units required, which would be incompatible with the above concerns and goals.

Sincerely,
Coral Bastien
2709 E. Minnehaha Pkwy
Mpls. Mn 55417
gregmsea@aol.com

Sent from Mail for Windows 10
Kim Grosenheider, MPCA

Laura Bishop, Commissioner fo MPCA
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Commissioner Laura Bishop,

Please use your influence to order an Environmental Impact Statement or deny permitting on the massive animal factory proposal of the Daley Farm to expand by 3,000 cows to 4,628 head. The massive feed lots and waste will only increase environmental contamination.

Though I am a city dweller I value the need for clean water and air for all Minnesotans. Please deny this permit.

Respectfully submitted,

Judy Solmonson
4300 West River Pkwy
Minneapolis, MN 55605
Ms. Grosenheider:

I am writing with great concern regarding the request by Daley Farms to expand their dairy operation. I grew up on a beef/grain farm in Illinois, and I have spent most of my life in agricultural technical education. While I am sympathetic to agriculture endeavors, I will argue against proposals that favor expansion of operations that jeopardize the environment both near and more distant. The density of livestock in the Daley Farm operation is very high risk during this period climate change and intensified weather events. Any permit analysis must be based on the best facts that can be found and the most extreme estimates of weather events. Even though I come from a farming background, I do not support exemptions or variations from standard environments reviews. There is a tendency during these reviews to make assertions that can no be substantiated; that cannot be allowed.

Thank you for your consideration of my concerns,
Robert Krumwiede

Robert Krumwiede
1504 North Rd
Duluth, MN 55811
218/728-5723 (H)
218/349-6313 (C)
Dear Kim Grosenheider,

I respectfully request that you deny the permit for Daley Farm to expand its mega-dairy in Winona County. I firmly believe that two issues should be considered, first, that increasing corporate farms in itself does increase to probably greater pollution and second that it appears to present a real risk of environmental damage at this specific location.

If you do not simply deny the permit on these grounds, at least do an EIS study.

Thank you.

Sincerely,

Dale Jacobson

a Minnesota citizen,

Alvarado, MN.
Dear Commissioner Laura Bishop,

I write on behalf of myself, spouse, and our three daughters! Please protect our beautiful state by mandating dairy and other "factory" farms complete environmental impact studies. If they refuse, I hope you will take the brave stance of denying their permits. Protect our water. Protect our land. Protect this amazing, natural state so the next seven generations can live healthy and enjoy all the camping, hiking, paddling, and fishing that Minnesota has to offer!

Many thanks,

[Signature]

Tyler Bouweke
Dear Commissioner Laura Bishop,

My heart aches for the people who live in southern Minnesota. I grew up on a dairy farm in southwestern Minnesota, when we were able to make a living on 160 acres.

Now we have the predatory agribusiness giants who are ruining the land, water, air and communities. Their motto is, “get big or get out.” It’s time for a change.

Dairy Farms must maintain compliance with state regulations for run-off and other issues. It’s time to take on the predators of industrial ag.

Sincerely,

Shirley Espeland
2250 Luther Place #104
St. Paul, MN 55108
Dear Commissioner Bishop,

As a member of the Soil Stewardship Project, I cannot believe this hearing increasing the size of its operation to more than twice without an Environment Impact Statement plus all the other regulations needed for water safety, manure storage, enough acres for manure spreading, and air quality for the neighboring area.

As a farmer from southwestern Minnesota, I like Winona County's cap of 1500 Acre zoning ordinance for it is not enforced.

I ask for an F15 on this witness project.

Sincerely,

[Signature]
February 23, 2020

MPCA Commissioners
Laura Bishop

Dear Commissioners,

I am concerned about the Daley Farm proposed expansion because I live only 2 miles from them on a farm.

So far, my water is OK and I want it to stay OK, and have enough.

Adding that number of Cows would be using so much more than their fair share of water and possibly polluting the groundwater. Once our groundwater is spoiled, how can it be fixed?

So many cattle in one place would also pollute our air with greenhouse emissions.

Please—an EIS is needed.

Sincerely,

Charlotte Pughcock
1834 Lower Anthony Dr.
Utica, MN 55779
Dear Commissioner Bishop,

As a rural resident of Fillmore County whose home and small business (14 room inn in Lanesboro) relies on clean and safe water from our unique and fragile Karst geology, I strongly urge you to order an EIS on Daley Farm in Wacona County. The EIS needs to be conducted on the entire project, including on the greenhouse gas Supplement. An industrial-scale animal facility is not exempt from being ordered to undergo an in-depth environmental review through an EIS (Minn. Statute 4110.4600 Subp. 19). Daley Farms has been out of compliance with state regulations for run-off and other issues, including violations with the MPCA’s feedlot division that have gone unenforced for over 22 years.

Our fragile Karst region needs to be respected and protected from Daley Farms’ too-large dairy operation. Please conduct a full EIS now or deny the permit. Our drinking water and air quality depend on it!

Sincerely,

Avisin B. Scottsro, M.S.
Preston, MN
Dear Commissioner, Business,

RE: DALEY DAIRY

I am a 72 year old man who has lived on a 30 acre parcel in Dodge Co., Carleton Twp. for nearly 35 years. I have seen most dairy farms shut down in our area with only a few very large dairy farms remaining. I know this is happening elsewhere, including Winona Co., as well. To me this is no reason to thoughtlessly sanction huge dairy operations without regard to environmental considerations. There is a good reason for the animal unity limitations in Winona Co., namely the geology. Ignoring the risk posed by a more than 4600 head cow operation on top of the already compromised drinking water situation in the area is irresponsible.

Rellying on any EAW makes little sense considering the potential risks to water and air quality in the area. Furthermore, the proposed cow increase is not only a threat to pollute the water, there is a significant question as to its impact on water demand. Aquifers aren't contained within property boundaries.

It seems to me that the reversibility of a failed manure system is extremely problematic. This should be explored in detail.

In short, it seems to me that the extent of the proposed deviation from the County's animal unit limitation calls for an EIS. I know they are expensive but considering the potential burden on the neighbors it seems justified. After all this is not a situation where people are moving in to an established 4600 head year-round.
operation and then waiting government to intervene on their behalf to reduce known impacts.

Thank you for your consideration.

Very truly yours,

Joe Whenev
I'm writing to urge Commissioner Laura Bishop to use the power she has under MEPA to order an EIS (Environmental Impact Statement) or deny permitting on the massive animal factory proposal made by Daley Farms.

I grew up on a family farm where farmers and their neighbors were conscious of how their farming practices needed to be in line with protecting safe drinking water, air quality, health, and quality of life for all their families. I can't imagine the irreparable damage to the environment and to people's lives that Daley Farms' proposal would impose on Winona County and ultimately our state.

Sincerely,

Audrey Lindhöfer
Suzanne Swanson
1507 Osceola Ave
St. Paul MN 55105

February 22, 2020

RE: Daley farm EIS/denial of permit

Laura Bishop, MCPA Commissioner
Dear Commissioner Bishop,

I am writing as a lifelong resident of the state of Minnesota (71 years), and as a member of the Land Stewardship Project. I am not currently a farmer, but I come from generations of farmers -- and some of my relatives do still farm. My father was a soil and water conservationist for the federal government, and I grew up attuned to the importance of solid, careful farming practices that would preserve, even grow, the health of our life-giving land and precious water.

When it comes to expanding the already-huge Daley dairy, it makes no sense that your predecessor would have ignored or inadequately addressed findings of fact from the DNR, nor information from karst expert Dr. E. Calvin Alexander. Communities in the sensitive karst region in SE Minnesota are already living with nitrate-contaminated water. Some are dealing with poor air quality that can diminish health or exacerbate existing conditions.

The current EAW recommendations are inadequate and inaccurate. A much deeper and intensive analysis is needed to substantiate estimates of potential emissions, and to create specific, achievable and sustainable recommendations for controlling greenhouse gasses. Also, without more information and analysis, we can’t easily predict amounts and effects of air and odor emissions for this size diary operation (which would be 9-23 times bigger than the typical Minnesota dairy).

We need a full EIS to gather critical data and analyze it. Commissioner Bishop, your agency’s charge is to “protect and improve the environment and human health.” You have the opportunity and the responsibility to require an Environmental Impact Statement on the greenhouse gas supplement and on the entire Daley dairy expansion project. Or you can deny permitting the expansion.

Please protect the citizens of Winona County and SE Minnesota, and restore to the citizens of Minnesota their trust in the Minnesota Pollution Control Agency.

Sincerely,

Suzanne Swanson
MPCA’s Environmental Review & Feedlot Divisions Are BROKEN. Commissioner Bishop has the Power to Make it Right for Our Rural Residents Regarding a Winona County Factory Farm

Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs) to 5,968 AUs. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal — share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line:

- An industrial-scale animal factory is NOT EXEMPT from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conduct a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. Insufficient Information. Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf. It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf.

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have never recommended an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to STOP pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
Dear Commissioner Bishop,

I am a corn & soy farmer in Winona County. I grew up on the farm and now I am raising my family here. Farming is a tough go and I get that. And sometimes it can feel like farmers are getting the short end of the stick. Despite that we have always worked hard to care for the land as best as possible. It is our legacy. I can't look at my daughter and not think of that. And that is why it saddens me to see global carbon emissions & greenhouse gas emissions going through the roof. You can't tell me that it doesn't look pretty bleak for the future of our planet.

We can't let this run away from us. It is in our power, more specifically your power, to make sure the worst emitters don't get a free pass. This Daley Farm expansion in Lewiston should be looked at with a critical eye. They must be required to go through an in-depth environmental review. It would be negligent not to. Please make them submit. My daughters are counting on you. I am counting on you.

Kind, yet urgent, regards, Josh Otte
2-23-20

Dear Ms. Groenheider,

Please use your influence and power to stop the expansion of the Daley Farm. My concerns about their continued growth include:

- The impact on the sensitive karst region
- The pollution of underground water reservoirs
- The greenhouse gas increases
- The concentration of cow manure in one place
- The apparent lack of long-term environmental protection for the benefit of our "family", the Daleys.
- The incomplete process by which an Environmental Impact Statement (EIS) was not included.

Please keep in mind that a land of 10,000 lakes (aquifers), not 10,000 sludge holes.

Thank you for your time.

Sincerely,

Chris Hughes
3515 Snelling Ave N.
Arden Hills, MN 55112
Dear Commissioner Bishop -

Thank you for your work and all you do to protect and manage Minnesota resources.

As a land stewardship member I implore you to think critically about the Daley Farm proposal in Winona County. Not only does this proposal come from a farm that is already out of compliance with state regulations regarding run-off, but it is unexcusable that an industrial scale animal factory could be exempt from an in-depth environmental review through an EIS.

Furthermore, we are in a farm crisis. Dairy farmers in particular are struggling to stay afloat in a market flooded with too much milk and unsustainable prices. Hundreds of smaller MN dairies have closed in the last few years. Supporting vertically integrated industrial dairies will not save any of us, much less the environment. If you want to support farmers work with the MDA to keep multiple smaller dairy farms in business.

I ask you to deny permitting to Daley Farm or order an EIS. Together we can support the dairy industry while also protecting Minnesota’s most geology and all the people and flora fauna that drink from our waters. Water is life. Be brave. We are with you.

Lebo Moore
February 23, 2020

Minnesota Pollution Control Agency
Commissioner Laura Bishop

In the early 1970's I went on a science museum sponsored tour of the karst region of southeastern Minnesota. The activities included exploration of an unmapped cavern in the limestone and viewing some of the many sinkholes.

The guide told us of the historical concerns of local citizens over their need to convert to more modern sanitary sewage treatment. Citizens insisted that in their region they had sinkholes. Mother Nature would cleanse any toxic materials that sunk into the ground.

Scientists explained but were not believed, so a public experiment was designed. A fluorescent dye would be poured into a sinkhole. Then downstream well water samples would be viewed under ultraviolet light. The glowing dye would clearly show the time needed to flow the few miles to the town water source.

Locals laughed that the science team would grow old awaiting the traveling dye. The actual travel time was measured in a few short hours.

Clearly the valued groundwater flow could easily and quickly carry pollutants into the natural environment and to community water.

The Daley mega-dairy is an industrial scale animal factory in Winona County. It should not be exempt from being ordered to undergo in-depth environmental review through an Environmental Impact Statement. A tripling of the animal population should not be allowed.

Sincerely,
Chuck Nelson
Land Stewardship Project Member
2694 Apache Road
North Saint Paul, MN 55109
Commissioner Laura Bishop,

After reading letter in mail, I will give a few comments. We all know that all types of pollution are harming our health. The water problem in Flint, MI should have woke up all of us as to what polluted water can do to ones health. The children in Flint MI and the surrounding areas had some terrible health problems with the water from drinking it too long. It sounds like this problem has gone on for 20 years as was said in letter. Why did it go this long? We in Minnesota do not want a problem like the Flint, MI area had. Get then soon an EIS on the greenhouse gas supplement on this entire project for this area.
Dear Commissioner Bishop,

I am writing with my concern about the proposed CAFO Farm expansion. I live in Dodge Co. in the Country. I am very concerned about this proposed Mega Farm or other that could follow. I can already smell a cattle operation where I am when the wind blows from the S.E. It is NOT a pleasant odor. That and other environmental factors must be studied and reported on before this farm is given an OK. As I understand it that is the law, and it should be enforced. We, like many, live in the Country for specific reasons. Mega Farm Stench & run-off severely impacts our quality of life in a negative way.

Thank you for your consideration of this matter.

Roxann Wright
my thoughts are with you as you take on this serious task to increase an already large dairy in this area.

The Daley Family families are good people. In short they believe the improvements they desire, can only come in this manner. What we really need is a smaller dairy processing plant - more local - less fossil fuel use.

Community healing,

my thoughts are with you because your decisions will have an impact for good health or sickness even life or death here on earth.

I'm leg-farmed with my first family. Now with my husband a son, daughter-in-law family.

My mother was the first recipient to be told "You're Not Big Enough." The egg industry would not pick up her eggs anymore; my first real job on the farm from 8-12 year old was packing eggs. I never forgot the feeling. We had some pigs - same thing.
• We moved back to this farm in 1983. The nitrates were 3 by 2008 they had spiked to 48. We drilled a new well, 926,000 later it was not a solution we battle high iron. By 2008 many small family farms were leaving others increased cattle numbers - changed the manner of raising from grazed herds to total confinement like pig, chickens less diverse crop manure changed from stock manure (carbon based manure) system to liquid. Larger dairies knife in this liquid - no one is monitoring the speed it can enter aquifers.
• Nature always commands a balance + honesty.
• Please do demand an EIS
• It can only help change Federal Farm Policy that is so biased. Smart mid family farmers are denied same treatment as big-
• It will help to force a move away from corn/bean rotation that brings more chemical to the land. Chemicals with known carcinogens. The chemicals also chelate necessary minerals and act as an antibiotic destroying our microbial life in the soil.
• All of this allows liquid manure to pollute soil, water, air easier.
• The Dairy Industry treats the small-mid family farmers differently. They refuse to pick-up their milk even if they drive by or they charge more for milk hauling than the big are charged.
• We need to correct the real issues facing dairy-
• People are not drinking milk—until the animals are raised in a manner that does not cause allergies etc. we have no need for this size.
• What I've seen with more animal concentration or no animals on the land is excessive chemical use.
• We have 4 organic dairy farms and other organic farms within this 7 mile radius of Daley's. 
  Arial fungicide use increases with size.
  Organic Valley has quota plus milk hauling.
  It's more for same bar. It all works!

I'm sending C'0's from works.
our keynote speakers in Mpls.
2019 - It's time consuming -
you will have a better picture of all of agriculture.
70% of the world's population
is fed by peasant farmers - Dr.
Zeich points out.

Thank you.

Galen Nelson
19475 Co Rd 33
Alberta, MN 55910
(I07) 796-6233 or text (507) 696-7914
ACRES 44TH ANNUAL
2019 ECO-AG
CONFERENCE & TRADE SHOW
DECEMBER 9-12
Minneapolis, Minnesota

Grounds for a Revolution
THE INTERSECTION OF SOIL AND HUMAN
HEALTH AND A PATH TO RECOVERY
Presentation by Dr. Zach Bush

VIDEO • 1 HOUR, 36 MINUTES • 1 DISC
MPCA's Environmental Review & Feedlot Divisions Are BROKEN. Commissioner Bishop has the Power to Make it Right for Our Rural Residents Regarding a Winona County Factory Farm

Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs) to 5,968 AUs. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line:

- An industrial-scale animal factory is **NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conduct a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. **Insufficient Information.** Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at [https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf](https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf). It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at [https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf](https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf).

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have **never recommended** an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to **STOP** pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

[Signature]

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
Commissioner Laura Bishop

The increase from 3,000 acres to 46,28 is too much to an already fragile protection of 1,500 acres

For next a ferns. They have their problems. That we have to protect what has already been fractured. Use your own definition to realize all that remains of basic protection.

Alene Fleming

Mostly concerned
Dear Commissioner Bishop,

As a long-time member of the Land Stewardship Project and a retired township clerk and member of the Kandiyohi County planning commission, I am writing simply to ask that you halt the Daley mega-dairy application in Winona County.

These mega-dairies and mega-hog farms should not be allowed anywhere in our beautiful state; but especially in the karst geology of SE Minnesota.

Please do what is right for all of Minnesota and our environment!

Sincerely yours,

Howard Patrick

Mr Howard Patrick
124 Birch St. SE
New London, MN 56273
Dear Laura Bishop

I am a retired farmer and still own our land. I would call myself a sustainable one. We live between two factory farms. We have lived with foul odors. We see the rot and destruction of the land around us, with constant greed for our farm. Such progress destroys the land and health around us. It is not healing the soil. Our industrial agriculture has made such progress that tilth no longer exists.

With loving care and health for the land, we remain,

Bernie and Mary Ann
Walsh
Dear Commissioner Bishop,

In this morning's "Star Tribune" we read the sympathetically written article on the Daly family and their efforts to preserve their farm by continuing to expand their operations. A large photo of a grandson carrying a calf and smiling accompanied the article. My husband and I could not help but feel for the desperation of this family to keep farming.

However, as non-farming members of the local stewardship project, we also have deep feelings for the suffering soils, to waters, and air that have resulted from decades of ever larger and more extensive industrial farms. Growing up on a farm in SD, MN, when farms were more all small-town supported, clinic, hospital, schools, I can see first-hand how political pressure from the agricultural industry has decimated rural life and the life-giving qualities of our Earth. This is wrong, and I believe you know this is wrong, too.

The degradation of our planet and the public's lack of power to protect itself is becoming the focus of much economic and scientific research. All the evidence points to the failure of "get big or get out," and leads us to make toward local economic, regenerative agriculture, and efforts to provide clean, drinkable water, air quality, and other public goods.

Please, Commissioner Bishop, use your power under the Maine Environmental Protection Act (MEPA) to order an EIS or deny permitting on such massive animal factory proposals as the one demanded by the Daly family. It is tragic - they are caught up in a system that is out of control and rapidly leading toward destruction. All farm families should be helped to do the right thing.

Sincerely,
Laura and Jan Reedeke
February 24, 2020

Laura Bishop, Commissioner
MPCA
520 Lafayette Road North
St. Paul, Minnesota 55155

Dear Commissioner Bishop:

Re: Factory Farming - specifically Valley Farm Windsor County

I write to you today with an urgent request to deny expansion of mega dairies in Minnesota. Your duty is to support the MPCA’s mission, which states acting to "protect the environment and the health" of its citizens.

Our air -- our water -- our soil (all of which are essential to good health) are under assault by federal policy -- and also state policy.

(your)
We, the citizens of Minnesota, Count on our legacy (which you hold) to respect all aspects of your mission.

I request that you act on my behalf and on behalf of all Minnesotans. Deny permission for continued growth of industries which pollute our air, water and soil and then our health as well.

These are public health issues which MUST be decided on what is in the best interest of the public (not on corporate interest).

Thank you for doing the right thing on this issue.

Respectfully,

Merilee Krukonis
Citizen
(SAED Stewardship Member for 18 years)
LAUREN BISHOP

KEEP FAMILY FARMS KEEP WATER CLEAN

STOP POLLUTION KEEP AIR CLEAN

SAVE THE PLANET

Mel and Sharon
Dear Commissioner Laura Bishop,

I am writing to you today to ask that you listen to the concerns of the citizens of Minnesota, and use the authority as our Commissioner, under MEPA to order and EIS, or deny permitting on this massive animal factory proposal for Daley Farm's.

I have lived in Minnesota almost 17 years, 18 years in Illinois, and California for 19 years. Over my lifetime in all of these agricultural dominate states, the environment is at risk if we don't take proper action to ensure the impacts on the soil, air and natural surroundings. The mega farms like Daley Farm's are using their capital to buy market control and do as they please. Do not be a law maker who buckles to fear and corporate intimidation.

Again, I ask you to use the power you have to protect Minnesota natural beauty for generations to come.
Stand up to Daley Farm's and demand they do the EIS and remove their NPDES.

The future voters are aware we need to protect our natural world - be a leader who joins them and leads them to a brighter future filled with all the hope for farms that respect our environment.

Yours Truly,

Margaret Spercher
Margaret Spercher
February 22, 2020

Dear Laura Bishop,

Minnesota needs you to use your power under the MEPA to order an EIS or deny permitting of massive animal factory farms. Winona County’s citizens and all people in southeastern Minnesota karst region are in need of protection from further contamination of drinking water. Daley Farm’s proposal to expand a mega dairy farm needs to be held accountable for increases of threats to water quality. Also, there is needed a greenhouse gas emissions review.

I grew up in Cottonwood county on a farm with a shallow well with clean water. Currently due to pollution this area has a lot of farmers required to be on Red Rock rural water. Water contamination is serious and the solutions very expensive and shapes the way farmers live and grow crops and livestock. I want Minnesota children as future consumers and farmers of this land to be resilient and able to have clean water. Please use your power to do what you can to regulated sources of water use, contamination and clean-up. Rural Minnesota needs small farmers who care, are wise in water use and are resilient.

By Angie Walter • SFA/DGA Education Coordinator

This study looked to identify the characteristics of resilient farms that impact farm financial health. The data was taken from FINBIN (financial data) and DHIA (cow records) from 2012-2018. The data show that there were 24 out of 87 farms in MN that were considered resilient. The average farm size was 84 cows showing that small herds were the most resilient. The average age of the resilient farmer was 41 which is about 10 years younger than the state average. Resilient farms produced 17 percent less milk per cow but had a $0.52 increase in milk price which was mainly from components. Resilient farms were more focused on producing quality milk instead of quantity.

The main takeaways from this study are that resilient farms in MN are mostly smaller family dairy farms. They value milk quality premiums over volume. They have a plan and they stick to their plan regardless of what milk prices are doing. The resilient farmers are generally younger and value educational opportunities to help them succeed.

Minnesota Farmers and Consumers need you to use your power to require in-depth environmental review through EIS (Minnesota Statute 4410.4600 Subp. 19).

Sincerely,
Carol Harder
Feb. 23, 2020

To Commissioner Laura Bishop of the MN Pollution Control Agency

Dear Ms. Bishop,

Clean water and fresh air, a right and a responsibility for all, are most critical to the well-being of all life, especially human life. MN statutes have been put in place to protect and improve the environment, human health and indeed the whole planet.

In particular, we are very concerned about a proposal to expand the Dally mega dairy in Hinoma, MN. Already one of the largest in MN, it wishes to over-reach itself from 225 to 5968 animal units on the same area of land.

This SW MN karst region is riddled with nitrate laden drinking water and poor air quality. Health conditions are threatened for humans, animals and plants alike.

MN statute 4410.1700, Sub.7 should hold the Dally farm accountable for potential and cumulative effects to all concerned. It is the job of public agencies to hold factory farms accountable to their rural communities and land. Holding 1000's of cows in one place, storing their manure in earthen lagoons, causes seepage into underground trails and pollutes the water. See also: MN statute 4410.4600 Subp.19.

Please consider this critical issue NOW and produce a practical, thoughtful, fair outcome for all.

Thank you for listening/reading and acting!

Mary gratefully,
Carmelle Matalich, SSND
February 24, 2020

Commissioner Laura Bishop:

The basic responsibility of people inhabiting the EARTH is to respect and care for this Habitat for Life of various kinds and descriptions.

Presently, the Darkness that human beings are experiencing in many essential ways of reality, lead to behavior that is destructive of life in all forms and our protection of life.

Daley's mega-dairy with its corporate Farm Structure asking to expand its animal units etc, is affecting water pollution, effecting life and other facts which give negative impact on Earth and life on this planet.

I believe you are responsible as Leader of Minnesota Pollution Control Agency to require our Earth's vitality to be respected through choices allowed corporations and state decisions. I trust you will proceed with wisdom, justice and respect for Earth and Life.

My deep gratitude and respect for wise, life protective leadership.

Sincerely,

[Signature]

Cathryn O'Donnell, S.S.N.D.
Ms Grosenheider,

Please protect MN Citizens by ordering an EIS on the Daley Farm proposal to expand its Dairy

This expansion exceeds the Winona County cap of 1500 AUs. I have a great fear that such an expansion seriously threatens the water purity. I also don’t believe the farm nor the Dept. agencies are equipped to monitor & protect against other environment concerns.

Greenhouse gases regulations need to be made clear, and especially not be left to the Daleys to monitor.

Another option that would be benefit to citizens would be to DEEPY the proposed animal expansion of the Daley Farm.

Sincerely,

Darlene M. Metzler
Hello,

I am not in favor of allowing the expansion of Oakley Farms dairy operation in Winona County. The reasons are many, water quality issues already an issue in this area and are very susceptible to additional pollution. Surface and near surface waters have direct connections to subsurface waters. These waters are private and public resources and should not be threatened by this or any business. The roots of private property rights are to protect you from your neighbors actions, not to allow your neighbor to do activities to damage your quality of life.

Zoning should matter to protect you from your neighbors. Zoning variances undercut these protections. Oakley's should not be granted any variances. They already are beyond what the public and neighbors have decided is the limit to protect the land, water and lifestyle they hoped to have in their community.

Thank you for the opportunity to comment.

Steve M. Kittelson
February 23, 2020

Maria Lindberg
1200 Oak Knoll Dr.
Blue Earth, MN 56013

To whom it may concern:

On Wed., Feb. 19, I received a petition from Barbara Sehn-Frank, project manager for Land Stewardship. She asked for letters of opposition to the projected increase in animal numbers at the Daly Farm located in SE Minnesota. Daly Farm is located in the karst geological area of the state where run-off from dairy kind of polluting entity results in much more pollution elsewhere... than in more impervious ground structure.

Today, Sat., Feb. 22, the Star Tribune had a front page article on the projected increase in animal numbers on this farm. Accompanying it was a photo of a young family member holding a new-born calf that he was moving from the maternity barn to another facility. I'm sure that this young man cares for these animals - likes them - but my initial reaction to the picture was: "the mother cow didn't even have the opportunity to clean her baby!" Such disregard I consider inhumane. Cows are sentient beings - as we are, and should be deserving of respect for who they are.
Animals kept in such large numbers are treated like commodities. I have a problem with that. Probably only farms that qualify as organic or sustainable produce products that honor the lives and the gifts from each animal.

With milk prices so low, it seems to me there must be better ways to increase income than just adding more livestock.

Sincerely,

Maria Friedberg
Dear Commissioner Lauren Bishop,

darin writing to oppose expansion of Daley's mega dairy farm in Winona County. Our people, our water & the health & welfare are counting on you. We believe you have our best interest in mind - and can see the whole picture.

We simply cannot favor big agriculture, and not see the impacts to water, health & communities today.

Sting decisions put us all in danger & do not represent the agency's goals or values. Please help us recover our community health.

Please help us recover our community health - environmental degradation (water, land, air) these machine-like farms impose.

Thank you for your service & for your commitment to protecting MN and its rural communities.

Halley Spender

RECEIVED
FEB 26 2020
Dear Ms. Bishop,

I write this letter with great concern about our environment as it pertains to the Daley's Mega Dairy. The zoning ordinances in the Winona County area need to be upheld. The animal unit cap of 7,500 is trying to allow other family farms a chance to make a living on smaller farms. All farmers should have a fair share of the limited water supply and families in the surrounding area must not be burdened with excessive waste and costs that will be encountered because of such a huge proposed project, i.e., polluted air, suffocating odors, increased costs related to transportation. The environment needs ALL of us to keep it healthy.

I admire farmers striving to make a living by increasing production but we must protect all people. Financial benefits to such a proposal benefit one enterprise but harm countless others who are trying to live with much less and are suffering because some farmers (Factory Farms) do not know that "Enough is Enough." We must all be called to reverence and respect the bigger earth picture and make decisions for the good of ALL.

Please do not allow the proposal for the Daley's farm project to pass. My own nephews who operate a dairy farm of 125 cows will suffer from such an increase.

Many people are watching this decision-making process closely. We are greatly concerned.

Sincerely,

Sister Solange Hennessy, SSND
February 24, 2020

Commissioner Laura Bishop
New Mexico Public Health Cabinet

Dear Commissioner Bishop,

I am writing with concern regarding a needed Environmental Impact Statement regarding the Daley farm in Huerfano Co. near Newrino near my own family farm north of Durango where I reside part of my time.

The Driftless SE MN karst region is unique in that water/liquids pass quickly through the soil to lower levels – meaning our wells for our drinking water.

Our farm’s water nitrate level is high – I think it as do most of the family visiting but we do have a note not to give to babies. Some family members bring bottled water. I do not want to buy bottled water as I know many times its...
Source is taking away from the local communities where it originates and they suffer.

I am a member of Land Stewardship Project and am grateful for their continued study in keeping our wonderful SEMN creative gifts in place for future generations.

Again, the Daley proposed dairy increase needs a strict EIS and any other assessment. Our area is unique. The topography is very porous.

With peace and gratitude

S. Ann Redig
February 24, 2020

Commissioner Laura Bishop
c/o Ms. Kim Grosenheimer, RMAD-MPCA
520 Lafayette Road North
St. Paul MN 55155-4102

Dear Commissioner Bishop:

I should like to ask the Minnesota Pollution Control Agency to require a full Environmental Impact Study for the Daley Farm proposal to expand its mega-dairy in Winona County. The operation as envisioned threatens the fragile surrounding environment with overwhelming pollution and should by denied unless an EIS can show otherwise.

I call on the MPCA to demonstrate that protecting Minnesota’s resources is its prime concern when faced with a private interest that would despoil natural wealth to the detriment of neighbors.

Very truly,

[Signature]

Elizabeth S. Dugan

Cc: Barb Sogn-Frank, Land Stewardship Project
February 24, 2020

Commissioner Laura Bishop
C/O Ms. Kim Grosenheider, RMAD-MPCA
520 Lafayette Road North
St. Paul MN 55155-4102

Dear Commissioner Bishop:

I am concerned that the Minnesota Pollution Control Agency's decision to bypass a full Environmental Impact Study on Daley Farm's proposal to expand its mega-dairy in Winona County destroys public trust in the Agency. The Daley proposal clearly threatens the surrounding environment. Please, take action to require an EIS or to deny the proposal.

My personal interest as a citizen is to ensure that Minnesota government protect the environment throughout the state for my children and grandchildren. The MPCA must stand against economic development that devastates resources needed by others.

Very truly,

J. S. Dugan

Cc: Barb Sogn-Frank, Land Stewardship Project
February 23, 2020

Commissioner Laura Bishop
MN Pollution Control Agency

Dear Ms. Bishop,

I am writing to express my concern that the MPCA failed in its responsibility to protect Minnesota’s environmental and human health when it denied the need for an EIS for Daley Farm’s proposed expansion of its feedlot to over 4,600 cows. An industrial scale animal factory is not exempt from the EIS requirement. It is ridiculous that the MPCA would not anticipate how much harm the effluent and emissions from an operation this size would cause.

This is a sensitive geological area. Because of this, Winona County set a 1,500 animal cap to protect its water and air quality. The MPCA seems to be trying to force this feedlot and its resulting pollution and health hazards into the area over the objections of local citizens. This is especially problematic because Daley Farms has a long history of uncorrected violations.

Please fix the MPCA’s review process by, at a minimum, requiring an EIS. Ideally, for reasons you have already been informed of, this permit should be denied.

Christopher Olson
5106 41st Ave S
Minneapolis MN 55417
Dear Commissioner Bishop,

I am writing to ask for the MPCA to deny a permit for the proposed Daley Farm. I am a dairy farmer who prides myself in grazing my dairy cows on perennial grasses and legumes. I am improving the soil quality of my land and helping to keep a healthy ecosystem for future generations that rely on this state and nation to make wise decisions for their healthy earth. I feel that Minnesota could be a leader in this nation to stop the growth of mega-farms and protect and restore our environments. Encouraging many small farms working with the land would be much less of an environmental impact vs. compounding the nitrogen levels of one farm in a sensitive area. Not only would small farms benefit the environment, but they improve small, rural economies. The families support local schools, promote local businesses and are a part of the rural communities. Please do not be negligent when doing your job in this great state.

Sincerely,

[Signature]
Kim Froehlecker  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St Paul, Mn 55155

Dear Ms. Froehlecker,

This letter is to request an Environmental Impact Statement for the proposed Daley mega-dairy in Winona County.

Here in Cottage Grove and Woodbury, our wells are contaminated due to chemicals leached into the soil by 3-M.

In Becker, we have seen the terrible explosions at Northern Metal Recycling, where no EIS was required.

We cannot protect our air and water quality by acting after the fact.

We must have an EIS on the Daley Farm Proposal.

Your decision and the decision of the MPCA will affect the quality of life for all of us.

Sincerely,

Mabel Nichols  
6460 Lamar Ave S,  
Cottage Grove, MN  
55016

michols mabel @ yahoo.com
Dear Ms. Bishop,

I am 73 years old and I have been resisting corporate practices since I was a teenager. I was not aware of Daley's mega-dairy, ad I rely on local organic food. I am distressed to realize that is not enough, and right under my nose, people are putting profit before people. Once again.

I feel it is crucial for each of us to do the best we can in our own lives. I do not buy from Amazon or shop in line. I don't support corporate grocery or hardware stores. Yet here I might be participating in a business which is polluting this beautiful state. We have not even managed to get an environmental impact statement on a situation which common sense tells me is unsafe.

Please, Commissioner Bishop, do your best to help create a safe, healthy environment for us all for future Minnesotans. The buck stops with me, but you are in a good position to do much more for us. I'll be watching more closely.

Thank you for your hard work.

Sincerely,

[Signature]
Dean mPCA -

Each year I make many trips crossing the Midwest through these states – Minnesota, Iowa, South Dakota, Nebraska, Kansas, & Colorado. I see acres and acres of land used for grazing cattle. I also see feed lots.

It is a travesty that we are even considering more density in farming. Do we have no value to the environment and the generations to come?

One other question I would ask - How many pandemics are we risking by overconstricting our animals?

MARCIA OPSTAD

MARCIA OPSTAD
402 Woodsdale
Cloquet MN 55720
Commissioner Laura Bishop,

I am calling on you to take action against the Deley Farms request to increase the size of their already oversized mega-dairy. Their large dairy was grandfathered in when Winona Co. set an animal unit cap level of 1,500 AUs, surpassing the limit by another 50%. It seems ridiculous to allow a variance to expand their operation more, when they had already been exceeding the limit. This in itself is enough reason to deny them this ability. At some point we need to draw the line and not allow profit to rule over good drinking water or environmental issues.

Considering the Deley Farms past record of non-compliance regarding environmental issues, such as run-off I feel they do not have the right to ask for a variance and definitely not allowed to receive a pass of zoning laws when they seem to be getting a pass on environmental issues.

It is up to you to protect the citizens of this state and not the interests of one overgrown mega-farm.

Sincerely, Jack Burghman
February 25, 2020

Commissioner Laura Bishop
MPFA
St. Paul, MN 55155

Dear Commissioner Bishop,

As a member of the Land Stewardship Project, I am appalled that the MPFA denied the need for an EIS for Dreyfus Dairy Farm on the greenhouse gas supplement and the entire project—

Southeastern Minnesota is already suffering from contaminated nitrate-laden water unsuitable for drinking. And the air quality surrounding farm industries is poor due to the greenhouse gases from manure. Expanding the Dreyfus Farms would add insult to injury and, at the least, should be subjected to an in-depth, thorough environmental review.

That the MPFA has not protected the community in that area because of lack of oversight is an abdication of your duty. Expect much, much more from my tax dollars!

Not only that, I want to retire soon to that area and want a clean, healthy place to live! Industrial animal farms such as this do nothing of benefit for society—one protecting the farm owners, neighbors, the community who needs to drink the water, even the animals aren’t living in a positive environment.

Please protect them!—the people!

Martha Dow
613 Vine St., Mankato
Commissioner Bishop:

I just want to add my concern about some of the owners of big livestock operations. They choose to ignore the facts. They come up with their own arguments which really avoid the real environmental concerns.

I'm a former farmer now living in the small town of Rushford, which is 20 miles south of Lewiston. After the flood of 2007, the city had to drill some new wells, because the current ones were contaminated. They kept having to drill deeper and deeper because of high nitrate levels. Finally they found water with lower nitrate levels, however it had a high radium level so it took a high level of purification to make safe drinking water.

Gilbert Luder
PO Box 448
Rushford, MN 55971
February 24, 2020

Dear Commissioner Laura Bishop:

I strongly urge you to DENY permitting the Daley Mega Dairy farm from getting any bigger. The environment cannot handle all that MANURE to be concentrated in one area without RUINING the clean water supply; not to mention the amount of METHANE GAS that is released into the air with such a HUGE CONCENTRATION OF COWS which has been PROVEN contributes to GLOBAL WARMING. It’s outrageous that this is even an item to be debated. There are regulations and statutes put in place for a reason. This shouldn’t even be debatable!

As a Land Stewardship Project member, I urge you to make the correct decision and deny the further expansion of this Dairy operation!

Thank you,

Doreen Blohm
1099 115th Avenue
New Richmond, WI 54017
Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs) to 5,968 AUs. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience – as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project - or ask the MPCA to deny permitting.
The Bottom Line:

- **An industrial-scale animal factory is NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conduct a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. Insufficient Information. Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf. It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf.

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have never recommended an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to STOP pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
Dear commissioner Laura Bishop,

I am a concerned individual with a strong interest in public health and small, organic farming. I am a small, urban farmer in St. Paul, MN taking the Land Stewardship’s Beginning Farmer year-long course. In hopes of opening my own farming operation in western Wisconsin next year. I need to express my concern for you allowing Daley Farm’s to expand their herd significantly. It is my understanding that their farm has had many "out of compliances" and there has been no EIS Study performed. Factory Farms are moving into the past, rapidly, and for good reason. They poison our water, ruin our land, provide awful animal welfare and poor quality products - that must travel hundreds of miles before entering a store. They financially support one family vs. many small farms. It is unacceptable to have a farm of this scale without a detailed EIS report to show the pollutants
these size farms are causing. Climate change is affecting us now and will sure as hell affect my twin babies. Small, organic is the only way forward and to approve an expansion of any factory farm is to put my children's future into further danger. There is scientific proof to back all of my claims and I beg you to consider the health of the local people and the climate. Do not approve this expansion, please.

Madeleine Poling
651-235-2955
DEAN COMMISSIONER,

I'm writing this letter in hopes that the fresh water and air that was put here by powers greater than us will not be taken away by greed.

I've moved here from the Central Valley in California in 2004. I lived in the county next to dairies and row crops. The nitrate levels in well water was such everyone used bottled water. The smell and flies were such you didn't leave the windows open unless the wind allowed.

It's said some learn by others' mistakes.

Russ Feller
To: Commissioner Laura Bishop, MPCA  
From: Thomas G. Birkey, MD  
Re: Worsome plan for rural Minnesota  

Greetings:

I am a mostly retired physician in Montevideo where I have practiced since 1965. I am also a member and supporter of the Land Stewardship Project, whose values and efforts in agriculture and environmental issues I trust.

Yesterday I received a letter from them which was prefaced by this statement: "MPCA’s Environmental Review & Feedlot Divisions are BROKEN. Commissioner Bishop has the power to make it right for our rural residents. Regarding a Winona County Factor Farm II. Apparently your predecessor John Line Stind acted in an inappropriate and apparently illegal way for Dogleg Farms proposal to expand its mega-dairy farm to 3,968 animal units from 2,025 Angus even though the Winona animal unit EPA is 1,500 AU.

If this happens, I share LSP’s opinion that this is like to cause not only environmental havoc with water pollution, air pollution as well as aesthetic demise of the land. In addition, such "factory farms" contribute to the death of 'family farms,' strong communities and a good place to live and work. Hopefully you can help this situation. Thank you.

Tom Birkey
Mr. James Bishop - Commissioner
Mr. Pollution Control Agency -

Dear Mr. Bishop:

I write to ask your review and opposition to permitting the Daley Farm, in Winona County, to increase their dairy herd to 4628 head from their current 1,628 cows for several reasons.

1) The south east area of Minnesota has a sensitive karst geology with easy ability to contaminate ground water and subsequently drinking water!

2) An Environmental Impact Study has not been done.

3) Winona County has a Zoning Ordinance setting an Animal Unit Cap of 1500 animal units. Daley Farms already has 3,715 Animal Units!

4) Daley Farms has been out of compliance with State regulations with violations filed by the MPCA's feedlot provisions!

5) Factory Farms - which Daley Farms would become, will give unfair competition to multiple small dairy farmers, what will likely have to quit their dairy business!

Thus I ask you to deny their permit or at least require a full Environmental Impact study.

Respectfully yours,

NicholaeRxKleiner
February 23, 2020

Commissioner Laura Bishop
MN Pollution Control Agency

Dear Ms Bishop,

The brevity of this letter does not reflect a lack of importance to me about the issue regarding the Daley Farm’s proposal to expand its feedlot operation to over 4,600 cows. The MPCA has the responsibility to protect the environment and human health in MN. Large feedlot types of operations by their very existence create inordinate amounts of waste and emissions that can not be managed without harmful effects to the surrounding area. In addition, Daly Farms has a long history of violations that have not been enforced by the MPCA.

So this really puts the spotlight on the MPCA as to why an EIS was not required. It appears that in this case, in direct contrast to its mission, the MPCA was actually trying to suppress information about how much harmful effects this animal factory would produce.

In order to rectify this error, please require an EIS on the whole project: better yet, just deny the permit which is what should have been done.

One of the reasons I live in MN is because for the most part, the state does care about its natural environment. **We really do not want to become another Iowa.**

Bonnie Nelson
4105 30th Av S
Minneapolis, MN 55406
800 Buffalo Hills Lane, Apt 31
Brainerd MN 56401-4557
February 23, 2020

Commissioner Laura Bishop
Minnesota Pollution Control Agency
520 Lafayette Road North
St Paul MN 55155

Dear Commissioner Bishop:

I oppose Daley Dairy Farm's expansion in Winona County. Factory farms are hard on the animals involved and damage water resources, soil, and air. Big isn't better.

Quality of life must trump profit for a few at the Top.

Sincerely,

Kathleen Richards
Kathleen Richards
Member Land Stewardship Project
Dear Commissioner Laura Bishop,

As a person who grew up on a family farm, I am well aware of the manure "fragrance" even with a herd only 30 in number. Since those days (now in my 80's), I am aware of the odor when driving past farms with only 100 head of cattle. Perhaps the members of MPC A should travel to these factory farms (like Daley Farm) and sit in your car with the windows down for at least an half hour. Then, bring along a thermos that you fill from the well on that farm, and take it home to give your family members a drink of the water. Seriously!

Gertrude Lambert
Onamia, MN
To: Laura Bishop  
% Kim Grosenheider  
MN PCA  
Date: Feb 21, 2020

Dear Commissioner Bishop,

I live in rural Stearns County, which still has small to middle sized dairy operations. Recently I met with six of my local dairy farmers in Rockville to share concerns and challenges. Key to their concerns is the continued approval of mega feedlot operations. My neighbors produce quality milk but can’t get a fair price, i.e. one that covers their cost of production. The mega operations dominate and flood the market, get the bulk of federal subsidies if things go array and contribute to the loss of true family farms. They also demand excessive water, oftentimes from ground water sources. This demand in rural areas can cause loss of water to adjacent landowners. The huge production of manure requires land for spreading/injection (from lagoons), often increasing transportation to appropriate sites (hopefully). If not applied scientifically, run off/over allotment can lead to pollution of our surface and ground water.

With this said, I am very concerned about the expansion of mega dairy/swine operations anywhere but karst areas are especially vulnerable. These areas in Minnesota are already suffering from excessive nitrates in the drinking water.

I understand that an existing mega dairy in Winona County (Daley Farm) wants to expand its operation by 3000 cows which exceeds Winona County’s animal cap. This proposal should go no further in light of the existing ordinances.

We desperately need to support small/medium sized dairy families. These are the ones that steward our land + water resources in a more sustainable way. They also better support rural communities and economies. In addition they treat cows humanely as living creatures.

Please, as an important member of the MN PCA, require an EIS on the Daley Farm expansion OR better yet, deny the permitting for this entire project.

Sincerely yours,  
Linda Peck  
12299 Sauk River Rd  
St. Cloud, MN  56301  
320-685-3365  
janipeck@cloudnet.com
Dear Commissioner Bishop

For the last three years all I seem to be doing as a 74 year old grandma is actively fighting for our climate, our air, our water. I have stood in the rain for four hours waiting to get into the PUC. meetings against the Enbridge pipeline that we don't need. I have been outside in -20 degrees in Duluth as part of a stop Polymet light brigade.

I've been at too many meetings, fund raisers, and have door knocked, paraded, and phone called for my progressive candidates. I'm exhausted, yet I continue and that is why I write you today.

I am not a farmer, but I am a member of Land Stewardship Project and I see where the Daley mega-dairy farm wants to expand their herd by 3,000 more head to a total of 5,968 cows. This project just sounds dangerous to the environment, the air, certainly the water. We must recognize the immediate and future climate repercussions of this mega-farm and the MPCA needs to consider the GHG emissions.

I have spoken before the Minnesota Environmental Quality Board and have been to a number of their meetings and I do know the difference between and EAW and an EIS, and for a project as large as the Daley mega-farm, an EAW is not sufficient. An EIS is needed for time to have more public input and more detailed information and facts.

I understand the Daly Farms is and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA's feedlot division that have gone unenforced for 22 years. It's time for the MPCA to step up and implement an EIS on this large factory farm and also others.

Sincerely,

Gail Loverud, a water protector and concerned citizen
Believe

Love

Faith in our family, friends, and love for community, family, and God. The struggle of our community, church, and nation today.

Believe that your friends in the church and future family members have a special purpose and love for community. Pray for a purpose and love for community. Pray for a purpose and love for community.

Believe in a special purpose and love for community. Pray for a purpose and love for community. Pray for a purpose and love for community. Pray for a purpose and love for community.
February 22, 2020

Commissioner Laura Bishop
Minnesota Pollution Control Agency

Greetings Commissioner Bishop,

As a member of Land Stewardship Project and person who lives ¼ mile from a large hog operation in SW MN, I am writing to express my dismay about John Stine’s decision to deny the need for an EIS for the Daley dairy farm in SE MN. Already SE MN’s sensitive karst region is riddled with nitrate-laden drinking water. Expanding this operation by 3,000 cows to 4,628 head would produce an excessive amount of waste in this sensitive area.

It also appears the Mr. Stine also ignored the health risks associated with water quality but also air. Findings of Fact from the Dept. of Natural Resources, information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were conveniently overlooked when making his decision. We both know that an industrial-scale animal factory is NOT exempt from being ordered to undergo in-depth environmental review through and EIS. (Minn. Statute 4410.4600 Subp. 19)

Sadly, leadership at the national level has brought increased industry influence and political pressure to overlook fragile biomes, local economies, people’s health, and quality of soil, air and water. You can change such a trajectory. A thorough EIS for this factory farm is critical, the sensitive karst region calls me to ask for a denial of the permit for this huge animal factory as well.

Sincerely,

Darwin Dyce
1764 330th St.
Ghent, MN 56239
To Commissioner Bishop, 2/24/2020

I am writing in strong opposition to the proposed permit to allow Daley Farm to create a huge mega-farm dairy.

You have received sufficient information as to why this would be a very poor decision from the environmental pollution standpoint. I would like you to also consider the personal impact.

We in Minnesota are proud of our family farming traditions. Not only do smaller farms keep rural families intact, but also small businesses rely on local buyers and employees.

Mega dairy farms destroy this local fabric. They often buy in bulk from non-state businesses and cause farmers and schoolchildren to leave. The snowball effect can be devastating.

Thank you for listening. John Lymaster
John Lymaster
763-423-9665
Feb. 24, 2020

Dear Commissioner Bishop,

I urge you to order an in-depth environmental review of Daley Farm in Winona County. Factory farms should be held accountable to Minnesota environmental regulations to protect our land and water.

We live near small local farms and there are concerns in the area with chemicals, odors, water quality of our rivers, etc. I can't imagine living near a huge factory farm as the concerns must be ever so much greater. Please protect our natural resources for future generations.

Sincerely,

Nancy Bud
St. Joseph, MN
2/23/20

Dear MPCA Commissioners Bishop,

I am a resident in Otter Tail County, MN - an area that has many lakes. I'm concerned about all possible pollution dangers in this state, especially since I lived away from the area for a number of years and returned to find Minnesota's waterways and land much more polluted than when I left. As a farmer's daughter, I am well aware that we need to also be stewards of our land. While expanding a dairy operation would never normally bother me, something my Dad did numerous times in his life, I believe there always needs to be an eye on keeping pollution under control.

Dakley Mega-Dairy may overextend the area of Minnesota it is current wanting to expand in terms of possible pollution. I can't imagine living next to a farm this size and how that affects air quality, water resources and land values. As the person in charge of pollution control, I would hope you have some kind of impact information on the water resources in the area. If not, I would ask you to consider allowing this farm to expand its operation. I would hope you have some kind of study on the air quality affecting the people in that area. If not, I'd ask why not?

I doubt that the long term, cumulative effects of this operation will be in the best interest of the people of Minnesota. Nor will it help the other smaller operational state wide which strive to act responsibly in their dairy productions.

Please reconsider allowing Dakley to expand.

Sincerely -

Beth A. Rose
Land Stewardship member
The Bottom Line:

- **An industrial-scale animal factory is NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW's recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. **Insufficient Information**. Staff from MPCA's environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, "Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny."

- "Estimates of potential emissions" are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- **Faulty underlying assumptions:** “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gases are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

---

Do your job or resign

Edwin L. Maus

Winona County, Min

Please deny permitting. This type of factory farm takes out the small family farm.

Judith Maus
Jack Judkins  
6689 Beltrami Line Rd SW  
Bemidji, MN 56601  

February 25, 2020  

Laura Bishop  
Commissioner  
Minnesota Pollution Control Agency  
520 Lafayette Rd N  
St. Paul, MN 55155  

Dear Commissioner Bishop:  

I am writing to express my concern about a large industrial farm project in Winona County. The Daley Farm expansion poses a threat to air and water quality for citizens of that region. Please oppose it.  

We are fortunate, as residents of northern Minnesota, that small farms still predominate here. We take our clean air and water for granted. Most folks up here have no idea how damaging large-scale farm operations have been to air and water quality in central and southern Minnesota. Would you want to live next door to the Daley Farm or drink water from nitrate-contaminated wells? It is time to draw the line and Winona is the place to do it.  

Thank you for your attention,  

Jack Judkins
Dear Commission Bishop,

I'm writing concerning the mega-dairy planned for Union County. I believe permits should not be approved, especially considering it is a sensitive karst region. There is great danger of contaminating ground water. There is also the added pollution of smell when so many animals are together. Clean air and clean water should never be sacrificed for perceived economic benefits. It's much harder to clean up later... better never to start the problem. We owe it to future generations, also, to have clean air and clean water.

Thank you for your consideration in this matter.

A rural Minnesotan,

Morella Bode
Dear Ms. Rosenheide,

I am a life-long farmer aged 70. I am concerned with the environmental, economic and societal changes brought about by mega-animal farms.

The vertical integration of food production in the U.S. has had a horrible effect on the rural communities as well as food safety.

"Economies of scale" are a myth.

Please limit expansion of livestock concentration! Daley's proposal to move to 4,628 head of dairy cows is wrong. I

John W

896
2/24/2020

Minnesota Pollution Control Agency

Attention: Commissioner Laura Bishop

We are members of LSP and we have deep concerns regarding the lack of EIS requirements relating to the Daley Farm’s proposed expansion. Communities and the environment are being endangered by this lack of accountability. This goes against the ideals, purpose and the reason that the MPCA was established in the first place. It is our responsibility as citizens to keep our environment and communities a healthy and safe place for our families and for future families.

Sincerely,

Mary and John Van Cor
304 Coulee Way, Wabasha MN 55981
651-565-2413
Vancor2012@yahoo.com
Commissioner Laura Bishop:

I am writing as a member of Land Stewardship Project re: John L. Stine’s decision to allow Daley Farm to expand in Winona County without a viable and truthful EIS. This farm has not complied with runoff regulations for years. Why on Earth do they get government support?

Is it any wonder American people are disheartened, disgruntled, disappointed, and frustrated with government from local to national? We vote with the intent of electing someone who we believe has our—and our neighbors’—best interests in mind. Instead, as in this situation, the MPCA official “made a mockery of the agency’s mission to ‘protect and improve the environment and human health’” due to personal agenda and outright greed.

Allowing an already-large factory farm to expand yet again is counterproductive on every level. Except one: money. The very nature of these farms creates pollution of all kinds, unbearable living conditions for those who are stuck with it in their backyards, and is detrimental not only now, but into the future.

We “little people” are being held hostage by big money created through big business, big government, big pharma, and now, big farms and an overpowering ag lobby.

The divisiveness created by governmental decisions that do not focus on the greater good helps no one. Constituents are left holding the bag, cleaning up the messes left by those officials—if they even can. But who cares, as long as somebody important earned a buck or two?

Star Trek’s Mr. Spock said it best: “The good of the many outweighs the good of the few or the one.” The many, in this case, are our neighbors in Winona County (currently dealing with a drinking water crisis), trying to fight the good fight against monumental power. Let’s finally support the “little people” and do what’s right—deny the expansion permit!

Walk a mile in their shoes: Would you want that monstrosity of a farm in your backyard?

Thank you for your time.

Respectfully submitted,

Diane L. Kaplan
To: Commissioner Laura Brodtk
From: Alice Peters, 2011 Intelschau Dr., Stillwater, MN.
Re: Environmental Impact Statement for Valley Farms and Minnesota Pollution Control Agency's Responsibilities

Dear Commissioner:

Although I do not live on a farm, I am a Land Stewardship Project member because I agree with the majority of their values regarding the environment. Living in Washington County I am keenly aware of water quality issues for citizens with their own wells because of 3M's chemicals that leaked into the groundwater.

The Kast region in southeast Minnesota already suffers from nitrate-laden drinking water. I believe that 4,078 cows in one place, no matter how all that manure is handled, will be detrimental to the water quality in that area.

I also agree with the Minnesota Court of Appeals that the MPCA, a public agency, must hold factory farms accountable to the land and rural communities for their own quality of the common good.

Thank you for taking the time to read my note.

Alice Peters
Dear Mark P. Gernes, MN Pollution Control Agency:

This letter is to express my unequivocal opposition to the utterly preposterous expansion proposal by the Daley Farms of Lewiston MN, and the efforts of Ben Daley (and his cohorts) to avoid, or simply ignore, the anti-pollution requirements of the equivocating MPCA.

Greenhouse gasses. Manure leakages – water (e.g. ground water), ground dispersion and pollution of farm land and ground water. Of course there will be pollution of ground water in spite of whatever ridiculous compromises (e.g. pseudo-science, prayers, and astonishingly absurd "best environmental practices") Ben Daley and family/owners and their attorneys will devise. Can nitrate pollution of the water wells in Winona County be good for those of us who drink water? NO. Past runoff violations by the Daley farm has been a health mess in Winona County, and these runoff contamination of wells will be compounded and continued with the dairy cow expansion.

I want the MPCA to require a full and complete Environmental Impact Statement by the Daley Farms of Lewiston, LLP.

I do not know Ben Daley or anyone in the Daley family.

Cordially,

Richard Stephen Schwartz

Richard Stephen Schwartz
1465 Park Lane
Winona, MN 55987

Copy:

Daley Farms have a history of non-compliance and the current hypocrisy at great underestimation of just completely out of compliance with all regulations regarding runoff, even the disaster waiting for rain lessons is a Daley Farm disaster.
Dear Commissioner Laura Bishop

Please do not allow Daisy Mega Dairy Farm to expand. You have to feel sorry for the folks that live in that area. As we know, unforeseen bad things happen. We should not put our environment and people at risk. It is just not right or fair.

Thank you

Robert Carrier

Mr. & Mrs. Robert E. Carrier
25187 Park Trl.
Osage, MN 56570-9424

RECEIVED
FEB 27 2020
By.
Dear Honorable MPCA Commissioner Laura Bishop,

I am writing with my great concern about the environmental and community impacts of the Daley's mega-dairy. The farm is already violating Winona County's 1,500 animal units, as the dairy already has 2,275 animal units (dairy cows).

While I am not a Winona County resident, my roots come from rural Minnesota. I am a Land Stewardship Project (LSP) member.

It is imperative that an industrial-scale animal factory, such as the Daley's mega-dairy, to be ordered to undergo an in-depth environmental review through an EIS - Environmental Impact Statement. This is essential to determine the impacts not only on water consumption but also runoff and emissions from the farm.

I implore you to order and EIS or deny permitting on this mega-dairy proposal.

Sincerely,

Nancy Pearson
5010 Bloomington Ave.
Minneapolis, MN 55417
Dear Commissioner Laura Bishop,

As a Grandfather of four, I take Stewardship of the Earth seriously. As a member of the Land Stewardship Project, I urge you limit the Daley's cemetary to the present 2275 "units." Balance is important.

Please let me know what you intend to do on this important issue.

Terrence Smith
February 25, 2020

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul MN 55155

Dear Sirs/Madames:

We are writing this letter to serve as our formal opinion in regards to the Daley Farm’s expansion. We strongly oppose this outrageous expansion due to the negative impacts on the land. The bottom line is it is just too many animals in one location.

We live in rural (northwest of the metro) Minnesota next to family-owned dairies and beef farmers. We understand and respect these businesses because the farmers respect their animals and land. We expect the Daleys to do the same.
Big animals take a lot of food and water to sustain their lives. They need room to move around. Big animals make a lot of manure. Winona County wisely put a cap on the number of animals a farm could/can have and we all need to heed that number.

Do not allow the outrageous expansion of this dairy. It is not fair to the animals, the neighbors and it is especially not fair to the water and land which will be destroyed by overuse.

Sincerely,
Kevin + Kim Schermer
4038 48th St NE
Buffalo MN 55313
763-682-3769
2/22/2020

Commissioner Bishop,

I am writing to ask you to deny permitting Daley Farm’s request to expand its dairy operation. There is ample evidence that the expansion has an intolerably high potential for significant negative environmental impact to ground water quality of the sensitive karst region and will emit unacceptable levels of greenhouse gases. The project is designed to provide short term gain to a very few while creating a long term loss to many. It does not need to happen.

You leadership can restore the MPCA to being a major force working against pollution. It is time for MPCA to emphasize its duty to protect all Minnesota citizens’ right to clean air and water.

Thank you for your consideration of this request.

Regards,

[Signature]

Tom Mahoney
Former Walden Township Clerk and Proud LSP member
Dear Commissioner Bishop:

I am not a rural Minnesota resident but I do support the work of the Land Stewardship Project. I love the land in our great state. We have an abundance of geographical variation and natural resources. Our precious water is the gold of the future and must be protected from all abusive practices including those found in agriculture, mining, manufacturing, etc. All residents should be stewards of our resources. Our planet Earth is a one-time gift to humanity. American Indian tribes have held the most beautiful, understanding beliefs of how people should regard and interact with our natural world.

The Daley mega-dairy expansion is excessive. The geology of the area is already vulnerable to the outputs of their current operation which is inexplicitly grandfathered in. Even if it were not located in the karst region, it is an obscene concentration of that many large animals in one place.

The operative words are "excessive" and "concentrate." In our world today we need measured precision to protect our environment. We are out of second chances to get things done right. The world is overpopulated and the profit motive continues to force bad decision-making.

The Daley family is large in number, united in purpose, and should be admired for their work ethic. But, like many enterprises, they have outgrown their workspace. And, just as other companies have to do, they need to go out and build a new site at a different location to accommodate their expansion of animals and employees. Industry does this everyday on an as-needed basis.
What is no longer doable is expansion at their present location. That would be excessive. It would concentrate the very negative elements of their business model on land that is already maxed out. It would further pollute their neighborhood, and their neighbors' rights to clean water and air quality are equally important in any consideration of this matter. Also, the proposed increase in the number of animals would be a further strain on the state of modern-day animal husbandry. The plight of dairy cows is well documented.

Any concentrated product sold has a label which includes instructions and often warnings. They are not meant to be used at full strength. They need to be diluted. If the Daley's business model is expansion, they need to contact a land agent and see what is available within the state. Their current business is already excessive and far too concentrated in its current location.

Respectfully yours,

Mary L. Leach
301 Meadow Lane S.
Golden Valley, MN 55416
Good afternoon,

Today I write to you as a concerned Minnesota citizen. I also write to you as someone that doesn't know everything about feed lots but I do respect a good process. Denying the need for an EIS for Daley Farm's proposal seems to be something that fails to take into consideration that we have a wealth of experts on a variety of subjects living right here in Minnesota. As an urbanite, I try to get as much information as possible so that I have an understanding of the issues that face rural Minnesota. For example, I have been a long standing member of the Land Stewardship Project and have come to appreciate the thoughtful way in which they approach the farming community, the economy, and the environment. They acknowledge that there are no easy answers - and I agree. This is why an Environmental Impact Statement should be done for the Daley Farm to make absolutely sure that the decisions are based on ALL of the available facts and that ALL of the constituencies are allowed an opportunity to speak from their perspective. Who are those constituencies? The neighbors, the scientists that can discuss the impact on the karst region, the county that wishes to cap the animal unit.

The Minnesota Statues give us good guidelines for making these decisions (Minn. Statue 4410.1700, Subp. 7 - Criteria: "to decide whether a project has the potential for significant environmental effects" must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

As I stated before, I am not an expert but rather someone that appreciates the Minnesota family dairy farms that primarily have fewer than 200 cows and a fully vetted permitting process. So although I would like to ask the MPCA to deny permitting, I would defer to the results from a full EIS.

Rebecca Shedd
4554 Wentworth Ave S
Minneapolis, MN 55419
This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.
Feb. 25, 2020

Dear Commissioner Bishop:

I am writing today to urge you to deny permitting of the animal factory proposal in Winona County. This Daley Farm has been out of compliance for years, for their run off and other issues. It is time to stop polluting our lands and water by farms that will not adhere to regulations set up for our protection.

I live in Stevens County, and we have a 10,000 head dairy farm just outside of town. The smell and the emissions it leaks are very hazardous to our community.

I also urge you to read the studies that have already been done on this issue by the Department of Natural Resources and others. At the very least, an Environmental Review must be ordered before granting this permit.

Thank you for your attention to this matter.

Barbara McGinnis
552 E. 5th St.
Morris, MN. 56267
Dear Ms. Grosenheider,

The urgency of climate change requires immediate action to reduce greenhouse gas pollution. In fact, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, and has acknowledged that agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions. The Daley Farms EAW fails to describe actions that could be taken to mitigate over 32,000 tons of CO2 equivalent emissions. The EAW should be strengthened to identify mitigation measures to offset all of these emissions. If Daley Farms does not agree to implement these mitigation measures through its permit, then an environmental impact statement should be required because the addition of 32,500 tons of CO2 equivalent emissions to Minnesota’s atmosphere each year is unquestionably a potential significant environmental effect.

It’s not enough to just measure greenhouse gas pollution in an environmental review, we have to do something about it. The Daley Farms EAW predicts greenhouse gas pollution equivalent to the tailpipe emissions of nearly 7,000 new cars on Minnesota roads every year. Yet, MPCA provides almost no information about things that Daley Farms will do to mitigate its greenhouse gases. The EAW identifies just one mitigation measure—planting alfalfa. This measure would reduce the Daley Farms project’s greenhouse gas pollution by just 1,000 tons per year, about 3% of the total emissions. The EAW does not discuss any other mitigation measures that could be employed at the project, despite the fact that the MPCA recently published a report that describes agricultural management practices that reduce greenhouse gases. Some of these practices also result in reduced nutrient run-off and leaching to surface and groundwater.

Worse, MPCA states that “it is not possible to model the physical impacts … caused by incremental GHG emissions, such as those from this Project.” MPCA appears to have included this statement to justify a decision not to conduct further environmental review. However, taken to its logical conclusion, this argument would mean that MPCA would never find a Minnesota project to be significant—and worthy of further study in an EIS—because all Minnesota projects will contribute but a small share of the global emissions total and none could be tied directly to any physical impacts.

Governor Walz has made climate change a priority and has described it as an “existential threat.” The Daley Farms EAW does not reflect this urgency, does not fully implement the Court of Appeals decision requiring study of greenhouse gas emissions, and should be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions.

Please do the environmental review for the benefit of our future generations. You have the
capacity to do this and your responsibility is to "protect the environment". Our future depends on it.

Sincerely,
Catherine Sullivan
4335 Whitaker Ct
White Bear Lake, MN 55110
This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.
Dear Commissioner Bishop:

Please adhere to the Minnesota Environmental Protection Act in regard to allowing the Deley Farm in Winona County to expand their dairy herd as they have proposed from 3000 to 4628 head. The water quality in this karst region is very vulnerable to contamination from surface discharge and is already challenged. An EIS is obviously needed to allow you to uphold your agency’s mission statement as well as to enable you to comply with the Minnesota Court of Appeals determination on the matter of considering the prospect of increased greenhouse gas emissions from the farm.

This farm has an extensive history of being out of compliance with state regulations on run-off and your agency has not demonstrated the competence or interest in enforcing against those violations. Therefore, a careful study is needed to evaluate the potential for harm that might result from this herd expansion.

As a rural resident of both Le Sueur and Crow Wing counties over the years, I appreciate the implications of ground water contamination and urge you to be very certain of the level of risk involved in deciding to permit this expansion. From my perspective, even without an EIS it seems obvious you would best serve the public interest by denying the expansion, but if you are unsure, be certain to fully explore the matter before making a decision that may well damage the well-being of Minnesotans for generations to come.

Sincerely,

[Signature]

Dean O. Rangston

Dean Rangston
3600 Bonnie Lake Rd
Crescent, MN 56442
(218) 642-4723
From: James Pelowski  
To: Grosenheider, Kim (MPCA)  
Subject: comments on Daley dairy expansion  
Date: Thursday, February 27, 2020 9:49:27 AM

Dairy Expansion 2020
As a neighbor to the Daley’s I will only supply all issues. I am 82 years old and been in the dairy business for 24 years. Working at IBM for over 30 years, ordering parts for 24 years and retired from purchasing February 1987. We still farm full time. During the 80’s dairy began to weaken. A reduced production plan was enacted which we were part of it. We produced less milk during the year and were rewarded for that year. We talked about this at IBM and one employee said that producing less milk is not the answer. Now the issue is to produce more milk in a declining market. The industry needs further sales not more milk. When IBM sales dropped we produced less and created products for future sales to keep going. The dairy industry failed in this respect. There were so many opportunities for dairy to explore and so other business took hold instead. Make dairy more efficient is all they headed into and caused dairy to sour right from the beginning. Milk consumption is still dropping today because of previous errors. While I was in dairy our farm was poisoned by drift of glyphosate (roundup) we lost a quarter of our milking cows and total cattle death was 28 head. The day of the drift I became very sick later ending up in the hospital. I purchased a large life insurance after I lost a lot of weight so the wife could continue on living and maybe move to town and every medical center I went for help, they only said they would check me over but no guarantee of recovery. What the wife and I did next is to long to talk about. If you want to know about it, just let me know. It is all on record. The weed killed roundup. First it kills all weeds. Seeds treated to grow when used will grow. However glyphosate inhibits something called the P450 enzyme system. This a master system our body uses to detox chemicals that we’re exposed with. Animal studies done over their life time caused kidney and liver problems, greatly increased cancer risk and led to a shorter life span. Second—glyphosate actually alters DNA basically an amino acid called glycine. Than when your cells are forming proteins they can mistakenly bind to glyphosate instead of glycine. that changes the structure and function of the brain proteins causes damage to them and memory loss. I don’t know about you but none sounds to good for me. When following glyphosate use from the beginning the following are increases of chronic diseases since. A Hugh increase of—Acute and subacute, Al amyloidosis, Autism—Alzheimer’s —bronchus, -B-cell Leukemia, diabetes type II—Chronic Lyphocytic, -depression—heart disease,--- Hodgkin's disease—Ischemic heart disease,-- Leukemia, --obesity,--- Porphyria Cutanea Tarda,-- Prostate cancer, ---Respiratory cancer,--- Soft-tissue sarcoma ---Lung, bronchus, larynx, , —infertility —cancer—gastrointestinal diseases. All you have to do is connect the dots. I don’t know about you, but I went thru the torture, and came close to dying, but I went to China after my poisoning and found part of my answer. Now it is time for decision making to more flood a declining market. Pres. Trump is cleaning up the waste in his swamp and it could include farm substitutes. He knows that it a total waste of money to increase product in a declining market.and he is right. Most feed back you will receive about ground water, etc and I question who pays to clean up our water (the expansion could use up to 92 million gallons a year). when that happens. God gave we humans a clean earth and to do other is against promise. At this point a decision has to be made against or for God’s clean earth. You be the judge. He remembers every thing and you will met him some day Personally I am banned from consuming factory farm milk for this reason.
Thank you James Pelowski. 31071 County Road 113. Utica, Minnesota. 55979. Ph 1-507-932-4665. ie. any questions, write me.
ie--- check the p450 gene suppression on the internet.this is life or death I am a very informative person
From: Loni Kemp
To: Grosenheider, Kim (MPCA)
Cc: Bishop, Laura (MPCA)
Subject: Attached and below: Comment on EAW Supplement on Climate Change Impacts, Daley Farms Dairy Expansion
Date: Thursday, February 27, 2020 7:39:15 PM
Attachments: Kemp comment 22020 Daley Supplement to EAW.docx

This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Public Comment on Daley Farms of Lewiston, LLP Dairy Expansion
EAW Supplement on Climate Change Impacts
Loni Kemp
14083 County 23, Canton MN 55922
February 26, 2020
Emailed to kim.grosenheider@state.mn.us

Introduction
I am a rural resident of Fillmore County with a 40-year career in environment and agriculture policy at the state and national levels. I served on the MPCA Citizens Board in the 1990s (and on staff in the 1970s), and am knowledgeable about the Minnesota Environmental Policy Act and the triggers for requiring an EIS versus a negative declaration on an EAW. I currently serve on the board of Responsible Agriculture in Karst Country, which recently successfully engaged in the process of denying the proposed Catalpa, LLC swine CAFO in Fillmore County.

I respectfully suggest that Commissioner Laura Bishop has an outstanding opportunity before her to seriously address the previous mistakes of the Daley expansion proposal. Prior Commissioner John Stine approved the permit, but he simultaneously requested that EQB develop a region-wide generic EIS on the massive nutrient pollution already experienced and documented in the karst area. While that seemed like a hypocritical request at the time—to allow the largest feedlot ever for this region while pollution is proven to be going out of control—in fact, the public responded with deeply passionate input to EQB Chair Bishop and her colleagues that we agree we have an enormous pollution problem! I attended the EQB meeting in Red Wing chaired by Commissioner Bishop. However, people were ready for action, rather than further study, and the GEIS faded in importance, while support for upgrading requirements and setting effective limits to manure and fertilizer pollution is stronger than ever. The critical reality is that karst pollution from agriculture and other sources is poisoning people and the environment now—it is a top priority.

Commissioner Bishop should take a leadership stand and deny the Daley permit based on water quality concerns. A second choice is to prolong the process with a full EIS—which is now virtually required because of the inadequate EAW supplement regarding climate change impacts from a massive CAFO, as required by the Court. Either way, the mistakes of the past can be corrected by a thoughtful MPCA leader, now in a position to address both climate change and karst pollution impacts of this proposal.

Recommendation
I recommend that the Daley Supplemental EAW be denied as insufficient, because it is lacking an adequate evaluation of the potential for significant contributions to climate change from the proposed facility, and does not give serious consideration to requiring reduction of climate impacts within the permit. Most importantly, Minnesota is falling woefully behind the GHG emissions reduction goals set by the Next Generation Energy Act—now in 2020 we have not even met the first reduction goal of 15% by 2015. MPCA and all of state government must take action.

Furthermore, an EIS should be required on the entire project because of the potential for significant environmental effects to climate and water, and the need to examine appropriate alternatives to the proposed action, including alternative methods of land application, cropping, covercrops, grazing and
grazing dairy cows, all of which can drastically reduce greenhouse gas emissions. These alternatives also simultaneously reduce critical water pollution. In addition, **only an EIS will evaluate the no-build alternative, which is precisely what Winona County law requires at this time, with their animal limit on new and expanding CAFOs.**

Frankly, I cannot understand why MPCA is wasting the taxpayers’ money by pursuing approval of a Daley permit while Winona County already prohibits such a facility. State and local government should coordinate and support each other much better than this, especially with existing water pollution and GHG emissions rising at an alarming rate. **In fact, the most efficient and justified action would be to deny the permit,** as was done with the Catalpa hog CAFO proposal in Fillmore County.

**Minnesota Environmental Policy Act (MEPA)**

A look back at the origins of MEPA reveal that the practice of environmental review has drifted away from its intended purpose. The Environmental Assessment Worksheet (EAW) was intended to be a brief summary of any potential for significant environmental effects from a proposed project. The Environmental Impact Statement was intended to be triggered by the EAW if any such potential effects were identified, and then go on to analyze “significant environmental impacts, discuss appropriate alternatives to the proposed action and their impacts, and explore methods by which adverse environmental impacts of an action could be mitigated. The environmental impact statement must also analyze those economic, employment, and sociological effects that cannot be avoided should the action be implemented.”

The MPCA and many project proposers seem to feel that requiring an EIS would be the kiss of death, and they **bend over backwards to avoid an EIS.** In fact, the MPCA staff has NEVER voluntarily ordered an EIS for a feedlot in Minnesota. The EAW is instead loaded up with ideas and options about mitigation, but they never get to the crucial admission that some CAFOs do have a potential for significant environmental effects, and that an EIS is required. MPCA is opposing the very step that the law wisely requires. **The heart of the MEPA state law is the search for appropriate alternatives for the proposal—including the no-build alternative!** Attempts at mitigation of impacts is not the final goal, as the EAW assumes; rather preventing significant environmental impacts is the goal.

**Climate Impacts are Not Legitimately Addressed in the EAW Supplement**

This EAW Supplement states that MPCA does not yet know how, nor have standard tools created, to quantify a full GHG life-cycle analysis of this project—and that is precisely the reason why **this EAW must trigger a full EIS.** What is not now known would be studied in depth, and a rational and complete methodology for GHG analysis—for this and other projects—would be created within the EIS. MPCA asserts that GHG emissions are too hard to measure, but that is not true. MPCA needs to either take the time to develop credible methodology themselves, or require an EIS to hire outside experts to devise the protocol for evaluating the size and impact of GHG emissions from the Daley proposal.

Surely the Court ordered this addition to the EAW to meet the full intent of MEPA. The EAW asks if an EIS is needed to evaluate the severity of Daley GHG emissions and mitigation effectiveness. We already know the answer is yes, because MPCA does not know how to assess its impact without further study. Furthermore, the Legislature has enacted law that sets critical goals for reducing GHG emissions from all sectors in the state. That those goals are not anywhere near being met, and thus that law should weigh heavily on the MPCA as it does on the whole Walz Administration. It is obvious that the Daley proposal would be a a step backwards for reducing total CAFO emissions.

One assertion in the Supplement seems particularly flawed. The addition of 850 acres of alfalfa for the project’s additional animals sounds good on the surface for mitigation, but **only if row-crop land is permanently converted to perennials.** Any time those hayfields are plowed up all GHG capture will be released to the atmosphere. In addition, the additional animals of this project expansion **also require additional corn silage and earlage,** and those cornfields typically leave the land bare and open to de-carbonization from mid-summer onwards, making it a **worse** practice for the environment than regular corn fields harvested for grain in late fall. On top of that, one must also consider the many acres of additional corn expansion to feed the additional cows grain. The small net increase in land in perennials like hay likely
pales compared to the increase of intensive annual crop cultivation.

MPCA needs the funding and carefully thought out scoping and scientific procedures of an EIS in order to turn out a competent GHG analysis and full consideration of water quality impacts. It was never possible in an EAW supplement, for the good reason that a cutting edge pollution evaluation for GHG is yet to be created. The Legislature through MEPA, and the Courts through its remand to MPCA, have required this study. Let’s take it seriously.

Respectfully submitted by Loni Kemp

February 27, 2020
Introduction

I am a rural resident of Fillmore County with a 40-year career in environment and agriculture policy at the state and national levels. I served on the MPCA Citizens Board in the 1990s (and on staff in the 1970s), and am knowledgeable about the Minnesota Environmental Policy Act and the triggers for requiring an EIS versus a negative declaration on an EAW. I currently serve on the board of Responsible Agriculture in Karst Country, which recently successfully engaged in the process of denying the proposed Catalpa, LLC swine CAFO in Fillmore County.

I respectfully suggest that Commissioner Laura Bishop has an outstanding opportunity before her to seriously address the previous mistakes of the Daley expansion proposal. Prior Commissioner John Stine approved the permit, but he simultaneously requested that EQB develop a region-wide generic EIS on the massive nutrient pollution already experienced and documented in the karst area. While that seemed like a hypocritical request at the time—to allow the largest feedlot ever for this region while pollution is proven to be going out of control—in fact, the public responded with deeply passionate input to EQB Chair Bishop and her colleagues that we agree we have an enormous pollution problem! I attended the EQB meeting in Red Wing chaired by Commissioner Bishop. However, people were ready for action, rather than further study, and the GEIS faded in importance, while support for upgrading requirements and setting effective limits to manure and fertilizer pollution is stronger than ever. The critical reality is that karst pollution from agriculture and other sources is poisoning people and the environment now—it is a top priority.

Commissioner Bishop should take a leadership stand and deny the Daley permit based on water quality concerns. A second choice is to prolong the process with a full EIS—which is now virtually required because of the inadequate EAW supplement regarding climate change impacts from a massive CAFO, as required by the Court. Either way, the
Recommendation

I recommend that the Daley Supplemental EAW be denied as insufficient, because it is lacking an adequate evaluation of the potential for significant contributions to climate change from the proposed facility, and does not give serious consideration to requiring reduction of climate impacts within the permit. Most importantly, Minnesota is falling woefully behind the GHG emissions reduction goals set by the Next Generation Energy Act—now in 2020 we have not even met the first reduction goal of 15% by 2015. MPCA and all of state government must take action.

Furthermore, an EIS should be required on the entire project because of the potential for significant environmental effects to climate and water, and the need to examine appropriate alternatives to the proposed action, including alternative methods of land application, cropping, covercrops, grazing and grazing dairy cows, all of which can drastically reduce greenhouse gas emissions. These alternatives also simultaneously reduce critical water pollution. In addition, only an EIS will evaluate the no-build alternative, which is precisely what Winona County law requires at this time, with their animal limit on new and expanding CAFOs.

Frankly, I cannot understand why MPCA is wasting the taxpayers’ money by pursuing approval of a Daley permit while Winona County already prohibits such a facility. State and local government should coordinate and support each other much better than this, especially with existing water pollution and GHG emissions rising at an alarming rate. In fact, the most efficient and justified action would be to deny the permit, as was done with the Catalpa hog CAFO proposal in Fillmore County.

Minnesota Environmental Policy Act (MEPA)

A look back at the origins of MEPA reveal that the practice of environmental review has drifted away from its intended purpose. The Environmental Assessment Worksheet (EAW) was
intended to be a brief summary of any potential for significant environmental effects from a proposed project. The Environmental Impact Statement was intended to be triggered by the EAW if any such potential effects were identified, and then go on to analyze “significant environmental impacts, discuss appropriate alternatives to the proposed action and their impacts, and explore methods by which adverse environmental impacts of an action could be mitigated. The environmental impact statement must also analyze those economic, employment, and sociological effects that cannot be avoided should the action be implemented.”

The MPCA and many project proposers seem to feel that requiring an EIS would be the kiss of death, and they bend over backwards to avoid an EIS. In fact, the MPCA staff has NEVER voluntarily ordered an EIS for a feedlot in Minnesota. The EAW is instead loaded up with ideas and options about mitigation, but they never get to the crucial admission that some CAFOs do have a potential for significant environmental effects, and that an EIS is required. MPCA is opposing the very step that the law wisely requires.

The heart of the MEPA state law is the search for appropriate alternatives for the proposal—including the no-build alternative! Attempts at mitigation of impacts is not the final goal, as the EAW assumes; rather preventing significant environmental impacts is the goal.

Climate Impacts are Not Legitimately Addressed in the EAW Supplement

This EAW Supplement states that MPCA does not yet know how, nor have standard tools created, to quantify a full GHG life-cycle analysis of this project—and that is precisely the reason why this EAW must trigger a full EIS. What is not now known would be studied in depth, and a rational and complete methodology for GHG analysis—for this and other projects—would be created within the EIS. MPCA asserts that GHG emissions are too hard to measure, but that is not true. MPCA needs to either take the time to develop credible methodology themselves, or require an EIS to hire outside experts to devise the protocol for evaluating the size and impact of GHG emissions from the Daley proposal.

Surely the Court ordered this addition to the EAW to meet the full intent of MEPA. The EAW asks if an EIS is needed to evaluate the severity of Daley GHG emissions and mitigation effectiveness. We already know the answer is yes, because MPCA does not know how to assess its impact without further study.
Furthermore, the Legislature has enacted law that sets critical goals for reducing GHG emissions from all sectors in the state. That those goals are not anywhere near being met, and thus that law should weigh heavily on the MPCA as it does on the whole Walz Administration. It is obvious that the Daley proposal would be a step backwards for reducing total CAFO emissions.

One assertion in the Supplement seems particularly flawed. The addition of 850 acres of alfalfa for the project’s additional animals sounds good on the surface for mitigation, but only if row-crop land is permanently converted to perennials. Any time those hayfields are plowed up all GHG capture will be released to the atmosphere. In addition, the additional animals of this project expansion also require additional corn silage and earlage, and those cornfields typically leave the land bare and open to de-carbonization from mid-summer onwards, making it a worse practice for the environment than regular corn fields harvested for grain in late fall. On top of that, one must also consider the many acres of additional corn expansion to feed the additional cows grain. The small net increase in land in perennials like hay likely pales compared to the increase of intensive annual crop cultivation.

MPCA needs the funding and carefully thought out scoping and scientific procedures of an EIS in order to turn out a competent GHG analysis and full consideration of water quality impacts. It was never possible in an EAW supplement, for the good reason that a cutting edge pollution evaluation for GHG is yet to be created. The Legislature through MEPA, and the Courts through its remand to MPCA, have required this study. Let’s take it seriously.

Respectfully submitted by Loni Kemp

February 27, 2020
Good morning Kim,
I'm writing today to express my opinion that a full environmental review be performed and an Environmental Impact Statement be issued for Daley Farms proposed expansion of their LLP site. The impact of greenhouse gas emissions of an operation at this scale are very concerning. The potential impacts on water usage and water pollution are also very concerning. Factory farms must be closely evaluated and held accountable to the state's laws and requirements up to denial of a permit. MPCA commissioner Bishop recently said, "Along with the Governor, I believe that the state must continue its leadership on the environment, and climate action will be a top priority..."
Environmental leadership might mean that the comfortable, easy status quo is no longer a viable option. I urge all of us to be open minded to prioritizing positive, equitable changes to the planet. Let us try harder to treat the earth like it's the only one we get.
Thank you for your time,
John Krenz
Dear Ms. Grosenheider,

I support Daley Farm of Lewiston’s dairy expansion plan.

Undue burden is being placed on the Daley farm and family by those who do not want the farm to expand. Daley’s and MPCA have assessed, planned, and evaluated benefits, changes, and impacts of an expansion. I believe those opposing the expansion will continue to oppose no matter the amount of data, facts, and documents that are provided.

Please allow Daley’s farm expansion continue without further burden or delay and carry on modern dairy farming with the next generation in Minnesota.

Thank you for your consideration,

Ben Ekern
Rushford, MN
Dear MPCA Commissioner Laura Bishop,

I am a rural resident of west central Minnesota and a member of the Land Stewardship Project. I am writing to comment on the Daley Farm’s proposal to expand in southeastern Minnesota’s sensitive karst region. This mega-dairy is already one of Minnesota’s biggest, and the surrounding communities are paying the price with nitrate-laden drinking water and poor air quality that would only worsen with an expansion. I know a great of facts have been presented in this case, so it was astounding that your predecessor denied the need for an EIS and granted a NPDES permit. The MN Court of Appeals was correct to recognize that MPCA was remiss in not considering greenhouse-gas emissions and all of the dangerous implications of concentrating thousands of cows in one place.

An industrial-scale animal factory is not exempt from being ordered to undergo an in-depth environmental review through an EIS. I urge you to abide by MPCA’s mission to “protect and improve the environment and human health.” Please use your power under the Minnesota Environmental Protection Act to order an EIS or deny permitting on this massive animal factory farm proposal. Restore the public’s trust in MPCA to correct the harmful decisions made in the past and to hold factory farms accountable to the land and rural communities.

Thank you for your time.
Kim Hiltner
Paynesville, MN
Kim,

Attached to this email you will find comments on behalf on Winona County Farm Bureau regarding the supplement to the Daley Farms EAW.

Thank you for your consideration.

Glen Groth
Winona County Farm Bureau President
Dear Ms Grosenheider,

I would like to request an EIS be required for the Daley Farm in Lewiston, MN. There are a wide variety of concerns that I have as a resident of the SE Minnesota karst region for feedlots the size the Daley’s are proposing. However, I am writing at this time to address only air quality concerns that I have about the expansion of this dairy farm.

I belong to an ever increasing number of citizens that are considered vulnerable on bad air days. My age and medical conditions make me a part of what is termed unusually sensitive people that should consider limiting prolonged exertion when the Air Quality Index (AQI) is categorized moderate. The warnings for the next two categorizes come with stricter warnings and caution the vulnerable to even stay inside. Your agency the Minnesota Pollution Control Agency (MPCA) sends me notifications when the air in SE Minnesota may be detrimental to my health. I am grateful for these Enviro Flash warnings sent directly to my email.

I enjoy a glass of milk on a regular basis but a dairy farm with nearly 6,000 Animal Units in Winona County, all together in one place, needs to be closely looked at and this type of facility evaluated for its impact on air quality. The accumulated effects of feedlots this size need to be studied. Storage of large amounts of manure before and after it is spread plus the release of ammonia and methane into the air needs to be taken into consideration by experts at your agency. The Environmental Impact Statement would give us an overall picture of the air quality surrounding such a large feedlot.

I only know that there are too many days of poor air quality in SE Minnesota. I know this because the MPCA tells me so. Adding pollutants from a large feedlot with already alarmingly poor air quality needs an in depth study. I received 95 Air Quality Notification emails from the MPCA in 2019. Already in 2020 I have gotten 18. I know that bad air hovers when it is humid. I know that bad air comes from many sources. I would like to be assured that the Daley feedlot expansion will not make the air worse.

I implore you to consider the total accumulated effects of bad air and look at how gases from feedlots will bind with already existing 2.5 particles in Winona County. Please, help me catch my breath. Thank you for your consideration.

Margaret M Walsh
Winona, MN 55987
(507) 452-229
To: Commissioner Laura Bishop

CO/ MPCA EAW contact person: Kim Grosenheider Resource Management and Assistance Division Minnesota Pollution Control Agency 520 Lafayette Road North St. Paul, MN 55155 Phone: 651-757-2170 Email: kim.grosenheider@state.mn.us

Mark P. Gernes Watershed Division Minnesota Pollution Control Agency 12 Civic Center Plaza, Suite 2165 Mankato, MN 56001 Phone: 507-344-5260 Email: mark.p.gernes@state.mn.us

RE: Daley Farms of Lewiston, LLP 18774 Highway 14 Lewiston, MN 55952 Utica Township Winona County, supplement to the 2018 EAW.

Dear Commissioner Bishop:

We can no longer ignore the crisis we are in regarding our natural systems break down and the erratic climate. The 2018 IPCC report clearly states that the greatest risk to humanity is two-fold, the loss of biodiversity and the catastrophic climate crisis. This project significantly impacts both.

I am extremely concerned about the urgent need to reduce GHGs in all areas and economic sectors of our state. The Daley Farm is already one of the largest dairy farms in the state. Winona County has a cap of 1,500 animal units – this project cannot be permitted without further breaking this regulation. This project should not be permitted due to increasing the climate crisis at a time when we urgently need to do all we can to reduce emissions and reduce pollutants in our air and water.

An EIS (Environmental Impact Statement) should have been required for the increased impact to water, air, and wildlife an increase in animal units of this magnitude creates. I, and many other citizens of this state, are losing any confidence in our public agencies for the rubber stamping and complete mockery of your mission to “protect and improve the environment and human health”. This is one more instance of this complete break down in responsibility. Stine’s refusal to acknowledge that an increase of this size in Minnesota’s sensitive karst region fails the public’s interest. This project puts communities already dealing with contaminated water and poor air quality in further health risk.

An increase of 20,300 tons of potent GHGs – N2O, and CH4 – is extremely significant in this time of climate crisis. This increase calls for an EIS.
Estimating offsets without the full analysis this substantial increase requires is unacceptable. The citizens of this state must take the brunt of water quality loss, air quality impacts, and especially the impacts of climate change. Increased economic loss from catastrophic weather events and changing weather patterns affects the whole state. Because Environmental Quality Board guidance is not currently available, and the information MPCA would need to conduct a full GHG life-cycle analysis is not readily available, a trigger for a full and comprehensive EIS or a permit denial has been met. (Minn. Statute 4410.1700, Subp.2a. Insufficient Information)

An industrial-scale animal factory is not exempt. I urge you to do the right thing for our future and deny this permit. Courage means following Minnesota law to protect all of Minnesota's citizens, not just those seeking to create profit.

Thank you for the attention to my comments,

Lois Norrgard
10368 Columbus Circle
Bloomington MN 55420
February 25, 2020

MPCA Commissioner Laura Bishop

Dear Commissioner Bishop,

I am writing to you about the request from Daley Farms for an expansion of their mega-dairy operation.

I lived in northeast Iowa for 50 years before moving to SW Minnesota, and I visited the beautiful Winona area many times. I am concerned about pollution of the area along the Mississippi River which is a fragile geological formation.

It appears that the Daley Farms is already a very large operation and that they have found ways to avoid a Minnesota EIS in the past. But I know an industrial-scale animal factory is not exempt from being required to undergo an in-depth EIS. (Minnesota Statute 4410.4600 Subp. 19).

I urge you to require the Environmental Impact Study be done to help in the decision of whether the Daley expansion should be approved – or NOT.

Sincerely,

Karen Hurst
1652 Thunderbird Road
Marshall, Minnesota 56258
Commissioner Bishop,

I am a retired farmer from Winona County. Concerning the Daley farm's request for a permit to expand the dairy herd, please stand by the laws already in place to deny this expansion. The Minneapolis Star and Tribune published a picture of a calf and a Daley farm-bred recently. I want to see young people be able to farm and continue the legacy of their families living close to the land. These huge animal farms however are not family size. They are privately owned factories. The Daley farm
already exceeds the animal-unit limits.

We are at a time in history where our priorities must change to protect the environment that we live in. Production and profit have long been priorities in our country. You are the one on the steps of the future to give the natural resources a voice and value above man-made ideas.

Protect the water that gives life to all by ordering the impact statement and denying the permit to expand this farm to a size that is unmanageable.

Thank you for your consideration.

Agnes Horness
Dear Ms Bishop

I am writing to encourage you to strictly enforce Environmental Safety Rules in our rural areas. I am a member of The Land Stewardship Project and live at the juncture of rural and urban MN. I am especially concerned about large animal farms polluting air and water quality. Our family had a cabin on Rice Lake near Paynesville. Agricultural runoff so polluted the lake that it was not swimable or fishable. About 1/3rd of our 10,000 lakes are no longer useful due to this pollution!

Please stop the pollution of large animal farms like The Daley Farm and others. Water quality affects
Our health! Most of rural drinkable water is affected.

Please deny large animal factory proposals!

Thank you

Susan Antacky
26915 Noble Rd
Shorewood MN 55331
Dear Commissioner Laura Bishop:

From 1970 until late 1989 my family lived in Weeding Township, Rice County, MN, surrounded by land of a hog farm. Assuming that owner abided by rules and regulations for livestock, we still felt enough negative effects.

After reading through Land Stewardship Project of the Dakota Farm’s proposal in Winona County, I just had to write you. An EIS on the greenhouse gas supplement and the entire project seems a minimal request. Denying permitting sounds logical, too.

Thank you.

Sincerely,

Patricia J. Cleutjens
Laura Bishop, Commissioner
Minnesota Pollution Control Agency
520 Lafayette Road N.
Minneapolis, MN 55104

Dear Commissioner Bishop,

We write today about your responsibility to re-examine the denial of the EIS for the Dalby Farm expansion in Winona County. You have the opportunity to fix the decision of your predecessor.

The karst geology of SE Minnesota is well-known for its vulnerability to pollution of all sorts carried by water. Perhaps even more important was the MPCA’s failure to account for increased greenhouse gas emissions projected from the Dalby Farm.

Our planet and our state face calamitously problems from ever-increasing greenhouse gas emissions. This is now the time for the MPCA to renege on its duty to “protect and improve the environment and human health.”

Sincerely,

Katie Fournier

To be clear: We want to see an EIS on the entire project denial of the permit.
Feb. 25, 2020

Dear MPCA Commissioner Laura Bishop,

I am a member of LSA and resident of the great state of Minnesota and concerned about the environmental health of All Minnesotans.

The Daley’s dairy is already in non-compliance with Winona county’s animal unit cap of 1500 AUs allowing Daley’s dairy to expand by 3000 cows would be adding insult to injury.

The amount of water required for these additional animals would further restrict the availability of fresh clean water for surrounding communities and residents. The increased concentration of animal waste would also add the poorer air quality the potential saturation of the sensitive land & soil in the region.

I urge you Commissioner Bishop to ask for an EIS on the entire project.

Sincerely, Ernest Broekemaier
July 26, 2020

Commissioner Laura Bishop
MPCA

Re: Public comment, Daley Farm, Union County

Dear Commissioner Bishop,

I am writing to encourage you to restore my trust in the MPCA to prioritize public welfare and water quality for all over the special interest by one farmer who wants to grow his bottom line. We need an EIS on the Daley Farm’s request to expand to 4,608 acres - and from what I’ve seen it appears the permit should be denied based on its impact on the drinking water of the region. As a resident of MN, I depend on you to keep our water safe and to reduce toxins in our food supply. It appears that special interests have pulled the MPCA away from its mission and its duty to abide by MN statutes.

As a Land Stewardship Project member and an urban resident, I depend on your wisdom to bring the MPCA back to its public mission. Thank you.

Sincerely,
Barbara M. Klatt
BARBARA M. KLATT
537 Chestnut Ave. E
St. Paul MN 55116
Dear Kim Gosenheider

I am writing this letter against Land Stewardship Group. My family’s dairy farm is in SE Minnesota about a hour away from the Daley farm. We milk 125 cows with our son and daughter. We have no interest in expanding, we are happy where we are. Daleys have several generations wanting to dairy farm, and are well equipped to do all the paperwork and anything else they need to do. They are great. They have been doing a excellent job. They are known for their operation, they do a excellent job. Daley’s will be monitored heavily if they receive the approval to expand. Please consider opposing their expansion.

Sincerely,
[Signature]
Commissioner Laura Bishop
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Commissioner Bishop:

As a member of the Land Stewardship Project, I am writing to oppose the decision made regarding Daley Farm’s proposal to expand its hog clarifier in Winona County. Although I am not a farmer or rural resident, I am the daughter of a vocational agriculture teacher who already disclosed the effects of the growing importance of “agri-business” on family farms in the late 1960s. Now it appears that Minnesota’s air and water are also impacted by factory farms.

Because large scale factory farms are not exempt from being ordered to undergo an environmental review through an Environmental Impact Statement, please consider ordering such a review of Daley Farm’s expansion in Winona County. Thank you for following Minnesota law.

Sincerely yours,

Patricia J. Walker
Dear Commissioner Bishop,

I was born on a small farm near Ada, MN in 1943. Because I am grateful for my farm childhood, I became a member of the Soil Stewardship Project.

I believe mega-farms are harmful to air, water, and local quality of life. Overcrowding of animals leads to antibiotic resistance, and makes humane treatment of animals difficult.

The expansion of the Dairy Mega-Farm in Winona County would increase the pollution that already exists in this area. In a time when milk consumption is declining, this expansion will only serve to drive smaller farms with less impact on the environment out of business.

I am hoping that the previous decision by Commissioner Stive can be re-evaluated. It defies common sense to maintain that 3,000 cows have no environmental impact when added to a space with 1,328 head!

Thank you for reading this letter. I hope the permitting can be denied.

Sincerely,

Diane Hansen
Dear Kim Drosenheider,

I am concerned about the expansion proposal for the Valley Dairy farm in Wexmo County. I don't think the bedrock in Wexmo County is stable enough to be safe in regards to Manure Storage on a dairy farm that has over 2,000 Animal units.

I am a retired Veterinarian that worked in Dairy practice for over 40 years and I believe that the Dairy farm will be financially sound and will continue to operate for many years to come without this expansion.

I see a lot of problems in the future regarding the number of family that want to be involved in management & day to day operations. I think this will be unworkable and most likely family will peel off & go do other things.

It is a fantasy to think that you are doing these families a favor by allowing them to expand the Dairy.

Sincerely,

[Signature]

Phone: 507-259-5180

address:
11613 Hwy 14 St. Charles, MN 55972

Email: joseph.moe@ymail.com
For the Minnesota Pollution Control Agency,
I write pertaining to the issue of Daley Farms proposal to expand their dairy operation.
I am opposed to Daley Farms receiving a permit to expand.
I write as a farm land owner, a physician and a citizen of Minnesota.
Large, concentrated numbers of cows presents multiple problems for the environment. Among the concerns are: ground water contamination, air quality problems, proper distribution of animal waste, and green house gas emissions.
I will not take the time to reiterate the technical and legal arguments which have been presented well by others.
The weight of evidence in this case is heavily opposed to giving Daly Farms permission to expand.
Please support the need for an EIS and any other steps necessary to block the expansion of Daley Farms dairy herd.
Thank you for your consideration.
Sincerely,
Mark Brakke, MD
3508 Mississippi Dr NW
Coon Rapids, MN 55433
Dear Commissioner Bishop,

I am asking you today to restore the public trust in the MPCA and its role in reducing pollution in Minnesota. Daley Farms has proposed an expansion of their dairy farm by 3,000 to 4,628 head. This large increase in Animal Units (AU) is not a good idea. The farm, as you know, is located in the Karst region of the state. This porous landscape is prone to nitrate pollution, as well as sinkholes. Not a good place for large earth-sliced lagoons filled with manure.

There must be an Environmental Impact Statement (EIS) performed. Daley Farms does not exist in isolation. They are a part of our community, and their farm impacts many people. With increased water use, increased waste and increased smell, along with the climate-change implications that come with the increase in methane gas.

As a concerned Minnesotan, I am asking you to require an EIS on the greenhouse gas supplement and the entire project. Even better, please deny the permitting of the farm’s expansion.

Thank you,

Rebecca Stenlund
DeeAnn Stenlund
2687 Matilda St
Roseville MN 55113
Dear Kim Groenfeldt,

I grew up in SE Minnesota. I remember seeing holes where farmers would throw junk and it would disappear.

Today we know that area was having karst geology and the things that disappeared probably helped to pollute the water.

We didn't know any better, that was 70 years ago. And my father had maybe a dozen cows.

Today when I hear of a farmer having or wanting 4,628 cows or 5,968 animal units, I can't imagine what effect they will have on the land with karst geology. How far will pollution go from a leak or disaster. How much air pollution will ponds to hold that much manure have and on how great an area if the wind is blowing.

God is good to each of us but we need to see the effects my
Desires can have on others and the potential for harm.

I believe that Daley Farms need to go through the necessary in-depth environmental review for the sake of the farm itself and for the sake of the land and the neighbors. When the facts are known then and only then can a decision be made as to expansion of the Daley Farms or the denial of that expansion right or privilege.

I trust that Laura Bishop will make the right decision for all involved. I pray she will find the courage to act and that Daley Farms will be able to accept the results.

Sincerely,
Mary Zveren
an LSP member
Dear Kim Groenheeder,

I urge you to deny permitting of the proposal to expand Daley Farm. Minnesota needs to do more to reduce greenhouse gases.

Consumption of beef uses much more water and land than consumption of quinoa per consumer. We need less beef cattle, not more. A thorough EIS will enable Minnesotans to see how this expansion will affect the environment. Large feedlot operations concentrate much more waste and no containment or treatment process is perfect. A large release is unavoidable.

Thank you for listening to my comments.

Jen Heinicke
687 Hillside Lane
Stillwater, 55082
February 28, 2010

Commissioner Laura Bishop:

The Minnesota Court of Appeals was right in overturning the MPCA’S negative declaration for an Environmental Impact Statement (EIS) on the proposal by the Daley mega-dairy Farm in Winona County to expand to 4,628 head of cattle or 5,968 head. Daley’s current huge operation of 2,275 cattle exploits the community’s water supply and endangers water quality in this karst geology region. To not request a more thorough look at the impacts of this milk factory would be a dereliction of duty for the Minnesota Pollution Control Agency.

The Minnesota Pollution Control Agency should require Daley Farm to file a full, complete EIS that addresses not only water supply and quality but other impacts as well. In particular, the public deserves to know how much methane will be emitted from the manure containment facilities....and, how that methane will add to the climate warming gasses already in the atmosphere.

The world is waking up to an understanding that only by stopping climate warming gasses from getting into the atmosphere now will we be able to avoid catastrophic consequences in the latter half of the 21st century. We must reduce greenhouse gasses, not add to them.

With increasing extreme weather events, especially downpours of rain that have been recorded in southeast Minnesota, no large earthen manure lagoons should even be allowed to be built.

I have been a member of Land Stewardship Project since 1986 and have followed the growth of largescale livestock facilities in the Midwest, seeing degradation of the land and water and air as a consequence. Our federal and state Pollution Control laws have been weak and enforcement of regulations cowardly. Local community democracy has been denigrated.

Ms. Bishop, you seem to understand the past failure of the Minnesota Pollution Control Agency to rein in the abuses of mega livestock farms. Please use your power to order an EIS on the Daley mega dairy or deny permitting any aspect of the Daley expansion.

Sincerely,

Dana L. Jackson

814 Everett St. North
Stillwater, MN 55082
651-293-8838
Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AU) to 5,968 AU. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AU so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 441.10.700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheimer: kim.grosenheimer@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line: on the Daley Farm proposal

- An industrial-scale animal factory is **NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW's recommendations are **inadequate, inaccurate, and incomplete** because, as stated, MPCA can't "conduct a full GHG life-cycle analysis." (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a) **Insufficient Information.** Staff from MPCA's environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, "Why are you spending time and our taxes on this supplemental EAW when you don't have enough information AND this project can't be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny."

- "Estimates of potential emissions" are **unsubstantiated.** We don't know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- **Faulty underlying assumptions:** "The Project will release air and odor emissions typically associated with a dairy farm" (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been **out of compliance** with state regulations for run-off and other issues, with violations filed by the MPCA's feedlot division that have gone unenforced over 22 years.

- **Recommendations** meant to control greenhouse gases are **vague and not maintainable.** For instance, consider the requirement that "Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public." The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley's land.

Read the brief EAW greenhouse gas supplement at https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf. It's also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf.

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public's power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have never recommended an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota's citizens, not just those seeking to create profit.

We need **Commissioner Laura Bishop** to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County's citizens along with all southeastern Minnesota's karst region communities are in a nitrate-induced drinking water crisis NOW. It's time to **STOP** pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org

Thomas C. Richards, Rural Baraboo, Minn.
Feb. 29, 2020

Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Kim Grosenheider,

I am writing to urge the MPCA to require an Environmental Impact Statement for the Daley Farms proposal to expand its dairy in Winona County. The EIS should include the greenhouse gas supplement and a thorough review of the impacts of the entire project. If this option is not chosen, then I urge the MPCA to deny the permit.

My grandparents farmed in Iowa, and my grandfather always tried to be a good steward of the land and water. Daley Farms has a poor history of compliance with state regulations for run-off and other issues, and it would be poor stewardship of our precious resources not to at least conduct an EIS.

Thank you.

Sincerely,
Doreen Kloehn
4036 Xerxes Ave S
Mpls MN 55410 - 1146
Dear Commissioner Bishop:

Please adhere to the Minnesota Environmental Protection Act in regard to allowing the Daley Farm in Winona County to expand their dairy herd as they have proposed from 3000 to 4628 head. The water quality in this karst region is very vulnerable to contamination from surface discharge and is already challenged. An EIS is obviously needed to allow you to uphold your agency’s mission statement as well as to enable you to comply with the Minnesota Court of Appeals determination on the matter of considering the prospect of increased greenhouse-gas emissions from the Farm.

This Farm has an extensive history of being out of compliance with state regulations on run-off and your agency has not demonstrated the competence or interest in enforcing against these violations. Therefore, a careful study is needed to evaluate the potential for harm that might result from this herd expansion.

As a rural resident of both Le Sueur and Crow Wing counties over the years, I appreciate the implications of ground water contamination and urge you to be very certain of the level of risk involved in deciding to permit this expansion. From my perspective, even without an EIS it seems obvious you would best serve the public interest by denying the expansion, but if you are unsure, be certain to fully explore the matter before making a decision that may well damage the well-being of Minnesota’s future generations to come.

Sincerely,

Dean A. Bourgeois
Dean Bourgeois
30070 Bonnie Lake Rd
Crosslake, MN 56442
(218) 692-4723
To Commissioner Laura Bishop, PCA
90 Kim Grossenheider, Resource Management & Assistance Division
520 Lafayette Rd N, St. Paul, MN 55155

Re: Daley Farm Mega-Dairy project

Please restore public trust in the PCA by making sure the Daley Dairy has a thorough EIS.

Mega-ag operations like this destroy rural communities economically and, to the point of this letter, environmentally. This operation is already out of compliance with state regulations for runoff and other issues. Concentrating this many more cows in one area, especially if their manure would be stored in an earthen-sided lagoon, clearly has significant potential for harmful environmental effects. Greenhouse gas emissions also need to be considered. Please have the EIS done.

I believe this will convince you and others that the permit needs to be denied. Thank you.

Steve Ernest
February 29, 2020

Dear Commissioner Laura Bishop

I'm writing to you in regards to the Daley's Dairy Farm expansion project and the environmental concerns that currently exist and the increased risk and toll it will continue to take on the natural resources required to support this mega factory farm.

As a Midwesterner, I've spent the better part of my life working on farms in Illinois, Wisconsin, and Minnesota. From small 200-300 acre family farms to large 5000-10000 acre mega farms. I've worked in the large dairy and feed lot operations and have first-hand experience of the impact of manure run-off and ground level contamination these large farms are susceptible to. Not to mention the many trade-offs that impact the livestock being confined to milking and feeding pens.

I'm not opposed to reasonable growth for families to make a sensible and sustainable living. But as a whole the farming industry is heading in the wrong direction with factory farms becoming the norm. The lack of bio-diversity due to mega factory farming will continue to diminish Mother Nature's intended evolutionary plan that is much more in harmony with smaller sustainable farming practices.

What we see above ground does not necessarily reflect what is taking place below ground and very difficult to fully understand the long-term impact of what is changing underground.

For these reasons that I and many other Minnesotans have we are reasonably asking that you look at the bottom line:

- **An industrial-scale animal factory is NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- **The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t conduct a full GHG life-cycle analysis.”** (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp. 2a. Insufficient Information. Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- **“Estimates of potential emissions” are unsubstantiated.** We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- **Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm”** (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- **Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.**

- **Recommendations meant to control greenhouse gasses are vague and not maintainable.** For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Sincerely, John Mueller
Commissioner Bishop

S.E. Minnesota's geologic features make decisions by land owners, livestock producers, and by governmental agencies particularly important. I worked as an Environmental/Public Health representative for 43 years in S.E. Minn.

I experienced first hand the impacts on surface waters and aquifers from poorly informed decisions and disregard for our environment. Our office served as a Regional Water Lab serving residents with testing needs and reporting the results (often disappointing) to them.

The public needs better information to make better decisions. Please actively promote legislative support for Geologic Surveys of each of S.E. MN counties. And develop easily understood interpretations of that resource.

Assign well trained adult educators to systematically meet with Township, city + County officials to help them comprehend the valuable information such studies provide. Also assign those resources to systematically meet with organizations representing Dairy, hog + other livestock producers and youth farm oriented groups such as FFA.

Farmers and community representatives make better decisions when they are well-informed. Lack of good information leads to expensive + politically charged fights, pitting individual + groups against each other.

Thank you Richard Peter
Minnesota Pollution Control Agency,

I am writing stating Daley Farms must do an E.I.S. They will have 62,500,000 gal of animal waste per year minimum. If that isn't enough volume to trigger an E.I.S. why even have the statute.

If this is indeed "a pollution control agency" then we need you to control and prevent pollution in Minn.

I ask you to honor the wishes of those of us that live in the Karst region of Minn.

If the Daley's pass a E.I.S study fine.

Don't assume things are fine and let them not do an E.I.S. study.

Sincerely,

Eugene J. Hansen
26596 Co Rd 12
Rushford, Minn. 55971
507-523-3779
Dear Commissioner Bishop,

Without water there's nothing. An EIS for the Deley project is going to show they can't keep their Manone out of the area's drinking water. The state must do the EIS or veto the project now.

The Deley family has to find another paradigm. Look where bigness has gotten them. Look at their violations of state regs over 22 years. They just can't stop taking their neighbors' water. They and everyone around them know about the ground water flow of the karst region, and they can't live with it. Past practice does not mean we must simply give official sanction to a perfectly hopeless project. Order the EIS.

Yours with dismay,

R.F. Jacobi
Dear Laura Bishop,

Concentrated animal operations have no place in the delicate, permeable, water-vulnerable area of the Daley Farm proposed expansion.

Sustainable, humane, regenerative animal operations DO exist and are the only sane option from now on.

Please deny permitting.

Nancy Conner
8810 275th Ave NE
N. Branch MN 55056

Rural resident, organic grower, businessperson and Land Stewardship Project Board Member
Dear Commissioner Bishop,

I encourage you to deny permits to greatly expand dairy herds. At the least have an Environmental Impact Study done and honor the results.

In my own community we have 3 new dairy operations within 20 miles of where I live near Montevideo, Minn. All 3 exceed 3000 cattle each. This is a great concern for the ground water table.

These mega farms have put a lot of small dairies out of business. This impacts the sustainability of our local economies.

For environmental and health reasons, more and more people are moving toward a plant-based diet. We now have many alternative “milks” and even “cheese” that are not dependent on animal factory farming.

Let’s support our small neighborhood farmers that graze their cattle on ground covered land, enriching the soil.

Thanks for your consideration,

Vicki Foes, Montevideo Minn.
February 26

Commissioner Bishop,

I am writing regarding Daley Farm proposal & expansion.

Our state and planet are in trouble - we have to correct many mistakes that have been made and not make more mistakes.

Doris Berger

507-334-2267

2035 Wabasha St. S

Minneapolis, MN 55404-1007
To: Commissioner Laura Bishop
From: Loretta Paulette Pace, SSD
Date: Feb. 25, 2020

I am writing this letter because I am a member of the Land Stewardship Project and I am very upset about the decision made concerning the Daley Farm’s proposal. It is hard for me to understand the reasons for accepting this proposal when it exceeds the cap of 1,500 NPS set by Winnona County and adds so much pollution to this area of our state! People are living with contaminated water and poor air quality!

Factory farms are not a source of greenhouse gases and are only good for providing profit for the owners. It has been brought to my attention that Daley Farms has been out of compliance with state regulations for years! Why have the laws not been enforced?

We need you, Commissioner Laura Bishop, to stop this animal factory proposal. We are in a crisis time and you can make a difference in this part of our state. Please pay attention to this matter.

Sincerely,
Loretta Paulette Pace
170 Good Counsel Dr.
Mankato, MN 52001
MPCA
520 Lafayette Re N
St. Paul MN 55155

Dear Commissioner Bishop,

I am writing regarding the proposal to expand the dairy at Daley Farm in Winona County. It is imperative that there be an EIS for such a large operation, especially considering it is already out of compliance for state standards for runoff and other issues.

I grew up on a family farm, then went on to earn a chemical engineering degree and later teach science to high school students. Rather than let family farms die away, we need the land stewards that they provide to much more responsibly than corporate farms. The future of the planet depends on decisions made today.

Sincerely,

Lisa Clark
948

Native American Rights Fund

By

MAR 02 2020

Dear Bradley,

3rd S. shelf. RA.

Dear Chair.

To date, our legal and political work has made significant progress in many areas. We have secured several important victories, including

- [specific legal victories]
- [additional achievements]

Our approach focuses on creating a more just and equitable society, and we continue to work towards this goal. I hope you will support our efforts.

Sincerely,

Shay Hurla

948
To: Laura Bishop

I hope the letters of protest are given due justice. When water laws and ordinances are not followed our quality of environment and sustainability take a large step down. When you have laws in place that are already working, how can you stoop so low as to change for one spoiled rich boy. Your predecessor must have been a "Trump Man" to think so little of the "Winoona Area". It would be a sell-out and Minnesota loss with the "Largest" river in the U.S. to be treated so badly. Treat this area the same as the St. Croix River Basin and you will be doing something!

Thank You-
Wish you all the Best -
Jack Brooks
MPGA’s Environmental Review & Feedlot Divisions Are BROKEN. Commissioner Bishop has the Power to Make it Right for Our Rural Residents Regarding a Winona County Factory Farm

Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Line Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs) to 5,968 AUs. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line:

- An industrial-scale animal factory is NOT EXEMPT from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conduct a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. Insufficient Information. Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gases are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at https://www.pca.state.mn.us/sites/default/files/p-ear2-143k.pdf. It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at https://www.pca.state.mn.us/sites/default/files/p-ear2-143b.pdf.

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have never recommended an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to STOP pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
commissioner Bishop -

I totally agree with the LSP position. You should order an EIS or deny the permit.

Thank you

Randy Peik
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Kim Gosenheider,

We are 3rd generation small-scale family farmers who value the health of our environment, esp. water and soil, plus the humane treatment and health of our animals! We strongly object to factory, huge type farms being exempt from an in-depth environmental review via EIS. MN St 4410.4600 Subp. 19.

We feel time and taxes are wasted on a EAW that lacks enough information and probably could be misunderstood esp. when the Daley Farms are not permitted in Winona County due to the 1,500 animal unit cap that we strongly support. In addition, Daley Farms is now and has been out of compliance with other state regulations like run-off and air quality matters. Not requiring an EIS on a Factory Farm of this size ‘is just plain Wrong’!

Our drinking water, air, gas and smell, smaller farm economic protection issues, good health and sustainable conditions of all life depends on a live-able environment!

We, people living in the S.E. MN Karst area, need this protection. This cannot be left to chance!!

Sincerely, Bernard B. Goetzman
Family of
I am a resident of the
Minnesota and a friend of the
operation in Winona County.

I am writing to you to ask
Commissioner Bishop,

I am a resident of Winona County.

I am writing to you to ask
Commissioner Bishop,

I am a resident of Winona County.

I am writing to you to ask
Commissioner Bishop,
Significant are not mini." Although this is probably
and many farm larger than
and plan to any medium or
Please order on F1s or step
improving in greater much,
urban direction, abstract of issues
proposed, which keeps me an

We want clean air and
water, too.

Don't forget about us
in mission

Birds and flowers illustration
Dear Commissioner Laura Bishop,

Please hold factory farms accountable to the small farms and communities they impact. Ask for an EIS study on the Daley mega dairy. With other struggling small, multi-generation family dairies trying to make ends meet, we don't need factory farms adding to these market situations or the climate situation.

I live in Fillmore Co. and am on a volunteer water/nitrate testing program. I'm aware how sensitive our Karst area geology is to water pollution. Help keep our water and air and climate sustainable for healthy and prosperous living for all, not just the greedy few who can work the system.

Thank you for your consideration.

Sincerely,

Lynn & Kathy Steinbrink

RECEIVED
MAR 03 2020
Kim Grosenheider  
Resource Management and Assistance Division  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, MN 55155

515 1st Avenue, SW  
Apt. #212  
Rochester, MN 55902

February 29, 2020

Dear Ms. Grosenheider,

I am a retired physician. My wife and I have lived in Rochester since 1977. During this time we’ve become very familiar with many of the challenges that people in rural Southeast Minnesota face.

We have become close friends of many farmers who are vendors at the Downtown Rochester Farmers’ Market. We have worked, voluntarily, on several of their farms over the years in Wabasha and Winona counties. Additionally through lectures (by Dr. E. Calvin Alexander) and our own study, we have become knowledgeable about the very fragile Karst geology of this region.

We have friends in the nearby Lewiston area where for many years, residents could not drink their own well water because of nitrate pollution. In fact, the City of Lewiston has had to install an expensive filtering system to remove nitrates in the water because of local agriculture. Nitrates on Karst geological areas can clearly be a problem relatable to large number of animal units.

We’ve followed the controversy about expanding the Daley dairy from an allowed 2275 animal units to 5668 animal units. We know many folks near this farm who are very concerned. Also the Winona County Board after a thorough discussion decided to limit the animal unit cap to 1500 animal units. How the former MPCA Commissioner decided to allow the expansion of the Daley dairy to such an amount without the more thorough Environmental Impact Statement (EIS) is really hard to understand.

We urge you to review this poor decision on the Daley dairy expansion (considering its effects on all our friends and their neighbors who live near this diary) and either deny the permitting or require an EIS.

Thank you for considering our concerns,

Alan and Judith Hoffman
March 1, 2020

Commissioner Laura Bishop
MPCA
520 Lafayette Road North
St. Paul, MN 55155

Commissioner Bishop:

We are long-term residents of Winona County in which the Daley Farm resides and wish to express our displeasure with and opposition to the MPCA’s flawed handling of the proposed expansion of the animal unit cap at the Daley farm from 2275 to 5968. This expansion far exceeds the 1500 animal unit cap authorized under the Winona County’s zoning ordinances of 1500 animal units. The dramatic, industrial-scale expansion of animal units in itself should result in a denial of the proposal, or at the very least require an in-depth Environmental Impact Statement under Minnesota Statute 4410.4600, Subp. 19 to supplement the MPCA review and reconsideration of the total Daley proposal.

The MPCA has clearly failed in its permitting duty to protect the state’s natural resources, wildlife and human health (clean air and water), as the Appeals Court correctly recognized in October 2019 when it revoked the Daley permit and required a supplemental MPCA review. The MPCA’s role is to protect and advocate for the public’s safety and interests rather than the interests of corporate entities as represented in this case by the Daley farm expansion proposal, especially regarding nitrate water pollution. Your agency has clearly lost its understanding of your mission and the customers you are to serve!

But you now have an opportunity to help rebuild the public trust in your agency by requiring the completion of a full Environmental Impact Statement of the Daley proposal prior reconsidering the Daley proposal with all relevant data being available, or, by denying the permit based on Winona County Zoning Ordinances. (The MPCA should NOT be a backdoor facilitator of the Daley proposal because they do not wish to abide by County ordinances.)

The focus of the required supplemental MPCA review of the Daley proposal is on the extent of air pollution and green-house gas (carbon dioxide and methane) production due to the proposed increase and concentration of animal units and manure generation at the Daley farm. Methane has 25 times more global warming potential over a 100-year time period than carbon dioxide, which the State of Minnesota is already boldly seeking to reduce on several fronts. The MPCA’s initial estimate is that the Daley proposal would emit the equivalent of about 32,500 tons of carbon dioxide per year, more than the green house gas emissions from 6,000 cars in a year! That estimate only covers 42% of Daley’s acreage that will be receiving manure from their operation. If a goal of the MPCA is to assist policy makers and industry toward reducing green-house gas emissions, a prudent
course of action, in order to facilitate State goals in this area, is to deny the Daley permit proposal, due to incrementally adding to and concentrating the green-house gas load already being produced.

The self-interests of the Daley’s expansion proposal do not adequately take into consideration the self-interests of others in the county, region and state with respect the persistent problems of air and water pollution and climate-warming green-house gas production. We request that the MPCA deny the Daley proposal.

Respectfully,

[Nancy M. Reynolds' signature]

James R. and Nancy M. Reynolds
4455 West 7th St.
Winona, MN 55987
jreynold@hbcicom
507-454-5486
To: Kim Grosheider, MPCA

Ref: Daley Farm Expansion, Lewiston, Minnesota

I write to you today regarding the supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions related to Daley Farm expansion.

Neither the MPCA or any prior court decision had previously required an analysis of potential greenhouse gas emissions from a livestock facility in Minnesota.

I believe that the permit should be granted as applied, with the EAW already in the application.

This farm could be a great case study for the MPCA to use going forward on how to monitor, and what type of expectations are anticipated as the farm is utilized.

This could hopefully give the MPCA a benchmark of their processes going forward for other types of expansions in Minnesota.

AGAIN, I am in favor of the Daley expansion going forward as applied for with the EAW.

Thanks for your consideration.

Don Brown

970 49th Ave.

Winona, Minnesota 55987
Dear Commissioner Laura Bishop,

I am writing to you as a Land Stewardship Project member regarding the Daley Farm Dairy in Winona County. It was brought to my attention that the operation wants to expand from 3,275 animal units to 5,900 AUs.

I am writing to ask that you run an Environmental Impact Statement on the greenhouse gas supplement and entire project and ultimately deny permitting for this project as the operation already exceeds the Winona county AU limit of 11,500 AUs.

The Winona County area is a fragile ecosystem and excess factory farming can and already negatively impacts its earth topography. Not only this but the greenhouse gases emitted and the economic impact of factory farms over 11,500 AUs (and just in general) is devastating. Small family farms that greatly contribute to the local economy and diversity of the landscape are needed more than ever and even though it will take longer to see the return on investment here, we need to prioritize these farms to have a viable future.

Please don’t just see profit and bottom line.

Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

Please order an EIS and ultimately deny the NPDES permit for Daley Farm’s and any farm over the 11,500 AU limit. Thank you, Rebekah Schulz schu4398@umn.edu
February 27, 2020

Commissioner Bishop -

I write to you with concern regarding the Daley Farms proposal to expand its mega dairy in Winona County.

I urge you to place the concerns for this sensitive karst region above the degrading practices of mega-farming.

As a long-term member of the Land Stewardship Project, I strongly agree that the best hope for this region, and all natural areas, depend on sustainable use of the land and resources.

I support you in making the best decision for the long-term health of our community over the short-term needs of unsustainable business models.

Thank you for your consideration,

Sincerely,

Virginia Templeton
LSP Member since 1985
Dear MS. Bishop,

Though, not living in Winona County that will be directly affected by the economic and health risks from the proposed expansion of the Daley mega-dairy operation, I do have red-flag concerns. A letter was sent to Land Stewardship Project members with facts, back-up information, cited statutes for environmental protection of agriculture and references. Adding 3,000 cows to the Daley mega-dairy operation was especially alarming to persons concerned about and advocating for responsible land stewardship.

My red-flag concerns are:

- The economic, environmental and health consequences of adding 3,000 cows to the already noncompliant corporate dairy operation.
- Economic concerns include the challenges facing small dairy farmers competing with mega-dairy operations. The small dairy farms serve, support and contribute to their community as involved citizens and provide quality products to consumers. Another concern being environmental, health and financial costs in the event of an environmental disaster.
- Corporate farm factories are known to have inhumane animal treatment practices that deny animals of the basic comforts of a natural habitat that smaller livestock farmers can provide. When one is around them, caring for them, one learns they have basic traits that respond to humane treatment. The small, animal friendly, dairy farms are going extinct.
- The mega-dairy presently is not required to do an EIS? That is totally unacceptable!
- The mega-dairy is so large it is inconceivable that with even with, “best practices”, it will face challenges to be cost effective and still meet and
sustain the environmental and health safety requirements. An EIS would
would be a useful tool to use for exploring that.

The health risks to neighbors, community and population beyond beg the
question; How can the air and water pollution elements be contained to farm
boundaries to prevent health risks to the populations affected by the pollution?
Air and water know no boundaries and travel freely in ground water and on wind
currents subjecting populations to present and long term health hazards.

As a Commissioner for MPCA, you are committed to land stewardship and the
challenges of keeping our environment healthy and livable. It is an awesome
responsibility to meet these challenges and definitely not an easy one. We thank
you for your service and hope you will listen to expressed concerns and take them
into account when making your decision on this existential treat to our land and
its people.

Respectfully,

[Signature]

409 8th Ave. NE

St. Joseph, MN 56374

#320 363 4307
Dear Laura Bishop,

Thank you for your public service on behalf of Minnesotans. I know public service can be a thankless job and I trust you are working hard every day for the citizens of Minnesota. I doubt this is ever easy, though I hope it is occasionally fun!

I am writing to urge you to acknowledge the truth that we live in a world where the environmental impacts—including water quality and climate change—of any given project may have longterm and irreversible effects on our lives.

With so many solutions to our environmental woes leaning towards smaller, clean, more localized operations of food chains, it behooves us to look closely at a proposal that promises none of these qualities. I’m speaking of the Daley Farm’s expansion proposal, which, by any public perspective, desperately needs an Environmental Review.

I am not a farmer but I rely on farmers—especially local ones—for an increasingly large percentage of food for my family. I am increasingly aware of the rarity & preciousness of clean drinking water. These things need to be preserved & prioritized, & as a leader today you are in an incredibly important position at an incredibly pivotal time.

I urge you to make a clean statement based on the truth—that this farm expansion should not happen unless it can prove that it will maintain the standards critical to the human race’s survival into another century. I depend on and trust your integrity & ability to see this.

Thank you for listening.

Best,
Katelyn Gordon

[Stamp: RECEIVED MAR 03 2020]
3/27/2020

Commissioner Bishop,

we don't need to change rules, we need to enforce the rules that are already in place.

Bruce Plaete
Plaete Dairy Inc.

Bruce Plaete
Pres.
The permit for the Daley Farms expansion in Wenzel Co. should be denied. If not, that, then a full EIS should be ordered. Daley Farms have been and is shown out of compliance for run-off and other point sources. The violations are enforced for 22 years! Because of this claim by the Daley Farms are not to be believable.

If our water becomes even more polluted by sewage or confirmed by EIS, it is too late.

The MPCA needs to work for people not for profit. This "Big Ag" everywhere else. It is time for widespread sustainable farming.

Thank you.

[Signature]
224 Lake Sadie Dr.
Wenzel, MN 55987
507.452.2505
Commissioner Laura Bishop
P.O. Box Grosenheider
MPCA
520 Lafayette Road North
St. Paul, MN. 55155

Environmentally-friendly greetings, Ms. Bishop:

I join many Minnesota citizens in expressing my concern that the MPCA will defend our land and water from harmful farming practices. Land Stewardship Project, of which I've been a member for two decades, alerted me to your role in being able to deny a permit to Daley Farms in Winona County. Because that enterprise has failed to conform to run-off regulations, and is guilty of repeated violations, it is appropriate to now deny it a permit. There is a just and simple solution for a dairy company which will not conform to reasonable laws protecting land and water from pollution: refuse to allow that company to operate in such a hazardous manner.

Sincerely,

Diane J. Peterson
4051 Griella Boulevard
White Bear Lake, MN.
55110
To: Commissioner Laura Bishop

I am currently an EPA member, I joined because of my concern and interest in the environment and farming. I realize the need for people to provide for families economically but the expense on the environment and health of our communities is becoming a great concern with large scale farming practices.

Please take note and require an EIS on the greenhouse gas supplement and the entire project or deny the permit for the feedlot proposed regarding the Daley Farms in Winona County. This beautiful area near the Mississippi has so much to value!

Juli Kranmer-Keilen

Thank you for your consideration
March 1, 2020

Dear Commissioner Bishop,

As a member of LSP I am committed to agriculture that benefits all of us—not just a favored few. Large scale farming has not proven to provide the healthiest food or healthy animals. That's why organic farming is so well supported. The consumers know it!

What makes matters worse is that States have been reluctant to set limits on the carrying capacity of the land, the water and the health of surrounding communities. Europe believes in and follows the precautionary principle—prevent it before you do it! We need to grow up and be as careful as our European neighbors.

I am not telling you anything you don't already know. Do not permit what to do? Say NO! Do not permit this already oversized facility. It is already oversized than they are. Do make them safer than they already are.

The only tool left to the public for safety is the EIS. A rigorous EIS keeps some kind of balance and check in place—and hopefully a matter of wisdom and common sense as well. If that is what is decided, it is not the best choice—just necessary. Denying the
permit would be the wise choice.

We don't hear enough about wise practices, wisdom, integrity. That's what is needed here. As a city dweller with farmers and friends - I know our fates are linked. What happens to one - happens to all.

It's time for courage, boldness, maturity and a clear vision. Agriculture when done right can help us face climate change, cleaning our water, bee pollination to crucial to our food sources, healthy foods from healthy well maintained animals, solid communities that interact and grow and prosper - it's all connected.

This isn't about just one farm - it's about a huge chain of life.

Can we choose a better way? We look to you to help us pave that better way.

Please deny this permit.

Thank you!

Florence Sandok
1516 13 Ave NE
Rochester, MN
55906
fsandok@charter.net
Dear Commissioner Bishop,

Regardless of what industry claims, factory farms are harmful to the soil, the air, and the water. A lot of well water is already contaminated. So many manure lagoons across the country have failed. The methane emitted is just another load, adding to our already perilous climate predicament.

Please deny permits until the results are in from a comprehensive Environmental Impact Statement with a greenhouse gas supplement. Then I think you will find it is not advisable to permit any expansion of this factory farm. The farm probably shouldn’t be the size it is to begin with in such a geologically sensitive area. Any spill would be an environmental disaster.

Thank you. Sincerely,

Joanie M. Davis (a decades-long supporter of the 3rd Stewardship Project)
Feb. 28, 2020

Ms. Laura Bishop, MPCA Commissioner
Main Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Bishop,

I am Wayne Hetts, a life-long resident of southeastern Minnesota. Now retired, I'm concerned about a proposed industrial feed lot expansion in Winona County for the Daly Farms.

Having some knowledge of the sensitive and vulnerable ground-water issues in our part of the state, I am wondering, who is anyone, besides local landowners, that will help safeguard the precious water that we all need to continue our way of life. That's why I am writing to you.

Some of us talk and others have the power to protect our resources. You being one of those key individuals, I feel the power to ask for an EIS regarding this proposed project for the Daly Farms.

It's always a struggle to balance the needs of many when making decisions that can affect so many for so long. I am sure, I am just one. A simple request that you consider an EIS as part of your judgement in whether to grant the above expansion proposal. If you've already decided not to request more information for the Daly Farms, please disregard this short note.

If you, like me, like all the information available regarding a proposal significant impact on our resources before making a decision, then please consider an EIS for the above.

We can save the ground water, but we can't fix it once it's been contaminated. Thank you for your efforts to protect our way of life here in Minnesota.

Respectfully,

Wayne Hetts
335 Monkey Valley Road
Kenyon, MN 55946
February 23, 2020

Dear Commissioner [Name],

I am writing this as a rural resident of Winona County. While not a resident of Winona County, I am concerned about drinking water quality and safety. At the western boundary of the nearest city, it is clear that feedlot run-off and the offensive seepage possible in these geographic areas affect us and many residents in our community.

It is vital - and very overdue - to hold factory farms accountable for their impact on our state and MN.

While MPCA have never yet recommended an EIS on a large factory farm, the times and findings of today's researchers and advocates like those of the Land Stewardship Project need to be heeded. For profit, private groups like Dairy Farmers are actually poisoning us. The EAD's are inadequate and a supplementary EAD would be so also. 

(MN statute 4410, 1780, Subp. 2a)

And the 1500 animal unit capacity has been

(over)
disregarded because I presumed the local public's concern and financial investments by such farming firms that go counter to real public (=people who live here) interest,

Please correct the harmful decisions of your predecessor granting an NPDES permit. MPCA needs to protect and improve the environment and human health in Winona Co., and all our counties. The Mr. Court I appeal "deference to the agency as expert" in overturning the initial declaration for an EIS failed the public's interest in this case.

As a member of the Land Stewardship Project and a concerned grandmother considering the living environment of our State - county by county - it is for an EIS on the greenhouse gas supplement to the entire project OK, denying the permit to Dakey Farms. Set a real and good precedent for all of us.

Sincerely yours,

Chris J. Birkey
Blue Earth MN
First of all, thank you for taking my letter. I live in southeast Illinois and am concerned about the proposed Dairy Farm expansion in Union County. I am writing to ask you to require an Environmental Impact Study for their proposed expansion. My understanding is they are able to increase their dairy herd from 3,000 cows to 4,600 head. This will lead to a huge increase in both water usage and quantities of runoff material.

We live in the heart geography of our state, with many springs, wells, and farmers, which makes it very vulnerable to ground water contamination. The point I wish to make is that deep clear water is a limited resource, and it should be treated as such. Many families in Union county already deal with contaminated water—either drinking water from farm runoff. As a rural resident of this area, if my well becomes contaminated, two things happen immediately:

1. I will need to buy water for drinking and cooking.
2. My property value drops due to the lack of clean water. We are blessed with large amounts of fresh, clean water in our area, and it will all need protecting.

The creek I grew up in a small farm town in central Illinois. With no local aquifer, our water supply was 3 wells. While in junior high school, the state condemned the wells due to contamination from farm runoff. Our town built a pipeline to a water treatment plant for a chemical company ten miles away. After many years of repeated benzene spills into
our drinking water, a new pipeline was laid from the nearest source, 40 miles away. Now the people of my hometown, Arcada IL, finally have access to good clean water! Unfortunately, their cost of operation has jumped 3-5 fold. All of this unfiltered runs over a number of years of contamination due to farm run off. With proper protection and safeguards, this should never have happened. I hope that scenario never plays out here.

Secondly, I ask that you require an EIS for climate change implications. With the number of increased corn irrigation requests, the air quality could be terrible, and the contaminated air isn't just stay over the Daley Farms. Their recommendations to control greenhouse gases are very vague. They also state they will evaluate weather conditions before manure application. The problem is that they only apply to average they own, 42% of the land to receive manure is on land they don't own.

Finally, as someone who has lived through water contamination from farm run off, I know how disruptive it can be. I am also a State cancer survivor (testicles, prostate), and I wonder if there were related to the contaminated water. I suggested for years, therefore, please require a minimum of an EIS of the Daley Farm expansion in Chisago County, or deny the expansion outright. Remember, in the long run it is much easier to prevent the problem, than to remedy it down the road.

Thank you,
Mark A. Norton
Minnecaska, MN  55700
Dear Commissioner Laura Bishop,

I will make this short and sweet.

The folks on private wells in SE MN, USA don’t want to
drink poop poop. As citizens of the USA, we have “inalienable
rights to protect life, liberty and pursuit of Happiness.” and
governments are created to protect those rights.

Because of the Supreme Court’s wrongly passage of
Citizens United in 2010, corporations now have personhood.
So, Daley Farms wishes to prosper by enlarging their
dairy farms, and do it at the expense of their neighbors
living in Winona County. This area is Karst topography
and highly susceptible to ground water contamination.

The Constitution of the United States clearly gives
Daley Farms the “Blessings of Liberty” not the blessings
of capitalism. No one should financially profit at the
health and happiness of others. And yet it happens in this
country all the time to the marginalized, if you happen to
live in the wrong zip code.

At the federal level things aren’t looking good. The
current administration plans on cutting the budget of the
EPA by 26% and Health and Human Services by 25% for
this upcoming fiscal year.

Seems like the Polluters are getting the “go ahead”
to pollute. The once regulated now get to regulate
themselves and write their own “best practice” model
to ensure maximum profit. Air and water quality
standards have a dismal forecast. For that reason, health
officials predicts Super bugs and infection rates will
have a mortality rate of 50% this century.

Animals like Dairy cows kept in mega confinements
like the one proposed by Daley Farms, will be naturally
stressed animals and dairy industry standards will
have them on antibiotics increasing the outcome
of the E.coli naturally excreted in the manure to be antibiotic resistant. Millions of gallons of manure percolating down through Karst topography will end up in these sand point wells. Antibiotic resistant E.coli is a killer and a major health emergency every year.

In all respect to you, your job is to stop the insanity and protect human health.

Sincerely yours,
Laurie Sell
I think you are the right person, in the right role, at the right time to correct harmful decisions made by your predecessor, John Linc Stine, regarding Daley Farms’ proposal to expand its mega-dairy in Winona County.

I understand that Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in the sensitive karst geology region or burden the community with excessive waste and odors.

Southeastern Minnesota’s sensitive karst region already is riddled with nitrate-laden drinking water.

I’m sure that you want to uphold your agency’s mission to protect and improve the environment and human health, as well as its duty to abide by Minnesota statutes, by considering type, extent and reversibility of environmental effects as well as cumulative potential effects.

From what I know, the Environmental Assessment Worksheet contains recommendations that are inadequate and Daley Farms is out of compliance with regulations for run-off and other issues. I am perplexed that violations filed by MPCA’s feedlot division have gone unenforced over many years.

Please help protect our local economies, natural areas and biomes. Please help us have access to clean water, air quality, health and quality of life. Please use your authority under the Minnesota Environmental Policy Act to order an Environmental Impact Statement or deny permitting on this massive animal factory proposal.

Factory farming is so different from family farming and, while it is part of modern agriculture, it basically is driven by unbridled capitalism that must be regulated to keep it under control. Factory farms have more to do with commerce than agriculture. By contrast, restoration and maintenance of environmental quality are values long associated with family farming.

I truly hope you will consider these thoughts to help you determine your actions on the Daley Farms issue.

Respectfully,

Paul Burck
5230 Dupont Ave. N.
Minneapolis, MN 55430
February 27, 2020

Commissioner Laura Bishop
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55155

Dear Commissioner Laura Bishop:

I am a member of the Land Stewardship Project and I am concerned about the Daley Farm proposal in Winona County to expand this mega-dairy by 3000 cows. I understand that contaminated water and poor air quality are already affecting rural Minnesotans in this sensitive karst region. I ask for an Environmental Impact Statement on this project, at the least, and that you consider denying the permit altogether. I believe that large, factory farms are environmentally unsound and I support the Land Stewardship Project in their work to maintain more sustainable family farms and to support a good quality of life in our rural communities.

Thank you for your consideration,

Suzanne Reedy
Dear Commissioner Bishop -

We must allow support for small farms and not MEGA operations.

Thank you for supporting the need for an EIS on the greenhouse gas supplement and the entire project; OR DENY THE PERMIT.

The mega operation, in this case for the Dairy operation - threaten land, air, water and all you.

I can only stress that you have the ability to speak up and do not allow my voice, which is in your hands, to be buried under nonsense.

Ms. Helen T. Dorisse
4675 Lake Ave
White Bear Lk, MN 55110-3228

SP member & citizen
Dear Commissioner Susan Bishop,

I am writing in regard to the Daley Farms proposal to expand its Mega-dairy in Winona County. We don't need more factory farms.

My concerns are how the environment is polluted, water contamination, greenhouse emissions throughout the county. How the small farmers will be affected by quality of life, for the confinement of the animals.

I request that you speak up against John Sims' Daley's proposal.

I am an LSP member and grew up on a small farm.

Thanks sincerely,

Gloria Deple
Feb. 27, 2020

Dear Commissioner Laura Bishop,

Thanks for you and the staff of MCPA for the opportunity to comment on a Factory Farm expansion in Wimauma, Fl.

It is incomprehensible to me that our state, MCPA would not want to require the Daley Factory Farm owners to have at least an EIS on their entire project. I think they should be denied the permit.

Factory Farms are not the way to go in our great state. No matter who owns them, a corporation or a generation family, a factory farm among many things:

- confines thousands of animals in a concentrated area,
- injects these animals with large amounts of antibiotics and feeds them grain grown with pesticides to keep them alive and productive,
- produces massive amounts of manure that can cause great environmental impact on air, soil and water quality, thereby harming the health of livestock and humans both locally and beyond.

Personally, I am very concerned about the health of our children being fed unhealthy milk, meat, and vegetables all produced in these unsustainable and wasteful ways.

My granddaughter is on the autism spectrum. My mother has joined with several other
parent with children so challenged to research how food might be causing so many health challenges in children today. She and others are convinced and with them that antibiotics and pesticide use on animals and soil is very harmful. She now buys local organic and grass fed meat and other foods.

The MPCA needs to support people who are into sustainable agricultural practices. It needs to protect the air, the soil, the water, algae us in MN and beyond.

Please either deny the permit to the Delly family or at least request an EIS on their entire project.

I wish you and the MPCA staff a good March 2020.

Peace,

Mary M. Kienen
1284 Eldridge Ave W.
Roseville, MN 55113
651-528-8924
Dear Commissioner Lara Bishop,

I am writing to you with concern of the proposed expansion of the Daly Farms proposal. I am writing as a LSP member, former organic vegetable farmer—but mostly as a concerned citizen of Minnesota.

My values—farmer—and from Renville & I remember when the MPCA failed them years ago allowing large hog lagoons. I was so surprised when the MPCA allowed these not tissue lagoons.

Please—I urge you—to not fail the citizens of SE Minnesota in this situation. Please do not allow a permit for this expansion. It is the right thing to do.

Regards,
Bob Cramer
2/26/20

Dear Commissioner Bishop,

I am writing regarding my concern about the proposed Daley farm expansion. My husband and I know the Daleys and have nothing against them personally. We also farm in Winona County. I don’t think there should be exceptions to the 1,500 Acre Cap. If the County wants to allow farms to exceed this cap then zoning ordinances should be changed following proper channels w/ EIS and with consideration for recent heavy rain events.

Please do what you can to make sure a good decision is reached that protects our environment.

Thank you,

Rachel Brown
31325 Nagle Ridge Dr
Winona, MN 55987
507-459-6695
rachelbrown31325@gmail.com
To Commissioner Bishop,

As a Minnesota resident and Land Stewardship Project member, I am troubled by the news of the Daley Farm. Our natural resources are among our greatest treasures in Minnesota. The fact that there is no Environmental Impact Statement required for the Daley Farm to expand their dairy is troubling. That county where the farm is located has restrictions on dairy sizes in order to protect its water which is already troubled by high nitrate levels.

Please assure that the MPCA is doing its job given by me and other residents of Minnesota. There must be an EIS on the greenhouse gas supplement and the entire project, or deny the permitting of an increased dairy all together.

Sincerely,

Kerry Harifié, Hanapee Ranch, Castle Rock, MN
29 Feb 2020

John Goodfellow

TO: Box 132
Mariveles ST Cnic, Mnl
55047

Commissioner Laura Bishop
MW Pollution Control Agency

Dear Commissioner Bishop,

I am writing to ask your agency to recognize that industrial agriculture is different than the small family farms of the past. The industrialization of dairy, hog, poultry farms is changing the impact of Ag on communities.

It’s time for the public, and our state agencies recognize that there aren’t your daddy’s old farms. They concentrate the adverse impacts of operations.

Please require a more rigorous review process when evaluating industrial Ag. And specifically, please require an EIS on the Delorq mega dairy.

Thank you for considering my request. S Goodfellow
Dear Commissioner Bashuck,

The Minnesota Pollution Control Agency needs to know that average Minnesotans need your protection and advocacy. I do not want to believe that the MPCA is merely an instrument of big business used to overcome regulatory hurdles. In the case of the Daley Farms proposal to expand its mega-dairy in Winona County and decisions made by past Commissioner John Loevne, it would appear so. You are the right person at the right time to take another look at this proposal in light of the demand threats to other quality air and water quality for neighboring residents. Please at least require that an EIS be completed for this project.

I grew up in Southeastern Minnesota and return often to visit relatives in Rochester. My husband and I own orchard land in Wisconsin and are supporters of sustainable agriculture.
and the family farm. We live in Duluth, MN, and are passionately opposed to the proposed copper-nickel mining projects that threaten our clean water and air in Northeastern Minnesota.

The issue of the Dakey mega dairy in your jurisdiction is part of a continuum. The bottom line is that now, more than ever, we need to pay attention to maintaining clean air and water. Regulatory agencies such as the MPCA should be our first line of defense. Please take action to regain the public trust in the work you are doing.

Yours Truley,

Judith Derauf

3422 E. 1st St.
Duluth, MN 55804
218-393-0622
A Statement of Public Comment
Seek & Speak the Truth

Date: 2/20/20

Comment: No part of the Daley Dairy expansion in Winona County is for the public good. Partially adequate pollution protection is not the public good, nor is uncontained profitability. We need healthy and sustainable.
Laura Bishop, Commissioner
Minnesota Pollution Control Agency
Resource Management and Assistance Division
530 Lafayette Road North
St Paul, MN 55155

Dear Ms Bishop:

Thank goodness you are on the job.
The PCA was established to protect Minnesota's precious water, land, and air, as well as the health of its citizens. The previous commissioner's predecessor had expanded the Dairy 4 farm without a proper environmental impact study and impact from the affected neighbors. The owner, put their own profits over protecting the precious environment. Cows are a major source of air, water, and food. Please deny the expansion and prevent further environmental degradation. We don't need more global warming.
You alone as commissioner are in the position to act in the long range public interest of all Minnesotans. Thank you for your consideration of this grave responsibility.

Appreciatively,

[Signature]

[Name]
Laura Bishop, Commissioner of MPCA
520 Lafayette Road North
St. Paul, MN 55155

Dear Laura Bishop,

What a huge responsibility you are
Commissioned with, to influence a positive
positioned for the people surrounding the
Daley Farm in Winona County. It angers
me to even imagine what is being
proposed - from 2,275 animal units
up to 5,968 AUs — the environment impact,
pollution that can affect water supply,
horrible smell and airborne pollutants
that threaten people around the area.

Thank you for giving thoughtful
consideration to our precious environment
and the health of precious individuals
who will be negatively affected.

I grew up on a farm. It is our
rages what can be forced on a
community. So destructive - just
for $58.  Evan Millard
Commissioner Laura Bishop
MPCA Resource Management and Assistance Div.
520 Lafayette Road North
St. Paul, MN 55155

Dear Ms. Bishop,

You are in a position to make a huge difference to many people who live near the Balew Farm's proposed dairy farm in Winona County. The previous MPCA commissioners denied the need for an Environmental Impact Statement (EIS) and granted a permit. This decision defies reason; increasing a farm to twice its current size in a region with least formation geology, not to mention the burden the sewage would put on the resources, is untenable. The smell and airborne pollutants would also threaten the health of people living near the farm, even more than they already do.

Please reconsider the need for an EIS for this harmful project.

Thank you for your efforts to protect Minnesota's air, land, and water from all three.

Sincerely yours,
Wendy Thordsen
To: MPC - Attn: Commissioners Laura Bishop

From: Carol Spearman

Re: Daley Farm - Winona County

Please protect our rural areas and water supply by
requiring an Environmental Impact Statement on any
further development on the
Daley Farm.

We do not understand how
this farm was approved for the
amount of livestock they have
now.

Thank you.

Carol Spearman
Laura Bishop, Commissioner, EARCA  28th February 2020
Resource Management and Assistance Program
Minnesota Pollution Control Agency
520 Lafayette Road, North
St. Paul, Mn. 55155

Dear Commissioner Laura Bishop,

Please use your influence to order an Environmental Impact Statement or deny permitting on the massive animal factory proposal of the Dairy Farm to expand by 3,000 cows to 4,600 head. The massive feed lot and waste will only increase environmental contamination.

Respectfully submitted,
Charlotte E. Erdlandson
4300 W. River Pkwy
Minneapolis, Mn. 55405
Laura Bishop, Commissioner to MPCA
Resource Management & Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road N.
St. Paul, MN 55101

Dear Commissioner Bishop,

Please, please support an Impact Statement on behalf yet, deny the permit for the massive animal facility proposed by the Daley Farm to expand their dairy herd.

I live along the Mississippi River because I love and value each and every drop of water in Minnesota — please, let's not add to the further polluting of it or animal waste.

Laurene Liddle
4300 W. River Pkwy #363
Mpls, MN 55406
Dear Commissioner Bishop,

You have said you need to restore public trust in the MPCA. Terrific!

Then please do everything you can to follow the law and common sense regarding the Daley Farm in Winona County. Their expansion must be stopped.

I live in a small town in Freeborn County so this issue does not affect me directly, but I want to support my neighbors in Winona County who are concerned about the air they breathe and the water they drink. That area is so sensitive to water pollution due to its Karst geology, and their water must be protected at all costs.

Minnesota is (or maybe was?) known for its "sky-blue waters". Not anymore. We have eroded our reputation by giving in to big business. The bottom line for anything anymore is greed for the almighty dollar. And look where that plan has taken us. We are destroying our planet! When will it end? Will you stand up for our air, water + earth?

One final thought... would you want to live next door to an expanded Daley Farm? Please do right by those who may have to.

Sincerely,

[Signature]

Feb 26, 2020

3/3
I’m contacting you to call for an EIS for The Daley Farms of Lewiston. My concerns and the concerns of many others in this area regarding water quality issues re well documented and your agency has stated remain in the record so I will be addressing concerns regarding the massive amount of greenhouse gases this facility will produce on an annual basis, 32,500 tons to be precise. First, this massive amount of greenhouse gases will occur on an annual basis during the life of this facility and will clearly aggravate climate change in a region that is already experiencing an increase in precipitation and ecological caused by this increase, Second, it is doubtful that the amount of Alfalfa planted in relation to this facility will truly be adequate to mitigate this amount of greenhouse gases. Third, the driftless region is arguably one of the most ecologically sensitive regions in the midwest which demands the most rigorous environmental review for sustainable development projects especially one that will permit over 4000 head of cattle to located in one relatively small location. Five it appears that as this project progresses additional environmental concerns seem to arise. In light of all these considerations the most rigorous environmental review, full EIS is called for anything less will not be adequate to fully asses the environmental impact of this proposal.

Thank you,
Dale H. Hadler
Winona, MN
Dear Commissioner Laura Bishop,

We write to ask you to require an EIS on the Daley Farm near Lewiston, or to deny the permit altogether.

Attracted to its natural beauty and to escape polluted metro areas, our family moved here to central Winona County over 30 years ago. (While we have a Winona postal address, we live about 3 miles outside of Lewiston.)

We are dependent upon the purity of our well water. Our Karst geology is extremely sensitive and susceptible to groundwater pollution — and many of our neighbors already have contaminated wells (>10 ppm nitrates).

Further, some of our friends already have health problems from poor air quality. (There is a hog CAFO up the road.)

Daley’s mega-dairy, already one of the biggest in Minnesota, wants to expand from 2275 AU to almost 6000 AU. This proposed expansion would go against Winona County's cap of 1500 AU, which was set by the citizens of this county through our elected officials.

Commissioner Stine’s denial of an EIS did not adequately address findings of fact and the very real concerns of those of us who live near the Daley Farm.

MPCA stated it can’t “conduct a full GHG lifecycle analysis.” This in itself is the trigger for an EIS! (MN Statute 4410.1700, Subp. 2a)

The Daley Farm has proven that it is not a law-abiding or a friendly corporate neighbor to those of us who live nearby. This corporation has violated state regulations for decades, yet these have not been enforced. Why should we expect that they will now abide by the law following a huge expansion?

Our rural community is already in a water crisis from nitrates. Ms. Bishop, you have the power (under MEPA) to order an EIS or deny the permit.

For the sake of our family and our neighbors, PLEASE do not ignore the consequences that will result from an expansion of this factory farm. Thank you for your consideration.

Sincerely,

Jim and Rose Gurley
Hillsdale Township, Winona County
22505 Betty Jane Drive
Winona MN 55987
(507) 459-7367
Sent from my iPhone
<table>
<thead>
<tr>
<th>From:</th>
<th>Mike Kennedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>To:</td>
<td><a href="mailto:kim.grosenheider@state.mn.us">kim.grosenheider@state.mn.us</a>.</td>
</tr>
<tr>
<td>Subject:</td>
<td>Daily Farms GHG Supplement</td>
</tr>
<tr>
<td>Date:</td>
<td>Wednesday, March 04, 2020 11:01:12 AM</td>
</tr>
<tr>
<td>Attachments:</td>
<td>Daley Farms GHG.docx</td>
</tr>
</tbody>
</table>

This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.
Kim Grosenheider  
Resource Management and Assistance Division  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, MN 55155

Ms. Grosenheider:

Thank you for holding the public informational meeting on Feb. 4, 2020 at the Lewiston Community Center. Although a main problem with the Daley Farms expansion project is still the groundwater pollution caused by nitrate concentrations in the very area of this farm, I would like to comment on the greenhouse gas emissions (GHG). Since the EAW studies originally didn’t include GHG studies by the MPCA, it is another good reason for the project to complete an EIS. Then both groundwater pollution and GHG data are complete and the safety of the local citizens is truly considered.

In the 2019 Minnesota Environment and Energy Report Card issued by the EQB (the combined team of experts) on page 5 is the Greenhouse Gas section and the following page heading summary that “despite success in the electricity generation sector, Minnesota is not on track to meet climate goals.” From this statement alone I would assume that the MPCA, as the main agent of air quality goals for the entire state, would be looking to improve on them. Having a standard for measurement would be a good start. Planning for Climate Change is another. The report goes on to say the “gas emissions are not on target to meet interim and 2025 goals.” The report further states that “achieving the 80% reduction by 2050 will require much more aggressive state and federal policies.” The first paragraph ends with: “Fortunately, Minnesota is in a position to lead the efforts.” So... How about starting now. There is new (2018) data since the EAW was researched, scientific medical evidence of concern regarding groundwater pollution affecting Minnesota citizens, especially those in the karst geology regions of southern MN. A medical professional, Dr Charles Shephard of Winona, who spoke prior to me pointed this out very specifically. He stated that both air and water pollution damaged health is already apparent in SE MN and a project like the Daley Farms expansion will only add to that.

In the same section of the EQB report, is a graph showing the sectors of concern for GHG emissions. The proportional segment of Agriculture/Forestry is equal to each of the other two large segments of Transportation and Electrical Utilities. This project, without an EIS, is throwing the dice, when we shouldn’t be gambling. The Status of all the GHG sectors in Minnesota is “Poor” with the trend of “Not much change”. In the “Working Together” section of the Introduction, is the statement “Tackling the complex issues in this report will require innovative approaches and cross-sector collaboration.” So, as the agency in charge, I am asking you to begin that change, starting now.

It is time for the MPCA, as our guardian of environmental quality that we all count on, to get more “aggressive” in the control of our pollution of both air and water. This is exactly what the EQB report card says and this Daley Farms project, that the Winona County Board has denied, is a VERY evident opportunity to do the right thing.

Thank you for the opportunity to comment.

Mike Kennedy  
316 W Wabasha St. Winona, MN 55987
Name: Hannah Burns

Email: schle475@umn.edu

Subject: Do a thorough environmental review of the proposed Daley Farm expansion.

Message: Hello,

I am a concerned citizen urging you to conduct a thorough environmental review of the proposed Daley Farm expansion. From my sources, there seem to be a number of environmental issues that will result from this expansion. As a policy and science graduate student at the Humphrey School of Public Affairs, I am concerned that there are more costs than benefits if this expansion takes place. The Land Stewardship Project and MCEA predict the expansion would result in Daley farms emitting 1,217,247 kg of methane per year, contributing to our changing climate. There are also concerns with water use (92 million gallons of water per year) and the potential for groundwater contamination from manure-spreading areas if this expansion goes through.

As a vegan and animal rights activist I think the expansion is not morally right. How can they possibly treat that many animals (4,628 cows) with any amount of dignity? I predict they are already spread too thin while caring for the current 1,728 cows in their operation. Logically, more than doubling the number of animals would give too much power to this mega-dairy operation. This would only increase their profits while negatively impacting animals, the environment, and community health. That does not sound like a win-win to me. Conducting a thorough environmental review is important for the sake of all stakeholders involved--even those who do not have a voice.

Please seriously consider these reservations,

Hannah Burns

(Sent via Greener Pastures)
I am emailing these comments to you to pass on to Commissioner Laura Bishop.

Dear Commissioner Bishop,

I have read the recent articles in the Star Tribune about the Daley Farms request to expand the size of their dairy, have read some of the documents created by the Daleys and the MPCA, and have read the letter the Land StewardShip Project has sent to its members (of which I am one) about this permit request.

I am not a farmer, and do not understand all of the issues about Animal Units, but I am concerned about climate change and how it will be affecting all of us in the coming years.

When I read the supplement to the Environmental Assessment Worksheet, I saw that Minnesota is already not meeting its target reduction of greenhouse gases (GHG).

On page 7 of that document, item number 11 refers to the "Next Generation Energy Act", which sets Minnesota GHG emission reduction goals of 15% from 2005 levels by 2015, 30% reduction from 2005 levels by 2025..." It goes on to say that "most recently available date (2016) shows the GHG emission at 12% below the 2005 baseline."

The documents state that this expansion of the Daley Farm will increase the emission of GHG. While I'm sure that this increase is a very small percentage of the overall GHG emissions, my question is, if we are to meet our state GHG emission goals, shouldn't we be encouraging reductions in GHG emissions, rather than giving waivers for individual enterprises to increase their GHG emissions?

I ask you to either require an Environmental Impact Statement, where the question of the level of emissions will be more thoroughly investigated, or to deny the permit to increase the number of cows at the Daley Farms.

Thank you for your consideration,

Anne Rutledge
5116 Ridge Road,
Edina, MN 55436
Commissioner Laura Bishop:

Please follow the intent of the MN Environmental Protection Act. As a member of the Land Stewardship Project, I believe we must respect the limits of the land's capacity to sustain animals.

Winona County's 1,500 AU's is much more reasonable than the proposed 5,968 AU's.

Respectfully,

Norman Leistiko
17849 Jasmine Dr
Park Rapids, MN 56470

When I raised cattle on my 45 acres, the largest # of animals I had was 310.
Dear Commissioner Bishop,

Big/Mega Dairies kill communities along with small farms. Their practices are poor for our environment and take away the ability of small farms to operate.

I farm on ground run by my family since 1984. I grow alfalfa organically and have grass fed beef. The few small dairies that did by my alfalfa are now closed — they could not keep up with the poor prices and high costs of hauling their milk. The big dairies have a monopoly on products and transportation of milk.

Regard
Winona County Factory Farm

February 22, 2020
Please keep agricultural practices and businesses as small farmers can compete. Small farms hold small families who children attend our schools and keep our towns viable — this is a crisis that affects us all.

Thank you for your consideration,

Sincerely,

[Signature]

Glenn J. Belhar
Yellow Medicine Farm — since 1884 family owned
4115 310th Ave
Clarkfield, MN 56223
March 1, 2020

Dear Commissioner Bishop,

I write this letter today to address the Daley Farm’s dairy in Winona County, and the request by them to expand beyond the “animal unit cap” set by county zoning ordinances, a limit they have already surpassed by more than 2,000 animals.

We have reached a critical time in our nation’s history, when the impact all of the great innovations of the 1800’s, the 1900’s and the early 2000’s are becoming known to every citizen who lives in a rural community, a small city, or a major metro area. These impacts are slow to be understood, and even slower to be recognized; the results can be hard to correct because it takes so much time for the science to catch up with the damage done, and the population to be re-educated to the new understanding. While we wait for science to “prove” the experiences of citizens “on the ground”, many citizens have stories that span these 200 years and are heartbreaking.

Science and experience have shown us that plowing the ground releases carbon into the air; that gasoline powered automobiles generate exhaust gases that pollute the air, soil, and water; that power generating and manufacturing plants release toxins into the air, soil, and water; that pesticides, fungicides, and herbicides kill or sicken more than their intended targets; that pharmaceutical “research and development” creates “medicines” that can help or even save lives, but the use and disposal of the same can pollute in ways we are just beginning to recognize; and we ignore all of this at our peril.

Today science knows that regenerative farming sequesters carbon in the soil and manages manure (if you can smell it in the air, fertilizer is not nourishing the soil); that permaculture is effective in controlling the damages caused to crops by insects; that a diverse plant population will mineralize the soil (we all learned about photosynthesis in elementary school); that animals who graze are healthier and provide better nutrition to the humans that consume them; and that all of the above promote clean air and healthy soil, and create natural springs that provide clean water. Grazing animals also produce “gold” in the way of non-toxic manure that becomes compost that becomes more plants that produce more minerals in the soil that provides clean water. Science knows that diversity is the key to health.

Animals living on concentrated factory farms require significantly more artificial means to maintain their lives (hormones for growth, antibiotics to control illnesses, and industrial vitamins and minerals); and the grains they are fed are grown from genetically modified and chemically treated seeds designed to survive being saturated with petro-chemicals in order for the yield per acre to be high. The treatment of those seeds is absorbed by the plant’s roots as it grows and is also present in the food produced.
In Minnesota, farmers will allow their fields to lie fallow on occasion as a conservation practice, and I have witnessed fields for miles around my neighborhood completely barren of all plant life during those years that no grains are planted (with the exception of a stray corn or soy volunteer from the genetically modified parent plant), indicating that the chemicals used are still active. A field with no plant life cannot re-mineralize itself, so chemical fertilizers and raw animal waste are applied to compensate. Many of the “nutrients” produced in this way are as unidentifiable by our bodies as they are by the bodies of the animals fed from the plants grown in that ground. The effects of which can cause more and varied illnesses over the long term, and can produce more pollution of the air, soil, and water; for example the farm runoff that has caused pollution of lakes and rivers, and the extensive algae blooms science is concerned over along the east coast and in the Gulf of Mexico, too; or the early physical maturity of our children that began due to the hormones used in the meat and milk.

The frustration felt by citizens stems from the belief that our elected officials will listen first to those who create fearful narratives, usually around loss of revenue and jobs, to support what they see as “cost effective”. It seems wise to use all of the available science to learn as much as we can, in advance of a new stress to the environment, to eliminate the need to clean up later; a process that takes decades to achieve once a standard is in place and a generation is “used to it”.

As a new member of the Land Stewardship Project here in Minnesota, I bring to the table knowledge and experience gained in the course of my 66 years of life. For 20 years of that life I raised horses, and experienced the disappointment and frustration of losing foals to poor mare nutrition due to a lack of nutrients in the soil. The advice then was to provide “sweet feed”; grains, vitamins and minerals held together with molasses. While it saved lives and produced healthy foals, my horses became very aggressive when feeding time came, and I eventually suffered the consequences; serious personal injury. But still, I didn’t stop feeding this way until I learned that breeders were finding that the feed caused diabetes in their brood mares over time.

What was needed was good pasture management; a diversity of plants to build and mineralize the soil, composting manure to add nutrients, implementing rotational grazing, and providing a more diverse grazing population of animals. Most important is the number of animals that the acreage is able to support. Wild herds do not stay in one place, and do not return to the same area frequently. In addition, more than one species of grazer is needed because they do not all choose the same plants all of the time, and that prevents any one plant from becoming dominant and causing the overgrowth of “inedible” plants.

“What you do unto the least of these, you do unto me”; this Bible verse refers to humans, but it could also refer to the environment, and the effect of human actions up and down the chain of life; what we do to the air, soil, and water, we do to ourselves. When faced with a decision that will impact all of the life in an area, it seems important to look at the bigger picture, to see the crossover effects of energy generation, agricultural practices, manufacturing practices, mining practices, and electronics, internet, and phone matrices; because what we do in one practice can effect what happens in the others and, ultimately, all of our actions effect the health of human beings, animals, insects, and plants. It feels important to note that none of these is less important than another, because of the connection between all life on Earth.
When working to determine the best course of action, it would benefit us all to keep in mind that our society has become increasingly convenience-based; a fact that carries with it the down side of a whole new slate of diseases and chronic illnesses. Many in our population are fat, tired, and sick. Many can no longer digest what is sold as “food”, and treatments consist of medications that do not heal or cure.

I feel confident that you are the right person, in the right role at the right time, to correct harmful decisions made by your predecessor, John Linc Stine regarding Daley Farm’s proposal to expand its’ dairy in Winona County. It is important to consider that the ordinances of the past were set in place by a board that understood the science behind that determination.

Thank you for your time, your consideration, and your kind attention,

Gini Kalton
Dear Commissioner Bishop:

I am writing regarding the Daley Farm’s proposal to expand their dairy in Winona County. After considering the negative environmental impacts as well as the negative socio-economic impacts, I strongly feel this permit should be denied.

As the son of a dairy farmer, I have 20 years of experience milking cows. Our farm was a true family farm. Along with Mom & Dad & my 6 brothers & 2 sisters, what started as a small dairy we eventually grew to a 100 cow herd. I know first hand what it is like to milk 100 cows as well as clean up the manure after them, over the winter that manure pile in the cow yard grew bigger & bigger and with the spring rains some of that would wash into the nearby river. Common sense tells us, as well as science, that the Daley Farm, which would have 40 times as many cows as we used to milk, would be a total environmental disaster. Even not considering the recent propensity for mega rain events, there is no way to prevent a manure lagoon that big from seeping into the water table and the surrounding fields and streams.

Also, from a socio-economic standpoint, the business model is flawed. This type of farm is typically staffed with low-paid (continued)
Immigrant labor. I have no problem with the immigrants, they are simply here to work and have left their homelands to escape violence & lack of opportunity. What I do have a problem with is a business model that hires low paid illegal immigrated labor and at the same time does nothing to advocate for a legal status, so they can the owners can continue to pay the lowest possible wages. This model drives down milk prices & creates unfair competitive for true family farms.

Hastily, regardless of the negative environmental & socio-economic impacts the current reality is the milk industry is suffering due to lowered demand. So why do we need to risk all the negative consequences of this mega-farm for an industry that is in decline anyway? It's just not prudent. Please deny this permit. If that is not feasible then at minimum request an EIS on the greenhouse gas supplement and the entire project.

Thank-you for your consideration

David Schueller
16715 Cottage Grove Ave.
Wayzata, MN 55391
February 29, 2020

Dear Commissioner Bishop,

I am writing you in regard to factory farm issues. Whether it is specifically, the Daley farm in Winona County or any new proposed CAFO. I doubt that I need to tell you the solid science around the air and water pollution caused by these large CAFOs whether it be the Karst region or anywhere in the state. Everybody exists in one watershed or another and the vast majority of rural economies rely on agriculture, tourism or both. The risks a CAFO brings to the health and wellbeing of a community is rarely, if ever, offset by the stated benefits and when there is a catastrophic event the land, the community and individual farms are often left holding (and paying for) the bag of consequences.

As rural resident born and raised and a longtime member of Land Stewardship Project, I have been actively involved in building healthy soil, water, rural economies and local businesses one farm at a time. We cannot look at this issue from the inside of a silo. Human health relies on healthy soil, clean water, clean air and thriving economies. Communities don’t thrive when the water, air and soil around them is contaminated. The larger the operation, the more risk and negative impacts there are to the community. Winona County knew that when they chose to restrict the size of AU’s to 1,500. Given that the Daley farm has already been in MPCA noncompliance for 22 years, I can’t imagine anyone holding regulatory power, rewarding this operation by further overlooking that fact and not doing a full EIS.

There is absolutely no logic behind the weakening of the public power to protect their local economies, water, air quality, and quality of life in their own communities. Political pressure by Global, National and State agricultural industries should never hold more power than the residents of any community.

An industrial-scale CAFO should never be exempt from a thorough EIS. As a public servant of the people of the State of Minnesota and I urge you send a strong message to those that would silence the voice of the people to do the right thing and order a comprehensive EIS or deny the permit for the Daley Farm expansion in Winona County, MN.

Respectfully submitted,

Sylvia Luetmer
LSP Member
2204 E. Lake Jessie Road SE
Alexandria, MN  56308
COMMISSIONER LAURA BISHOP,

OUR BEES ARE DYING. BIRDS AND OTHER WILDLIFE ARE DISAPPEARING, AND FISH AND OTHER AQUATIC SPECIES ARE UNABLE TO SURVIVE IN OUR POLLUTED WATERS. OUR AIR, WATER, AND LAND QUALITY ARE IN JEOPARDY.

WE MUST PASS AND ENFORCE STRONG ENVIRONMENTAL REGULATIONS AND MCPA RULES, LAWS, AND PROCEDURES MUST BE FOLLOWED.

I AM DEFINITELY OPPOSED TO THE DACEY FARM’S PROPOSAL TO EXPAND ITS MEGA-DAIRY IN WINONA COUNTY.

THE MCPA MUST PUT AN END TO THE DESTRUCTION OF OUR ENVIRONMENT. WHAT KIND OF FUTURE ARE WE GOING TO LEAVE TO OUR CHILDREN AND GRANDCHILDREN?

YOURS TRULY,

Terry J. Makepeace
Commissioner Bishop,

I have been keeping abreast of the ongoing situation with the Daley Farm for several years now and am appalled that I even have to write this letter at all.

The only two advantages that I see for the Daley Farm expanding their herd is more money for the Daleys and a nice chunk of money for the county in the form of taxes. As far as the disadvantages, I see many more.

My son has lived in Lewiston, MN. for five years now and has used bottled drinking water since the day he moved there. The porous ground of the area does not filter rain water nor the run off from the Daley farm at this present time let alone with the addition of 3000 head of cattle. That ground water is not just staying in the Daley’s area of the county, it is also polluting the water in the rest of the county which flows towards Winona, MN. The large farms in my area are the biggest contributors of ground water pollution and are the reason for the heavy smell of chlorine which we have been filtering from our drinking water for the last 20+ years. With a herd expansion, I see this going from bad to worse for the Lewiston/Winona area.

The smell of so much bovine excrement that will be added to the environment would also constitute air pollution. Case in point, the smell of the factory farm that is located just outside of Eyota, MN. near Interstate-90. I am one of the many fine residents of the area that speed past the facility to get away from the stench. The assault is not only good at keeping tourism away, it’s good at making all but the most rooted and determined of the population to leave.

Thirdly, with the increase in factory farms, you will see even more small family farms foreclosing because they couldn’t sell their product for the same as bigger agricultural operations. Most will leave the area for jobs in other cities or towns and further in the future, we could be looking at the demise of Winona county’s many small villages and towns, not to mention the devastation and contamination of our natural resources.
The Daleys seem to believe this is just about a bunch of people just trying to get in the way of progress but what they don’t realize (or just choose not to see) is though it is their land to do with what they want, their progress is polluting everyone else’s land and water too and will eventually lead to the region’s death. I don’t need substantiated proof of emissions nor am I only making assumptions that the proposal of the Daley farm is bad for all who live within the county, except for the Daleys.

Please do the right thing and not allow the expansion of the factory farm in Lewiston, MN. The only ones that will benefit from this is one lone family.

Thank you,

Tim and Leslie Vodinelich
1418 Saint Charles Ave.
Saint Charles, MN.

And:

Ben Vodinelich
150 2nd Str. So. Apt. # 9
Lewiston, MN. 55952-1472
Dear Commissioner Bishop,

I'm very worried for my friends in Winona County and the entire West region. One family, who owns an enormous dairy operation and wants to expand, is willing to risk the drinking water of all of their neighbors in order to make a profit. This is unsafe, unconscionable and preventable.

An industrial scale farm run by people who are currently in violation of state regulations regarding compliance should not be allowed to expand. At minimum, they must be an EIS. The right thing to do is to deny this expansion outright and bring the Dalsys into compliance with the regulations that cover their existing property.

Thank you for your time.

Madeline Neenan, farmer and LSP member
Feb 29, 220

Commissioner Laura Bishop,

Factory farmers with cows are creating methane gas destroying our ozone layer worsening Global warming.

Please we need EIS on good house gas supplement and the entire project.

Please deny permitting by MPCA.

Excuse my poor writing.

Sincerely,

[Signature]

Nieblek
March 3, 2020

Dear Commissioner Bishop,

I am writing you to plead with you to do everything under your power under MEPA to either order an EIS or DENY Daley Farm’s proposal to expand its mega-dairy in Winona County to 3,000 to 4,628 cows.

Southeastern MN Karst region is already riddled with Nitrate-laden drinking water. The community is already living with contaminator dangerous levels of polluted water. Daley Farms has been out of compliance with state regulations for run off, etc. with violations by MPCA’s feedlot division that have been unreforced over 22 years!

As a friend of farmers in the Midwest who do not try hard to do the right thing for our environment and the committees they live in, I implore you to do your best to fight this.

Thank you for reading this.

Sincerely,
Joanna Winship

[Stamp: Received by MAR 04 2020]
To: Commissioner Lara Bishop,

Please take immediate action to control the activities of the Daley farm in Monroe County. Your predecessor ignored the rules regarding its expansion. There must be a cap on the size of factory farms. And environmental impact statement must be provided. The water is dangerously polluted with nitrate.

Please deny the right to have such enormous farms.

Karen Ostendorf
ostendorf@hotmaile.com
Member of Iz and Walton League of America
Member of Land Stewardship Project
Earth provides enough to satisfy ever man's needs, but not every man's greed.

- Mahatma Gandhi

Submitted by: Brad Trom
PO Box 757
Blooming Prairie MN 55917-0757
bront.brad@gmail.com
507-583-7718
Commissioner Laura Blythe, MPCA,

I am writing you regarding the proposal to expand the dairy mega dairy by 3,000 cows. The MPCA is to protect and improve the environment and human health. A factory farm the size must be accountable to rural neighbors and consider the unique and sensitive karst geology of the region. Excessive waste with the additional cows makes it no sense to me, with our rural upbringing. Decisions you emissions must be taken into account. Please don’t fail the public interest in this egregious proposal.

As a Land Stewardship Project member who values abundant clean water and land stewardship, I urge you to deny this permit. Failing that humble and scientifically based request, I request an EIS on the greenhouse gas supplement.

Sincerely,
Julie F. Habben
Dear Commissioner Laura Bodey,

I understand that the issue currently being addressed regarding Delta’s mega-dairy is in regard to the all the gas emissions. Who would ever want to live next to that?

However, my biggest concern is how you can simply apply a manure in a land application where water is being thought in a matter of minutes. It goes into the springs, into our drinking water, into our rivers. Our drinking water is already contaminated with nitrate! We more! An animal unit (AU) was put in place in a manner.

Another concern is that there is no animal waste self-regulation AND the fact that Delta’s have not always been in compliance in the past.

Please see what is right for our citizens!

Thank you,

[Signature]
March 3, 2020

Dear Commissioner Grossenheider:

I am writing to express my opinion that your agency should not proceed with granting a permit to the Daley’s farm expansion.

I understand how difficult it is for dairy farms to survive in today’s farm economy. Creating a larger farm enterprise on soils in the karst region should be carefully scrutinized. I think an EIS is warranted due to the location, size of the expansion, underlying soils and geology, ground water issues and manure disposal sites.

As a former NRCS employee, I have worked in the karst region, so I am familiar with what can go wrong with manure pits. Seems to me I recall a manure pit emptying out overnight, sometime in the past 30 years or so. You could check your permits for that occurrence.

I would also encourage you to look into previously undiscovered sink holes in Askov, right where the city was going to install a sewage treatment plant. They were undiscovered, in spite of MPCEA permit, soil and geology investigation, until a further investigation revealed sinkholes on/near the proposed site.

A project of this size and located in the karst area warrants further investigation, the type of investigation that an EIS would provide.

Sincerely,

Larry Nelson
42290 Ginger Ave.
Harris, MN 55032
651.492.5651
Commissioner Bishop,

I strongly encourage you to force the MPCA to comply with mandated animal unit limits on factory farms, thereby minimizing potential environmental and aesthetic pollution.

Large factory farms by putting all of our eggs in one basket so to speak, also increase risks of crowd-based diseases and threaten the sustainability of small family farms which are the foundation of our rural communities and economies.

Speaking now specifically of The Daley Farm in Winona County: This corporation is not above the law and must be held to established standards for such types of businesses, specifically Minn. Statute § 4410.460 Sub.19.

We must stop risking long term environmental sustainability for short term narrow scope monetary gains.

Sincerely, Rick Rayburn, Small landholder, Willow River MN.
March 1, 2020

Dear Commissioner Bishop:
I am a 74 year old Winona County resident born and raised on a 120 acre family farm in Central MN, an avid gardener for 60+ years of my life, and am a seven year member of the University of Minnesota Extension Master Gardener Volunteer Program for Winona County. I also have a daughter, son-in-law and three grandchildren who live on a 800+ acre dairy farm in Southern Minnesota. My concern for environmental and human health is a natural result of my background and family. That concern is why I’m writing.

I think it is imperative that the MPCA does not permit the Daley Farm of Winona County to increase the size of its herd by 3,000 cows. I also believe that an EIS on the greenhouse gas supplement and the entire project should always be required. Four points that justify my stand on the issues are:

1. The Daley Farm has been out of compliance for over 22 years with state regulations for run-off and other issues as filed by the MPCA’s feedlot division. I don’t think it’s fair that they get the OK for another permit.

2. An industrial-scale animal factory is NOT EXEMPT from being ordered to undergo an in-depth environmental review through an EIS if permission for the increase is granted.

3. The Daley Farm is out of compliance with a Winona County ordinance which sets a cap on the number of head of cattle. This ordinance was developed so that one enterprise could not take more than its fair share of water or burden the community with excessive waste and costs.

4. I don’t understand how an agricultural giant can be so remiss at taking the environment for granted. 4,628 head of cattle will create solid and gaseous waste that would make a considerable contribution to global warming because of the nitrates and methane that this waste produces. The enterprise has already affected the air, water, and soil health which in turn affects the health of not only their neighbors of a few miles but the whole world.

Thank you for your time and consideration to my concern for the environmental and health issues presented by the Daley Farm.

Sincerely,

Tom Kujawa
Dear Commissioner Bishop and Members of the MPCA:

I have been a life-long resident of rural southeastern Minnesota. I grew up on a dairy farm. All our neighbors were dairy farmers as well. I support small dairy farmers who live and work alongside their neighbors within the zoning ordinances established by their counties.

I am writing to you today to share my deep concerns about the expansion of Daley Farms in Winona County. It is my understanding that Winona has set an ordinance limiting the number of animal units to 1500 and that Daley Farms has already been granted a variance to exceed that limit and is now seeking to go even higher. This is outrageous. It is outrageous that a variance was granted in the first place with no Environmental Impact Statement. It is outrageous that the Daley Farm has the audacity to expect another variance to increase its size. They are banking on the idea that the current MPCA will continue to be a rubber stamp for factory farms and waive another EIS.

This is the time for the Minnesota Pollution Control Agency to live up to the reason it was created in the first place—control pollution and protect our ever-increasingly fragile environment. All rural Minnesotans want to rely on the watchful protection of the MPCA to safeguard our environment and our way of life. We need you, Ms. Bishop, and your colleagues of the MPCA to take the lead, write a new chapter for Minnesota’s environmental protection. Please, stand up and do what is right.

Thank you.

Sincerely,

Marilyn Oswald
Commissioner Bishop, Kim Groesenheide,

I would hope that you would respect local laws and not let the interest of a large dairy farm (though it is family run) trump the Winona county ordinance that limits farms to 1500 animal units. This was a sensible regulation that helps protect the sensitive environment of that area of Southeast Minnesota. Is it not a shame that so many wells are already contaminated in that region of Minnesota with farm runoff chemicals and atrazine that limits a woman's ability to have children? Is this really good farming and being stewards of the land? Hell, those animals will never even be outside; their whole lives crowded together in buildings. Does this make good milk? Or is it bigger is better? But why? To extract more from the community and concentrate wealth?
Please consider beautiful Kuppecht's Valley where some of the manure could be released if one of their lagoons ruptures. It is a beautiful valley where the woods and clean Rollingstone Creek can heal your soul. Think about the whole community; this project will pump so much water out of wells that maybe there will be a greater chance of sink holes and a manure breach.

Why not study the project more. Maybe it is good for the valley family short term but not good for them and the rest of the community long term.

Thanks for listening,

John Elward
4007 40th Ave S
Mpls, MN 55406
612 727 2096
Hi KM,

I am dropping you this note to ask that a full EIS be vetted before allowing any expansion of Daley Farm's operation in Winona County.

My family owns farmland in Freeborn County and we are concerned about expanding that type of operation in the central region. Please make this a priority on behalf of local residents and of all Minnesotans.

Sincerely,

Walter Ebertz
651-824-2184
To Commissioner Laura Bishop

MPCA

As a member of the Land Stewardship Project, I have been asked to write you relative to their efforts to curb further expansion of the Daley Farm. I urge the MPCA to use all of their legal power to protect the environment and ground water in this sensitive area. As a suburban dweller, I would say that cheap milk is not worth the expense of permanent damage to the environment and ground water.

Yours truly,

[Signature]

James C. Broten

3085 Labore Road, Little Canada, MN
Commissioner Laura Bishop

Regards Daley Farms to expand

Not only does this expansion cause environmental concerns, but what good is this expansion for the community? All of us in agriculture are struggling and dairy farmers have it the worst. This proposed expansion does not help the industry, but instead puts smaller farmers out of business and some of these farmers are only suited to dairy without cows they become extremely unprofitable.

I would like to quote from a book written by Peter Wehner, "The Death of Politics" that I think is worth pondering. "The cornerstone of Catholic social thought are human dignity, subsidiarity, which holds that nothing should be done by larger and more complex institutions than can be done as well by simpler ones, with a special concern for the poor and most vulnerable members of the human community.

Should we be sacrificing our environment and neighboring dairymen for the good of the mega dairies?

Sincerely,

Khareena Schumel
4431 160th St.
Easton, Mn
56025
At a time when family farms are at another unprecedented state of loss... low prices, bankruptcy, attacks by corporate aggregation, the Daley Farm represents all that is wrong & allowing them to continue polluting, let alone expand is indefensible.

The soil, rock & landscape characteristics of the region in which the farm is located is even stronger evidence that this farm should not be allowed. Pollution of the groundwater is impossible to undo once done... at least in our lifetimes! Perhaps the Daley farm would like to pay for all the needed water treatment that would be needed when (not if) their operation lagoons fail or even function
as intended! As a very small farm in NE Minnesota, we face huge obstacles to rebuilding our historically vibrant and economically viable food system. We need all state agencies supporting this effort, not undercutting us at every turn.

Clover Valley Farms
MPCA’s Environmental Review & Feedlot Divisions Are BROKEN. Commissioner Bishop has the Power to Make it Right for Our Rural Residents Regarding a Winona County Factory Farm

Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs) to 5,968 AUs. Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sides lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line:

- An industrial-scale animal factory is NOT EXEMPT from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conduct a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. Insufficient Information. Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at [https://www.pca.state.mn.us/sites/default/files/p-car2-143k.pdf](https://www.pca.state.mn.us/sites/default/files/p-car2-143k.pdf). It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at [https://www.pca.state.mn.us/sites/default/files/p-car2-143b.pdf](https://www.pca.state.mn.us/sites/default/files/p-car2-143b.pdf).

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have never recommended an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to STOP pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
MPCA Commissioner Bishop,

Having recently read articles on the Daley Farm expansion I have grave reservations concerning this. They may be doing OK now for the land/water, I do not believe they understand what that amount of waste/water usage will do to the environment, with a concentration of livestock as such. In my area of Houston Co. I have seen manure pits/lagoons run over with recent rains and the harm on roadways with large manure spreaders. I do not see any way around, spreading manure on distant fields all at the right time, for environmentally safe application.

I am an Organic Farmer that is protecting the soil & environment in my area.

I would ask you to deny the permit for expansion.

Thank You

Mark A. Hines
As a resident of rural Wabasha County, where our property is planted in native prairie grasses and surrounded by state forest land, I am writing to you because our once clean 520’ deep well here in karst Country had increasing amounts of nitrates and pesticides in its water.

We have known for a long time that nitrates come from applications of manure and fertilizers to crop land. While MPCA has introduced the new Groundwater Protection Rule, it relies heavily on voluntary participation, and we see manure lying on frozen fields all winter. Just one example of a breakdown in the voluntary system.

Chris Jones, a research engineer and professor at Iowa university, writes a blog on water quality and agriculture. He estimates that Iowa farmers apply 34 pounds of excess fertilizer to each acre of land, and waste $99 million each year. As you know, this excess nitrogen has created an enormous dead zone at the base of the Mississippi, and poisoned Des Moines drinking water. Yet another breakdown in voluntary compliance that has produced disastrous results.

Meantime the MN Department of Agriculture conducted studies of wells here in Karst country and found that the majority of townships in Wabasha County and much of S E Minnesota had wells that exceeded the 10mg of nitrate considered safe for drinking water. Yet the MPCA continues to approve large containment farms like the Daley farm, the Leonhardt farm and the Yotter farm, to name a few, that will continue to add to this health hazard.

In reviewing the EAW for the Daley farm, on page 4 it is stated that Daley MAY delay adding manure in fall, he MAY add nitrogen inhibitor and he MAY plant a fall cover crop to remove CO2. However on page 7, paragraph 6 it says Daley WILL “implement without limitation the use of cover crops”.

There is a big difference legally between MAY and WILL. Which is it? Who enforces whatever is decided? Is this another voluntary breakdown in the making?

On page 9 paragraph 3, of the Next Generation Energy Act, it speaks of a reduction of 15% of GHG emissions from the 2005 level by 2015. In 2016, we were only at a 12% reduction, so we are already behind that goal, and the increasing numbers of containment farms are only adding to the climate change problem.
The paper goes on to mention that this Daley project’s emission standards cannot be translated into effects on climate change but what about the cumulative effects of All the containment farms in Minnesota? 4410.1700 criteria Subpart 7, part B would suggest this cumulative effect requires an EIS.

Where are the stats for the total number of animal units in Minnesota?

Where are the stats for total amounts of manure produced, and spread or injected on fields?

Where are the stats for the total number of pounds of applied nitrogen?

Where are the stats for the total number of gallons of Water drawn out of our aquifers from high capacity wells?

Where are the stats for the impact all of this has on our natural systems? How can the MPCA draw effective conclusions without this information?

I am a believer in government’s role in protecting the health and welfare of its citizens, indeed that is why government exists, and why we all pay taxes, But WHO is looking out for individual well owners, the rural municipalities and community well owners? Why are our health, and our rights being jeopardized?

Most of my rural friends have no idea their wells may be polluted, knowledgeable longtime government workers are frustrated, and local governments shrug their shoulders, pass the buck and say the MPCA will protect us, but will you?

Our environmental review and feedlot regulatory oversight system is BROKEN, it is beyond time we establish and/or enforce existing regulations that will protect our drinking water and air quality for all Minnesotans.

Please Commissioner Bishop, Order an EIS on the Daley farm and all future containment farms, so that we can measure the cumulative effects and act to protect ourselves before we have ruined everything.

Sincerely,

Deirdre Flesche
P O Box 180
Lake City MN 55041

3/3/2010
Dear Commissioner Bishop,

I am writing to ask you to have the MPCA do an EIS on the expansion proposal of Daley Farms in Winona County.

This proposed expansion of their dairy operation has the potential to do significant harm to water quality in the area. The Karst region in which this dairy is located has already suffered from excessive nitrate pollution of the water, and this proposed expansion would worsen the problem.

In addition, the impact on greenhouse gas pollution would advance the already very troubling trend in climate change.

Please do the right thing and have the MPCA do a thorough EIS on the Daley Farms proposal.

Respectfully,

Gowell Johnson
4441 20th St.
Fort Ripley, MN 56449
218-828-6238
Commissioner Bishop

Thank you for extending the public comment period. This increases our trust in the MPCA's role in being sure that we safeguard our most valuable resources of land and water.

It also signals your acceptance of the vital importance of people's right to control negative impacts in their local situation.

No one wants to live next to mega waste facilities. No one wants to have the burden of someone else's waste. Do an ESIR! Thank you for your consideration.

Keith Redge & Jeanne Kant
LSF member
Dear Sirs:

Keeping environmental protection in the forefront of farming activities is an
admiral goal and one that needs to be supported on a daily basis.

Between my husband and myself we own several smaller land parcels which are either
CRP or rented.

I do not see value in huge commercial agricultural operations. There should be reasonable
livestock equity for chickens, turkeys, cattle, pigs

There is no reason to pollute air, soil and water

resources in Winona County or any other in Minnesota.

I grew up on a family farm in Le Sueur
County. Our flocks and herds were kept by current
standards. I went to school in feed sacks dressed in

my mother loving seved as my sister and myself.

Corporate are good stewards of their bottom
line and nothing else.

Susan Anderson
29874 Henderson Station Rd.
Henderson, MN 56044

S.A.

To: Commissioner Laura Bishop
MPCA

3-3-2020

I'm writing today as an urban farmer as well as a consumer of raw organic milk products to encourage you to require an Environmental Impact Statement before the Daley Farm in Winona County is allowed to expand. I believe you are the right person to correct the harmful decisions made by your predecessor John Line Stine on this matter.

If an enormous number of cows are allowed to reside on such a small area, it could pose threats to the drinking water for nearby residents, not to mention greenhouse gas emissions.

Thank you in advance for standing up for the public interest!

Sincerely,

Janet Lenius
Dear Commissioners Laura Bishop

the MPCA's Environmental Review & Feedlot
Divisions are Broken.

I am totally against Factory Farm. It the family
farms that brought this country together and a strong
nation, whom worked together and got things done happily.
I would like you to set a animal unit cap of
no larger than 1,500 animal units.

Small farm's don't cause all the greenhouse
gas on all other points in this case, fail the
Public's Interest.

What is newer than all the country small
Dairy Farm's in the open Grand County

I hope you put a Stop on Factory Farms

your's truly

Leop Hammelsh
3/1/20

Dear Commissioner Bishop,

I feel the MPCA is responsible for our unusable waters in this community. Please fix this. Our towns of Belle Plain, Bagford etc. have had to install city pools as lake water is toxic.

How on earth did Daily farms not get required an E.I.S.? It appears so corrupt!

Iowa has been sacrificed to industry to the point that their constitution has been manipulated by big companies and now they need to dump in MN!

Please use water etc. over corporate profits on the priority list.

Is a daily farm on no permit? The Daily Goshke - Shelley, 20725 361st Ave. Shelley farm Henderson, MN 56044
Kim Grosenheider  
Resource Management and Assistance Division  
Minnesota Pollution Control Agency  
St. Paul, MN

Ms Grosenheider and MPCA Staff:

In your continuing assessment of the environmental impact of the Daley Farms expansion please consider the following points related to nitrate contamination of Winona County surface and ground water- all new information since your 2018 review:

- On **June 11, 2020**, in the Journal of Environmental Science, Environmental Working Group scientists published a study estimating that nitrates in drinking water may be causing thousands of cancer deaths in the United States (colorectal cancer, with ovarian, thyroid, kidney and bladder cancer). Reports of this research also indicated, “several well-regarded epidemiological studies have linked nitrate in drinking water with cancer and other serious health issues at levels less than one-tenth of the legal limit” and that the legal standard, set in 1962, may be substantially higher than the true safe limit.

- In **August 2019** the Minnesota Department of Health Environmental Health Division expanded their concerns for nitrate in well water: “Only recently has scientific evidence emerged to assess the health impacts of drinking water with high nitrate on adults. A growing body of literature indicates potential associations between nitrate/nitrite exposure and other health effects such as increased heart rate, nausea, headaches, and abdominal cramps. Some studies also suggest an increased risk of cancer, especially gastric cancer, associated with dietary nitrate/nitrite exposure, but there is not yet scientific consensus on this question.” (August 30, 2019, MN Dept. of Health, Environmental Health Division brochure, “Nitrate in Well Water”.)

- In Southeastern Minnesota we have had individual rain storm events of 18 and 10 inches in recent years. The 2018 EAW submitted by the Daley Farms (p.13) indicates that sufficient storage in the feed pad runoff basin will be available at all times to handle the runoff volume generated by a storm event of 5.4 inches- far below expected one-day event levels. Official reporting sites closest to the Daley Farms, Rochester Airport and Winona Dam set all time precipitation records in 2019 (MN DNR web page posted Dec. 31, 2019). Altura, a few miles from the Daley Farm recorded 49.51 inches in annual precipitation in January 2019. Such precipitation levels could overwhelm the feed pad runoff basin scheduled to be emptied only once a year.

- The record 2019 rainfall is a part of a trend and believed to be associated with climate change. High rainfall storm events also increase the likelihood that manure applied to fields will get washed into streams and ground water through Karst features which provide easy pathways for
contaminants—before it can be utilized. The environmental impact of seasonal precipitation and rainstorm events on the Daley expansion needs further study.

- On February 24, 2020, Tony Runkel of the Minnesota Geographical Survey, reported recent research at a seminar in Winona titled, “Nitrate Transport through the Surface Water-Ground Water System in Southeastern Minnesota” (WSU Geoscience Dept. EarthTalks Series.) His research conclusion was that, “Deeper aquifers in SE Minnesota show a steady increase in nitrate levels.” And additionally, in a response to a question Mr. Runkel agreed that in 10-20 years those aquifers will be at 10 parts/million. It is clear that expansion of feedlot practices in Winona Co., already known to cause nitrate contamination of groundwater, will result in faster and more severe contamination of our deep aquifers—the drinking water source for tens of thousands of people in Winona County.

- As I read recently produced reports about nitrates and ground water I see more and more references to the likelihood of pesticides and other pollutants co-existing where nitrate levels are high. So there are likely even more dangerous contaminants in drinking water from private and community wells in Winona County. We need to know what we are drinking.

I appreciate your mission and work at MPCA and thank you for your consideration of this evidence. As you have heard in hundreds of other submissions from Winona County residents, I believe the MPCA should require and Environmental Impact Statement for the Daley Farms expansion.

Sincerely,

Robin Draves
614 W. King St.
Winona, MN 55987
robind@hbcj.com, 507-452-3954

(Thirty-seven year resident of Winona; supporter of farmers and, public health; retired school psychologist who worked in all Southeastern Minnesota school districts; volunteer with Prairie Enthusiasts; Freshwater Society Master Water Steward; stream monitor with Isaac Walton League’s Save Our Streams program.)

Building a nuclear plant on a fault line— not a good idea.

Building a high intensity animal feedlot in Minnesota’s Karst region—also not a good idea.
March 4, 2020
TO: Kim Grosenheider, MPCA
FROM: John Weber
22382 Glacial Ridge Trl.
Nevis, MN 56467-4018
RE: Daley Farm's mega-expansion proposed for Winona County

Not only has the agri-business model of "bigger is better" been in vogue for too many years, but also its illogical conclusion that "bigger is the only way to survive".

Rather than further concentration, a sustainable future for agriculture, water and air quality and land use favors dispersal and treading more lightly, not more heavily on the planet's natural resources and its populace.

Many aspects of the Daley Farm's expansion cry out for at least an EIS, if not an outright denial of a permit by the MPCA.

Thank you for considering my input.
I am writing to you as if I were all over the planet since the beginning of farming and agriculture. As a cow, I want to be appreciated. I want to live on a small farm where I am taken care of by a family and where there are children and family parties. I need human contact and I want to hear human voices. I do not wish to live on a factory, robotic social high rise apartment with 5,968 other humans with no yard, no space, no sun, wind & weather. How would you feel? Appreciated?

I think disease because of your living conditions? T.B. mad-Cow horrible virus! I don't even know the names of. I don't want to live in packed conditions, cared for by robots. Please help me. Please let me live on a
family farm or at least a smaller farm. The children do not like the profit driven decisions that the adults in charge are making now days. The children need clean air, clean water and green space with trees. Do not cut all the trees down. Do not pollute the water and air by packing us cows in so tightly we will get sick without antibiotics. We do not want to be on antibiotics our whole lives. We do not want growth hormones either. I have a much greater chance of being abused on a big factory dairy. I am afraid I have a right to live a good life. I want to be appreciated, not taken for granted. I am a living being, no less precious than your dogs and cats, that you spoil, adore, and want to be a member of your family. Please, please, please consider my plea! I request to live with dignity, even love, in a family farm. Cows have lived in service to humanity a time. Please, don’t ruin our lives in this changing too fast. Profit driven modern agriculture.
I am a member of this organization

LEWISTON OFFICE
180 East Main St, Box 130
Lewiston, MN 55952
507-523-3366

MINNEAPOLIS OFFICE
821 East 35th St, # 200
Minneapolis, MN 55407
612-722-6377

MONTEVIDEO OFFICE
117 South 1st St
Montevideo, MN 56265
320-269-2105

MPCA’s Environmental Review & Feedlot Divisions Are BROKEN. Commissioner Bishop has the Power to Make it Right for Our Rural Residents Regarding a Winona County Factory Farm

Dear Friend,

The Minnesota Pollution Control Agency’s (MPCA) Commissioner Laura Bishop must hear from rural residents that we are confident she is the right person, in the right role at the right time to correct harmful decisions made by her predecessor John Linc Stine regarding Daley Farm’s proposal to expand its mega-dairy in Winona County. She has acknowledged the need to restore the public’s trust in this agency. While we appreciate that she has extended the public comment period by 15 days, until March 6; this situation must be made right, NOW.

Daley’s mega-dairy is already one of the biggest in Minnesota and this proposal would expand it by 3,000 cows to 4,628 head, in other words, from 2,275 animal units (AUs), (to 5,968 AUs). Through its county zoning ordinances, Winona County set an animal unit cap of 1,500 AUs so that no one enterprise could take more than its fair share of water in this sensitive karst geology region or burden the community with excessive waste and costs.

As MPCA Commissioner, Stine denied the need for an Environmental Impact Statement (EIS) for Daley Farm’s proposal and granted an individual National Pollutant Discharge Elimination System (NPDES) permit. Southeastern Minnesota’s sensitive karst region is riddled with nitrate-laden drinking water. Communities in the region are not only having to consider “potential” threats to the environment that sustains them, they are already living with contaminated water and in some cases, poor air quality that worsens or threatens health conditions for neighbors. Stine’s refusal to acknowledge this in his decision making defies logic and the letter and intent of the Minnesota Environmental Protection Act (MEPA).

Findings of Fact from the Department of Natural Resources (DNR), information from karst expert Dr. E. Calvin Alexander, along with over 500 comments, as well as factual data and concerns submitted by the public asking for an EIS were inadequately addressed. Stine’s decisions made a mockery of the agency’s mission to “protect and improve the environment and human health” and its duty to abide by Minnesota statutes. From Minn. Statute 4410.1700, Subp. 7. Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

When the Minnesota Court of Appeals overturned the MPCA’s negative declaration for an EIS, it was recognizing that a public agency must hold factory farms accountable to the land and rural communities. It also recognized the climate change implications of concentrating thousands of cows in one place, where the manure they produce would be stored in an earthen-sided lagoon. The court was correct in noting that the MPCA was remiss in not considering greenhouse-gas (GHG) emissions when it conducted its environmental review. But, the Court’s customary “deference to the agency as expert” on all other points in this case, fails the public’s interest.

TAKE ACTION – LETTERS MUST ARRIVE NO LATER THAN MARCH 6: Write a note today to Commissioner Laura Bishop using the enclosed paper and envelope. A personal note from you as an LSP member delivers a powerful message. Comments MUST BE RECEIVED BY THE MPCA BY 4:30 p.m. on March 6. You can email comments to the MPCA’s Kim Grosenheider: kim.grosenheider@state.mn.us; call 651-757-2170 with questions. For optimal impact:

- Write in your own words as you cite specific facts of this case that are most meaningful to you.
- Make it personal – share a bit of your experience - as LSP member, farmer, rural resident, etc.
- Ask for an EIS on the greenhouse gas supplement and the entire project – or ask the MPCA to deny permitting.
The Bottom Line:

- **An industrial-scale animal factory** is **NOT EXEMPT** from being ordered to undergo in-depth environmental review through an EIS. (Minn. Statute 4410.4600 Subp. 19)

- The EAW’s recommendations are inadequate, inaccurate, and incomplete because, as stated, MPCA can’t “conclude a full GHG life-cycle analysis.” (Supplement to EAW, 6C, last paragraph) This is the trigger for an EIS. (Minn. Statute 4410.1700, Subp.2a. **Insufficient Information.** Staff from MPCA’s environmental review and feedlot division were ill-prepared with scant, and in some cases misleading information at their public information meeting in Lewiston on Feb. 4. Community members asked, “Why are you spending time and our taxes on this supplemental EAW when you don’t have enough information AND this project can’t be permitted in Winona County due to the 1,500-animal unit cap? EIS or deny.”

- “Estimates of potential emissions” are unsubstantiated. We don’t know the baseline factors being used to make the calculations given that variables such as weather events, humidity, and temperature will affect potential emissions and the capacity of the proposers to meet the requirement of the EAW.

- Faulty underlying assumptions: “The Project will release air and odor emissions typically associated with a dairy farm” (Supplement to EAW, 6A). Around 86% of dairy farms in Minnesota have fewer than 200 cows. This expansion would make this mega-dairy 9 to 23 times bigger than the typical Minnesota dairy.

- Daley Farms is, and has been out of compliance with state regulations for run-off and other issues, with violations filed by the MPCA’s feedlot division that have gone unenforced over 22 years.

- Recommendations meant to control greenhouse gasses are vague and not maintainable. For instance, consider the requirement that “Daley will evaluate weather conditions, primarily wind speed/direction and humidity, before manure application to minimize impacts to neighbors and the public.” The Daley operation will not monitor about 42% of the acreage receiving manure, since the EAW only covers Daley’s land.

Read the brief EAW greenhouse gas supplement at [https://www.pca.state.mn.us/sites/default/files/p-eaw2-143k.pdf](https://www.pca.state.mn.us/sites/default/files/p-eaw2-143k.pdf). It’s also helpful to review the Conclusion of Law and Order and Findings of Fact containing comments from experts and the public in 2018 at [https://www.pca.state.mn.us/sites/default/files/p-eaw2-143b.pdf](https://www.pca.state.mn.us/sites/default/files/p-eaw2-143b.pdf).

Decades of political pressure by the global, national and state agriculture industry on local, state and national lawmakers, public agencies, decision makers and citizens themselves has weakened the public’s power to protect its local economies, natural areas and biomes, access to clean, drinkable water, air quality, health and quality-of-life. Is this why MPCA staff have **never recommended** an EIS on a large factory farm? Courage means following Minnesota law to protect all of Minnesota’s citizens, not just those seeking to create profit.

We need Commissioner Laura Bishop to use the power she has under MEPA to order an EIS or deny permitting on this massive animal factory proposal. Winona County’s citizens along with all southeastern Minnesota’s karst region communities are in a nitrate-induced drinking water crisis NOW. It’s time to **STOP** pouring gasoline on a raging fire by ignoring the consequences we know are presented by this factory farm.

Sincerely,

[Signature]

Barb Sogn-Frank, Land Stewardship Project Organizer, 612-722-6377; bsognfrank@landstewardshipproject.org
1. Daley doing is already over the legal limit in animal units.
2. They frequently break current environmental rules.
3. This is KARST country. You know what that means.
4. An EIS is needed.
5. DNR says this is a bad idea.
6. They don’t have enough land to take care of the amount of manure they will create.
7. Water use will be excessive.

Do your job! Demand EIS.
Deny this project.

[Signature]
Spring Valley, Minn
MACA Commissioner Laura Bishop,

The purpose of this letter is to request that you and the MACA deny permitting the Daley dairy expansion. These factory farms in Minnesota must be stopped!

Last Fall we wrote the governor and CC'd you on a factory hog farm proposal next to my Mother Rosemary Arhart's new home. Not a response from anyone and Sibley County Commissions approved the permits. We couldn't even get an EIS under current rule language. This is the worst form of Bio Politics. The current Fed lot rules seem written by the industry, MACA staff could not or would not do the right thing.

Please don't let this happen again! Winona County and its people deserve better!

Please direct your staff to do the right thing and deny this and other factory farm permits. Minnesotans deserve better!

Sincerely

Tony D. Arhart
67994 County Road 33
Squaw Lake, MN 56681

Anthem D. Arhart
Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

March 5, 2020

Dear Ms. Grosenheider:

I am a resident of St. Paul, but grew up in La Crosse, Wisconsin. I have uncles who own farms in the La Crosse and La Crescent Minnesota areas; my extended family owns and operates an orchard in Winona County. My brother owns property in the heart of the driftless region in Vernon County Wisconsin which has a beautiful trout stream and several natural springs. I am very familiar with that landscape, its geology and vulnerabilities. I have also had some first hand experience with how large scale animal production operations impact air and water quality: my ex-wife came from a farm family, and her brother went all in on a massive contained hog production operation on their family farm. The consequences were significant: days when the air quality was so poor it was nearly impossible to be outside, well water that became undrinkable. From my perspective the degradation of the quality of life on that century farm and for the farm’s neighbors was truly tragic.

Thus it is extremely important to me that Commissioner Laura Bishop correct the decision of her predecessor Commissioner Stine and require an Environmental Impact Statement on the Daley Farms proposal to expand its large scale dairy operation in Winona County. Apparently Daly Farms, already one of the largest dairy’s in the state, wants to nearly double the number of cows in its operation despite the fact that its current herd exceeds the maximum allowed under Winona County zoning ordinances. The fact that that area already has significant issues with nitrate-laden drinking water and areas of poor air quality should be reason enough to trigger an EIS. But the fact that Commissioner Stine in denying the need for an EIS ignored findings of fact from the DNR and geology experts, and failed to adequately address the lived experience and concerns of the many, many members of the public who weighed in on this issue is unconscionable.

Given that MPCA’s mission is “to protect and improve the environment and human health” and that there are so many potential negative consequences of the Daly Farm proposal, including:

- increasing greenhouse gas emissions when we are clearly in a climate crisis and need to significantly reduce such emissions;
- potential leakage from earthen-sided manure lagoons, let alone the possibility of such a lagoon bursting in an intense/heavy rain event (something occurring more frequently as the climate warms);
- potential ground water contamination, especially given the karst geology of that region;
- reduced quality of life and increased health hazards for the neighbors of this operation;

and given that Minnesota statute states that MPCA has the authority “to decide whether a project has the potential for significant environmental effects”(including type, extent and reversibility of environmental effects as well as cumulative potential effects) how could the MPCA not require an EIS and the utmost scrutiny for a project so potentially damaging?

If Commissioner Bishop wants to restore public trust in the MPCA this is a perfect opportunity to take a step in that direction. I respectfully request her to use the power she has under the Minnesota Environmental Protection Act to insist on an EIS, or better yet, deny permitting on this massive proposal. The well being of Minnesota’s citizens, communities and fragile, already beleaguered environment deserve to be prioritized over the few who stand to profit from such an expansion.

Please forward these comments to Commissioner Bishop on my behalf.

Respectfully,

Greg Heberlein
1265 Edgcumbe Road
Saint Paul, MN 55105-2912
651-341-8594
To: Kim Grosenheider,

I strongly encourage you to protect Minnesota's waters by re-examining the Daley mega-dairy permits. An EIS must be done. We do not need anymore contamination to the waters of Winona County or the state. Please do the right thing for human health rather than the big agriculture industry!!!
You are in a position to make a difference!

Thank you for considering this!

Doris Petrie
651-433-3566
Dear Commissioner Bishop,

As a LSP member, I'm asking you to please consider requiring EVERY CAFO to do mandatory EISes. Farming has changed. Shouldn't the permitting processes also reflect these changes? These are FACTORIES not farms anymore. They produce factory scale waste.

As a MN Citizen, LSP Member and as a grandmother, I plead with you to do all in your power to protect the health, safety & property values of our future. Iowa is an example to us of out of control AG pollution. Let's learn from them.

Thank you -
Renee Bjork
LSP member
Dear Commissioner Bishop,

I live in a Minneapolis suburb, shop at my local farmer's market and have participated in agricultural CSA's for locally grown organic fruits and vegetables. I am also a member of the Land Stewardship Project because I am concerned about the human induced degradation of our lands and water and the effects of climate change on our environment.

I read with great concern the Star Tribune article printed on 2/23/20 about the Daley Farm in Winona County. I have also received information from Land Stewardship Project.

When an expansion of this magnitude has the potential to negatively impact the land, water and human health to the degree this project may an EIS MUST be undertaken before deciding if the project should proceed. Either that or deny the project outright with the information you already have.

I urge you to proceed with great caution. Today, that corner of our planet's health rests on your shoulders.

Sincerely,

Jeanne Norrgard

10733 James Rd
Bloomington, MN 55431
March 3, 2020

Commissioner Laura Bishop
Minnesota Pollution Control Agency
520 Lafayette Rd N
St Paul MN 55155
Dear Commissioner Laura Bishop,

Please consider all of the problems that factory farming entails, including the environmental and humane aspects. The idea of that many animals in such a space as Daley Farms proposal is simply unkindly both to people and animals.

Sincerely,

Sandra Marion
I'll keep telling Commissioner Bishop. You and I both need air and water to live. Daley's mega-dairy would compromise the quality of both air and water for those who live nearby. Please deny permitting of this operation.

Thank you,

Jim Lovestar

Received
Mar 06 2020
By
Dear Commissioner Bishop,

I am writing to you about my concerns regarding the Daley Farms proposal to expand their already large dairy operation in Winona County. I urge you to follow state law (Minn. Statute 4410.4600, Subp. 19) and require an EIS for this project.

I live in St. Paul, but I take seriously How Walley's One Minnesota philosophy. I rely on the quality of the food that comes from organic farmers in southeastern Minnesota. The Daley Farms proposal puts both water quality and healthy food production in jeopardy, and that means public health.

In addition, climate change is perhaps the biggest challenge facing humanity. We need to carefully consider operations that have the potential to greatly increase greenhouse gas (GHG) emissions. The EISA for the dairy expansion made clear that your agency is to "conclude a full GHG life-cycle analysis." That in itself is enough to trigger an EIS (Minn. Statute 4410.1700 Subp. 2a).

I also understand that Daley Farms is, and has been, out of compliance with state regulations for runoff and other issues, with violations filed by the MFCD's feedlot division that have gone unenforced for more than 2 decades.

You have an opportunity to make a better decision than your predecessor and protect the residents of Winona County, who are already experiencing a nitrate-induced drinking water crisis. I strongly urge you to ask for an environmental impact statement on the greenhouse gas supplement and the entire project, or simply deny the permitting for the dairy expansion.

Regards,

Jeanne Land Kramer
Saint Paul, MN
Dairy Expansion 2020

As a neighbor to the Daley's I will only supply all issues. I am 82 years old and been in the dairy business for 24 years. Working at IBM for over 30 years, ordering parts for 24 years and retired from purchasing February 1987. We still farm full time. During the 80's dairy began to weaken. A reduced production plan was enacted which we were part of it. We produced less milk during the year and were rewarded for that year. We talked about this at IBM and one employee said that producing less milk is not the answer. Now the issue is to produce more milk in a declining market. The industry needs further sales not more milk. When IBM sales dropped we produced less and created products for future sales to keep going. The dairy industry failed in this respect. There were so many opportunities for dairy to explore and so other business took hold instead. Make dairy more efficient is all they headed into and caused dairy to sour right from the beginning. Milk consumption is still dropping today because of previous errors.

While I was in dairy our farm was poisoned by drift of glyphosate (roundup) we lost a quarter of our milking cows and total cattle death was 28 head. The day of the drift I became very sick later ending up in the hospital. I purchased a large life insurance after I lost a lot of weight so the wife could continue on living and maybe move to town and every medical center I went for help, they only said they would check me over but no guarantee of recovery. What the wife and I did next is to long to talk about. If you want to know about it, just let me know. It is all on record.

The weed killed roundup. First it kills all weeds. Seeds treated to grow when used will grow. However glyphosate inhibits something called the P450 enzyme system. This a master system our body uses to detox chemicals that we're exposed with. Animal studies done over their life time caused kidney and liver problems, greatly increased cancer risk and led to a shorter life span. Second— glyphosate actually alters DNA basically an amino acid called glycine. Than when your cells are forming proteins they can mistakenly bind to glyphosate instead of glycine. That changes the structure and function of the brain proteins causes damage to them and memory loss. I don't know about you but none sounds to good for me. When following glyphosate use from the beginning the following are increases of chronic diseases since. A Hugh increase of— Acute and subacute, Al amyloidosis, Autism— Alzheimer's— bronchus, B-cell Leukemia, diabetes type II—Chronic Lyphocytic, depression— heart disease, Hodgkin's disease— Ischic heart disease,-- Leukemia, --obesity,-- Porphyria Cutanea Tarda,-- Prostate cancer, --Respiratory cancer,-- Soft-tissue sarcoma --Lung, bronchus, larynx, --infertility-- cancer—gastrointestinal diseases. All you have to do is connect the dots. I don't know about you, but I went thru the torture, and came close to dying, but I went to China after my poisoning and found part of my answer. Now it is time for decision making to more flood a declining market. Pres. Trump is cleaning up the waste in his swamp and it could include farm subsidies. He knows that it a total waste of money to increase product in a declining market and he is right. Most feed back you will receive about ground water, etc and I question who pays to clean up our water (the expansion could use up
to 92 million gallons a year). when that happens. God gave we humans a clean earth and to do
other is against promise. At this point a decision has to be made against or for God's clean
earth. You be the judge. He remembers every thing and you will met him some day
Personally I am banned from consuming factory farm milk for this reason.

Thank you James Pelowski. 31071 County Road 113. Utica, Minnesota. 55979. Ph
1-507-932-4665. ie. any questions, write me.

ie--- check the p450 gene suppression on the internet. I am a very informative person
Kim

Kim:

I am writing concerning the pending proposal for expansion of the Daley Farm milking operation.

I believe it is a mistake for the MPCA to focus their review on the narrow topic of greenhouse gasses.

In the year since the Daley permit was remanded by the courts, the knowledge base around nitrates has expanded. I believe the review should be expanded to include groundwater, nitrates, and that new knowledge. To site three examples:

1. The finding that 500,000 Minnesotans are drinking water from contaminated wells, reported by the Environmental Working Group in the Minneapolis Star Tribune on January 14, 2020.

2. The association between manure and well contamination with nitrates and coliform bacteria in areas with porous bedrock (the Driftless Region) as reported by a Department of Agriculture researcher, Dr. Mark Borchardt, at the 2019 Midwest Manure Summit, sponsored by the University of Wisconsin Extension Service. Dr. Borchardt has 88 publications to his name. This was widely reported; my source was the Winona Daily News of March 3, 2019.

3. The experience in LaCrosse County, Wisconsin, where Babcock Genetics was given a permit to operate a CAFO with 4,000 pigs. Within a few years of opening, 90% of wells in the area had nitrate levels above 10mg/liter. This information was reported in the LaCrosse Tribune on 5/8/17. While it is older information, I believe it is unknown to the MPCA staff. It is relevant because LaCrosse County shares the same karst geology as Winona County.

I believe the probability of contaminating wells in the Lewiston area is exceedingly high if the Daley operation is expanded as proposed.

Thank you for your consideration.

Charles A. Shepard, MD, FACP
Dear Commissioner Bishop,

I am writing to you today because I am concerned about the negative impact that Factory Farms are having on our environment and our economy.

Environmentally, these Factories, which are exactly what Farm is, are polluting our mother Earth. In my travels around our beautiful country and especially here in the upper midwest, I have seen what impact these mega Factories have had on our environment. Just take a look at the slime and algae on small ponds and lakes that are near these Polluters.

Economically, look no further than the number of small Farms that are going under each year.

I urge you to ask for an EIS for the entire proposal being submitted Daily. Please, do not issue a permit to the Daily Factory.

Thank you for your consideration in this matter.

[Signature]
Good Morning Kim:

I am writing today to express my disappointment concerning the staff review of this proposal. I was Regional Manager for the MPCA S.E. Region from 1977 to 2014. During that time many proposals for potentially environmentally damaging facilities were denied including: the Ironwood Landfill proposal to become a Hazardous Waste Disposal Site, The Bluffview Labs mega hog farm proposal near Elgin, MN and others. The groundwater resources of S.E. MN are very fragile and easily severely impacted by poorly designed and/or operated facilities. Examples of system failures include the Wastewater Stabilization Pond System failures at Altura and Lewiston. Even when waste storage systems are properly designed and constructed the waste is itself a threat to the groundwater.

This is especially true with animal waste storage systems. The amount of waste generated is huge. Standard practice for the disposal/ utilization of this manure is to land apply it at agronomic rates. This requires a substantial number of acres of cropland for the amount that would be generated by a facility the size of the proposed Daley Facility. Over application of animal manure to cropland has been a significant factor in the build up of Nitrates in the groundwater in this region of MN. In some areas, the uppermost aquifer is so heavily polluted the water is unfit for human consumption and nitrate levels continue to rise.

S.E. MN consists of "layer cake" sedimentary geological formations that are interconnected. Pollution in the uppermost aquifer can and does impact the deeper aquifers. All communities in S.E. MN utilize groundwater for their drinking water. This groundwater resource must be protected. The citizens of S.E. MN certainly recognize this and have done many things to try to ensure that this precious resource is protected. I expect the MPCA to show a like amount of concern as is required by statute.
Dear Mark P. Gernes, MN Pollution Control Agency:

This letter is to express my unequivocal opposition to the utterly preposterous expansion proposal by the Daley Farms of Lewiston MN, and the efforts of Ben Daley (and his cohorts) to avoid, or simply ignore, the anti-pollution requirements of the equivocating MPCA.

Greenhouse gases. Manure leakages – water (e.g. ground water), ground dispersion and pollution of farm land and ground water. Of course there will be pollution of ground water in spite of whatever ridiculous promises (e.g. pseudo-science, prayers, and astonishingly absurd "best environmental practices") Ben Daley and family/owners and their attorneys will devise. Can nitrate pollution of the water wells in Winona County be good for those of us who drink water? NO. Past runoff violations by the Daley farm has been a health mess in Winona County, and these runoff contamination of wells will be compounded and continued with the dairy cow expansion.

I want the MPCA to require a full and complete Environmental Impact Statement by the Daley Farms of Lewiston, LLP.

I do not know Ben Daley or anyone in the Daley family.

Cordially,

Richard Stephen Schwartz

Copies.

Richard Stephen Schwartz
1465 Park Lane
Winona, MN 55987
March 5, 2020

Commissioner Laura Bishop
Assistant Commissioner Katrina Kessler
Minnesota Pollution Control Agency
520 Lafayette Road North
St Paul, MN 55155

Commissioner Bishop and Assistant Commissioner Kessler,

We are Minnesotans who call southeastern Minnesota’s karst region home. We appreciate that you, your staff, and Environmental Quality Board members have acknowledged in several interactions with the public that the public’s trust has been broken through past decisions, actions and lack of action by the Minnesota Pollution Control Agency. We know this is especially true for rural residents of the karst region of southeast Minnesota.

The agency has been unwilling to use its power provided under the Minnesota Environmental Policy Act (MEPA) and state statutes to fulfill its mission: to protect and improve the environment and human health. In the case of one industrial-scale animal factory expansion proposed for a sensitive environment already experiencing crisis-level water contamination, ordering an Environmental Impact Statement (EIS) or denying a permit altogether are the only appropriate actions under MEPA.

Daley Farms of Lewiston, LLP’s proposal is NOT EXEMPT from in-depth environmental review through an EIS or from denial of permit due to its potential for significant environmental effects in an extremely sensitive region that is already in crisis with high nitrate levels throughout the region and especially in proximity to the proposed site.¹ The EIS is an essential tool to prevent creation of known and unknown risk. We contend that:

- The Supplemental EAW on Greenhouse Gasses (GHGs) for Daley Farms of Lewiston, LLP should have been put on hold. Staff from MPCA’s Environmental Review and Feedlot Divisions stated at their public information meeting on February 4, 2020, that MPCA does not have enough information to complete the greenhouse gases EAW. Minnesota Administrative Rules 4410.1700, Subp. 2a, states that an Environmental Impact Statement is required when there is insufficient information for sound conclusions.²

- The original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.³ Former Commissioner John Linc Stine and staff under his direction dismissed and subverted criteria including “the irreversibility of environmental effects that are already present in the area surrounding the proposed mega-dairy expansion; the cumulative potential effects; the inadequacy of mitigation plans and enforcement; and the extent to which environmental effects can be anticipated and controlled”. We reject the customary practice by the Court of Appeals of deference to the state agency’s expertise about this case.
• An EIS should be required on the entire project because of the potential for significant environmental effects and the need to discuss appropriate alternatives to the proposed action, including alternative methods of land application, cropping, grazing, cover crops and grazing dairy cows. The no-build alternative must also be included in the EIS.  

• Minnesota taxpayers should not have to foot the bill for this continuing Supplemental EAW process when MPCA has NO STANDARDS upon which to make conclusions and recommendations for GHGs. In addition, they should not have to pay for this continuing process when Winona County’s Zoning Ordinance has an animal unit cap of 1,500 AUs. At almost four times this cap, Daley Farm’s proposed expansion was found NOT to meet the criteria for a variance by Winona County’s Planning Department and the Board of Adjustment. No county permit is allowed for this expansion.

Moreover, data is growing, from numerous studies published even in just the last two years since Daley Farm’s began their EAW process:

• linking high nitrate levels in drinking water to serious health threats, including some cancers and “blue baby syndrome (methemoglobinemia).”

• It is estimated that as many as one in eight Minnesotans are drinking unsafe levels of nitrates in their drinking water.  

• Published in the Star Tribune on March 4, 2020, a new study that builds on the study noted above reports that “Nitrate pollution in public drinking water across rural Minnesota is not only widespread but getting worse, a new report shows.”

• From Elsevier Ltd., Environment International Journal, the study: Residential proximity to concentrated animal feeding operations and allergic and respiratory disease examines objective and subjective measures of respiratory and allergic health among rural residents living near dairy CAFOs in a general population living in the Upper Midwest of the United States. The study concludes that “CAFOs may be an important source of adverse air quality associated with reduced respiratory and allergic health among rural residents living in close proximity to a CAFO.”

• In November, 2019, the American Public Health Association issued a policy statement calling for a moratorium on CAFOs; the dangers described within this article from Johns Hopkins Center for a Livable Future are clear.

Anthony Runkel, Chief Geologist with the Minnesota Geological Survey presented Nitrate Transport through the Surface-Groundwater System in Southeastern MN on February 24 at Winona State University. At the conclusion, the key question was, “Is the (nitrate) problem getting worse?” His answer is “Yes, in the deeper aquifers commonly utilized for drinking water (it is).” We believe that you, Commissioner Bishop and Assistant Commissioner Kessler, are the right professionals, serving in the right positions of authority, at the right time, to correct past MPCA failures to “protect and improve the environment and human health”.

We understand that many forces push for continuation of the status quo and we support your efforts to build an environmental review process with regulation, oversight and enforcement that fulfills the letter and intent of MEPA and Minnesota Statutes and Administrative Rules.

Sincerely,
Amy Cordry, Homer Township, Winona, MN

Beth Slocum, Welch, MN

Dag Knudsen, Lake City, MN

Deirdre Flesche, Lake City, MN

Tim Ahrens, Altura, MN

Barbara Sogn-Frank, St. Paul, MN

Bonita Underbakke, Lanesboro, MN

David White, Winona, MN

Ken Tschumper, La Crescent, MN

Bonnie Haugen, Canton, MN

Land Stewardship Members contributing to and signing on to this letter without signature scans:

Angela Anderson, Stillwater, MN
Richard Dahl, Winona, MN
Mike Kennedy, Winona, MN
Tom Hunter, Wabasha, MN

Dr. Charles Shepard, Winona, MN
Loni Kemp, Canton, MN
Sonja Trom Eayrs, Maple Grove, MN
Sources:


alcohol fuels that would have or would increase its capacity by less than 500,000 gallons

Supplemental 4. Fuel conversion facilities. Expansion of a facility for the production of

megawatts is exempt.

or combination of plants at a single site with a combined capacity of less than five

Supplemental 3. Electric generating facilities. Construction of an electric generating plant

which environmental review is being conducted pursuant to part 4410.3600 or 4410.3700

E. Projects for which environmental review has already been completed or for

an EIS would not influence remaining construction; and

D. Projects for which a substantial portion of the project has been completed and

Government approval.

C. Projects for which, and so long as, a governmental unit has denied a required

approve a project under part 4410.3100.

B. Projects for which all governmental decisions have been made. However, this

exemption does not in any way alter the prohibitions on final governmental decisions to

A. Projects for which no governmental decisions are required.

Supplemental 2. Standard exemptions. The following projects are standard exemptions:

of the thresholds specified in part 4410.4000 or 4410.4400.

unless they have characteristics which meet or exceed any

parts 4410.2000 to 4410.6500. Projects within subparts 3 to 25 and 27 are exempt from

Supplemental 1. Scope of exemption. Projects within subparts 2 and 26 are exempt from

4410.4600 EXEMPTIONS.
Supp. 19. Annual Reedsios. The activities in items A to D are exempt:

A. Harvesting of timber for maintenance purposes is exempt.
B. Public and private forest management practices, other than clearcutting or the application of pesticides, that involve less than 20 acres of land, are exempt.

Supp. 18. Agriculture and Forestry. The following projects are exempt:

A. Drainage ditch within the limits of its original construction flow capacity, performed within 20 years of construction or major repair, is exempt.

Supp. 17. Ditch maintenance or repair. Routine maintenance or repair of a drainage ditch within the limits of its original construction flow capacity, performed within 20 years of construction or major repair, is exempt.

Supp. 16. MARINEs. Construction of private residential docks for use by four or less vessels, watercraft, or water surface of less than five acres is exempt.

Supp. 15. Water Impoundments. A new or additional permanent impoundment of 900 square feet of water surface is exempt.

Right-of-Way is exempt

Supp. 14. Reconstruction or modification of an existing bridge structure, or essentially the same improvement or location that may involve the acquisition of minimal amounts of public roadway associated with bridge or culvert replacement is exempt.

Supp. 13. Stream diversion or channelization within the right-of-way of an existing and faciliated within existing right-of-way are exempt.

D. Roadway landscaping, construction of bicycle and pedestrian lanes, paths.

Supp. 12. Roadway landscape, construction of bicycle and pedestrian lanes

Supp. 11. Modernization of an existing roadway or bridge by reconstructing, restoration, rehabilitation that may involve the acquisition of minimal amounts of right-of-way is exempt.

B. Installation of traffic control devices, individual noise barriers, bus shelters,...
Supp. 20. Utilities. Utility extensions are exempt as follows:

D. The modification without expansion of capacity of any feedlot of no more than 300 animal units if the modification is necessary to secure a Missouri corn deposit

C. The construction of an animal feedlot facility with a resulting expansion of an existing feedlot facility by less than 100 animal units, no part of either of which is located within a floodplain area, a shoreline area, a defined wetland, or a project area; or by less than 300 animal units or

B. The construction of an animal feedlot facility with a resulting expansion of an existing feedlot facility by less than 100 animal units, no part of either of which is located within a floodplain area, a shoreline area, a defined wetland, or a project area; or by less than 300 animal units or

be permitted.

The permit for an animal feedlot facility is not in an environmentally sensitive location listed in part 4410.4300, subpart 29, item B;
243

Minnesota Administrative Rules

Minneapolis Administration Rules

http://www.revisor.mn.gov/rules/4410.700

Supp. 2a. Insignificant Information. If the RCU determines that information shall be extended by the EOB chair by no more than 15 additional days upon request of the RCU.

B. For all other RCU's, the decision shall be made no later than 15 days after the close of the review period, or only on a periodic basis, the decision shall be made between three and 30 days after the decision is to be made by a board, council, or other body which meets in compliance with one of the following time schedules:

Supp. 2a. Decision-making process. The decision on the need for an EIS shall be made in compliance with one of the following time schedules:

Supp. 1. Standard for decision on need for EIS. An EIS shall be ordered for projects that have the potential for significant environmental effects.
potential effect, the degree to which the project complies with approved mitigation project is significant when viewed in conjunction with other contributions to the cumulative project, or whether the cumulative potential effect is significant; whether the potential effect is significant on the cumulative basis.

B. Cumulative potential effects. The RCGU shall consider the following factors:

A. Type, extent, and reversibility of environmental effects.

7. Criteria. In deciding whether a project has the potential for significant environmental effects, the following factors shall be considered:

Step 5. Standard. In deciding whether a project has the potential for significant environmental effects, the RCGU shall consider the impacts that may be reasonably expected.

Upon notification, the EDB shall request the RCUs to publish the RCGUs decision in the EDB Monitor.

A copy of the RCGU's response to those comments prepared under subpart A. shall be sent to all persons who submitted written comments. All persons who submitted written comments shall be provided with five days to all persons on the EAVW distribution list pursuant to part 4410.1500 to all persons that commented in writing during the 30-day review period, and to any persons upon that comment.

Formation of the RCGU, the decision shall be provided, within five business days, to all persons on the EAVW distribution list pursuant to part 4410.1500.

4. Record of findings supporting decision. The RCGU shall maintain a record of findings supporting its decision. The record must include:

Step 4. Record of findings supporting decision. The RCGU shall maintain a record of findings supporting its decision. The record must include:

- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the

- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the
- Specific responses to all substantial and timely comments on the EAVW. This record shall either a separately prepared document or compilation of the records of the

3. Form and basis for decision. The RCGU's decision shall be either a
an EIS.

Supp. 9. Connected actions and phased actions. Connected actions and phased actions shall be considered a single project for purposes of the determination of need for a proposal, including other EISs.

D. The extent to which environmental effects can be anticipated and controlled as a result of other available environmental studies undertaken by public agencies or the project proposer, including other EISs.

E. Environmental impacts of the project, and

F. The extent to which the environmental effects are subject to mitigation by the proposer to minimize the contributions from the project;

measures specifically designed to address the cumulative potential effect, and the efforts of
Subd. 2. [Repealed, 1980 c. 447 s 10]

Council

Rehabilitation, and regional development commissions other than the Metropolitan
Including counties, school districts, the Department of Iron Range Resources and
Economic development authorities established under sections 469.086 to 469.108, but not
Under chapter 139D, counties, towns, cities, port authorities, housing authorities, and
Unti of Government in the State including, but not limited to, watershed districts organized
Government until "means any state agency and any general or special purpose
Including the federal government:

Conducted, permitted, assisted, financed, regulated, or approved by units of Government
Government action means activities, including projects wholly or partially
Statement is required for a proposed action.

(c) "Environmental assessment worksheet" means a brief document which is designed

116B.02, subdivision 5;

Subdivision 5. "Pollution, implementation or destruction" has the meaning given in section 116B.02, subdivision 4.

Subdivision 4. "Natural resources" has the meaning given in section 116B.02, subdivision 4.

For the purposes of this chapter, the following terms have the

Subd. 1a. [Repealed, 1980 c. 447 s 10]

116D.04 ENVIRONMENTAL IMPACT STATEMENTS

2018 Minnesota Statutes

https://www.revisor.mn/egov/statutes/code/116D.04
A mandatory environmental impact statement is not required for a facility or plant.

(6) A mandatory environmental impact statement is not required for a facility as a whole.

An environmental assessment worksheet is prepared in the event agency with the greatest governmental unit for an existing plant or biobutanol facility project for which an environmental assessment assessment worksheet must be prepared. The responsible actions for which environmental assessment assessment worksheets must be prepared, but not be required if the expanded or converted facility to produce alcohol fuel, but must be required if the expansion of an existing plant to a biobutanol facility.

Subd. 2a. When prepared. (a) Where there is potential for significant environmental effects resulting from any major governmental action, the action shall be preceded by a detailed environmental impact statement prepared by the responsible governmental agency.
EWG Analysis: Nitrate Pollution of Drinking Water in Rural Minnesota Is Getting Worse

Contamination Has Increased in Almost Two-Thirds of Utilities With Already Elevated Levels
Contact:
Sarah Graddy
(202) 939-9141
sarah@ewg.org
For Immediate Release:
Wednesday, March 4, 2020

MINNEAPOLIS – Nitrate contamination of drinking water has increased across Minnesota’s farm country, an Environmental Working Group analysis of state data has found.

EWG analyzed data from 115 water utilities, serving over 500,000 Minnesotans, with elevated levels of nitrate between 1995 and 2018. About 63 percent, or 72, of these systems saw increases in nitrate during that time, impacting 218,000 people.

The rate was even higher for the community water systems with the worst contamination: 67 percent of the systems with nitrate at or above the federal legal limit of 10 milligrams of nitrate per liter, or mg/L, serving about 48,500 Minnesotans, showed increased contamination over the study period.

“Rapid, strong action is needed to protect Minnesota’s tap water from agricultural pollution,” said Anne Weir Schechinger, EWG senior economic analyst and the report’s author. “The problem is not only widespread, it’s also getting worse at an alarming rate.”

Although nitrate occurs naturally in soil at low levels, a contamination level of 3 mg/L or higher indicates a human cause, according to the Minnesota Department of Health.

The 10 mg/L legal limit for nitrate in drinking water, regulated by the federal Safe Drinking Water Act, is based on a 1962 U.S. Public Health Service recommendation intended to prevent so-called blue baby syndrome, a potentially fatal condition that starves infants of oxygen.

But research from recent decades, including a recent peer-reviewed study by EWG scientists, indicates that nitrate is associated with higher risks of cancer and birth defects at 5 mg/L – half the federal limit – or even less.

In 2018, the average level for nitrate in the 72 systems that have seen worsening contamination was 4.4 mg/L – a 61 percent jump from 1995’s average of 2.7 mg/L.

Nitrate is a primary chemical component of fertilizer and manure that can run off farm fields and seep into drinking water supplies. In January, Minnesota began implementing a new Groundwater Protection Rule to
address this pollution, but EWG and other watchdog groups have pointed out the regulation’s many shortcomings, including its heavy reliance on voluntary measures to address nitrate pollution from farms.

“For nearly 30 years, Minnesota has relied on a voluntary approach to working with farmers to protect drinking water, but surveys show fertilizers are still overapplied to crop fields,” said Jamie Konopacky, EWG’s Midwest director. “But the state’s new Groundwater Protection Rule includes no immediate and practical requirements for farming operations to ensure communities have safe drinking water.”

EWG’s new analysis, which includes community water systems that rely on groundwater, surface water, or both, is based on Minnesota Department of Health data. Similar comprehensive data for Minnesota’s hundreds of thousands of private wells is unavailable, but it is likely they have seen a similar increase in nitrate contamination, because many draw water from the same sources as public water systems.

In January, EWG released a related report showing widespread nitrate contamination in private wells and groundwater-based water systems across the state between 2009 to 2018.

###

The Environmental Working Group is a nonprofit, non-partisan organization that empowers people to live healthier lives in a healthier environment. Through research, advocacy and unique education tools, EWG drives consumer choice and civic action.
One in eight Minnesotans drink nitrate-tainted tap water, report says

Environmental group says Minnesota is on "the brink of a public health crisis."
By Jennifer Bjorhus Star Tribune
January 14, 2020 — 11:19am

Years of unchecked pollution from farm chemicals have brought Minnesota "to the brink of a public health crisis," according to a new report. Above, University of Minnesota students checked the growth of Kernza grass at a field at the U's St. Paul campus.

When the aging nitrate-removal plant in Clear Lake, Minn., started failing, the city took its problem well offline and decided it had to dig a new one. That's an expensive undertaking for a town of 610 people described by public works director Dustin Luhning as a "bedroom community with a lot of farms."

Now, with a $1.3 million loan from the state, Clear Lake has finally broken ground on a well it hopes will rid them for good of the farm chemicals — a triumph for Luhning.

"I've been trying to get this drilled since roughly 2013," he said.

Clear Lake is one of at least 10 Minnesota communities forced to install costly nitrate-removal systems or drill new wells to find clean water in the state's ongoing battle with growing nitrate pollution. Many more now face undertaking the burdensome projects.

A report released Tuesday morning by a national environmental group says that one in eight Minnesotans are drinking nitrate-tainted tap water.

Years of unchecked pollution from farm chemicals have brought Minnesota "to the brink of a public health crisis," according to the Environmental Working Group, which based its findings on public records from the state Department of Health and Department of Agriculture.
“We should be moving faster to prevent it from entering crisis mode,” said Sarah Porter, a senior mapping analyst in the organization’s Minneapolis office and co-author of the study.

The group’s one-in-eight count includes wells where at least one test in recent years detected nitrate above 3 milligrams per liter, the level at which the state Department of Health deems nitrate concentrations to be from a human source. The state and federal health limit for nitrate is 10 milligrams per liter, or 10 parts per million.

One of the most surprising findings, the authors said, is the extent of contamination in private wells across the state.

The analysis found that more than 3,000 Minnesota households drink from private wells with concentrations of nitrate at or above 10 milligrams per liter.

But only a fraction of the estimated 200,000 private wells around the state have been tested, said Anne Weir Schechinger, a senior economic analyst in the Environmental Working Group’s Minneapolis office who co-authored the report.

“I think we would all be surprised how much nitrate is in these wells if we actually tested them,” she said.

Drinking water high in nitrate has been linked to different types of cancer, elevated heart rates and a potentially fatal condition known as blue baby syndrome in which infants are deprived of oxygen. Most of the nitrate contamination comes from nitrogen fertilizer applied to row crops, as well as manure spread as fertilizer.

The Environmental Working Group analyzed five sets of state and federal data to create interactive maps so the public can easily find the drinking water information in one place.

The analysis focuses on groundwater and includes public water systems, community systems such as those serving a mobile home park, and private wells.

A separate study will examine nitrate concentrations in surface waters such as lakes and streams.

The group also said it wants to see the state’s legal nitrate limit reduced because of new research linking even the lower levels of the contaminant to increased risk of colorectal cancer, for example.

The analysis comes as Minnesota begins formal enforcement of the Groundwater Protection Rule, a landmark provision aimed at curbing the use of nitrogen fertilizer in certain strategic areas.

On Wednesday, the state Department of Agriculture will post on its website official maps of the land subject to the state rule.

They will show growers exactly who is affected, although earlier maps gave many farmers a good idea.

Years in the making, the new rule prohibits applying commercial nitrogen fertilizer in the fall or on frozen fields in parts of the state with soil vulnerable to leaching chemicals, such as karst or sand, and in drinking water supply management areas that already have elevated nitrate levels.

The rule also establishes an enforcement program, albeit one that relies heavily on encouraging farmers to adopt greener practices.
Warren Formo, executive director of the nonprofit Minnesota Agricultural Water Resource Center, whose members include about two dozen major agriculture groups, said farmers support the new nitrogen fertilizer restrictions. He said he’s optimistic the changes will have an impact on water.

“We know that farmers are taking it very seriously,” he said. “The discussion about the rule has really generated a lot of conversation between farmers. Farmer are receptive.”

Conservation groups and some agricultural experts have criticized the rule as too narrow. It doesn’t address manure or contamination of private wells, and ultimately only covers only about 13% of the state’s total cropland.

It also focuses only on when commercial fertilizer is applied and not how much is applied.

That’s a big miss, retired University of Minnesota soils scientist Gyles Randall said when the final rule was first announced, because surveys show Minnesota farmers use too much commercial nitrogen.

The Environmental Working Group cited a 2014 survey by the state Department of Agriculture showing that 61% of fields across the state were getting more nitrogen fertilizer than the amount recommended by the U, and 71% of fields were getting more manure nitrogen than recommended.

Still, the advocacy group praised the rule as a strong first step, and said other states are watching to see how it’s implemented.

“The Groundwater Protection Rule has its issues, but it’s still a first in-the-nation rule,” Weir Schechinger said.

Jennifer Bjorhus is a reporter covering the environment for the Star Tribune. She was a business reporter for much of her career but in recent years focused on criminal justice issues, including police use of force and responses to sexual assault.

jennifer.bjorhus@startribune.com 612-673-4683 jbiorhus
Nitrate problem worsening in rural Minnesota's drinking water

A new report shows that fast action is needed to control the contamination.
By Jennifer Bjorhus Star Tribune
March 4, 2020 — 10:02pm

Nitrate pollution in public drinking water across rural Minnesota is not only widespread but getting worse, a new report shows.

While not a surprising finding, the analysis released Wednesday is a sobering reminder that fast action is needed to control the contamination.

Using data from the Minnesota Department of Health, the Environmental Working Group studied 115 public utilities across Minnesota with elevated levels of the toxic chemical, then tracked the levels from 1995 to 2018. During that time, the nitrate levels rose in more than 60% of the affected water systems — or about 72 of 115 systems.

The average nitrate level in 1995 was 2.7 milligrams per liter of water; by 2018 the average was 4.4 milligrams. That is below the state and federal limit of 10 milligrams, but it could be high enough to pose potentially serious health risks based on newer health research, according to the report.

The worsening water systems supply tap water for more than 218,000 Minnesotans in farm country, primarily in the southern and central portions of the state.

Nitrate is a dangerous byproduct of nitrogen in farm fertilizers and manure that leaches into groundwater and fouls lakes and streams, making them toxic to fish and other aquatic life. Nitrogen is a major cause of the dead zone of depleted oxygen in the Gulf of Mexico and is particularly dangerous for infants, which prompted the
federal government years ago to set a nitrate limit for drinking water of 10 milligrams per liter, or 10 parts per million.

The findings are a call to action, said Craig Cox, senior vice president for agriculture and natural resources at the Environmental Working Group.

“We don’t want it to get too late for any more communities,” Cox said in an interview. “It’s a solvable problem if we just put our minds to it.”

Cox said that recent health research, including work by the National Cancer Institute, suggests that the 10 milligram limit is out of date and should be lowered. He said the research shows “pretty troubling results” that link drinking water containing nitrate of 5 milligrams and even less to cancers and, possibly, birth defects.

The state Department of Health helps monitor nitrate in public and private drinking water wells.

Agency spokesman Scott Smith said the department hasn’t had a chance to review the subset of data the Environmental Working Group used. The agency often hears that the nitrate standard is too low, or not low enough, he said.

“Our toxicologists constantly review the literature and have not found evidence to modify the current number of 10 mg/L,” Smith said. “There is not scientific consensus that exposure to nitrate below 10 mg/L results in adverse health effects.”

Smith said the agency constantly works with public drinking water systems to keep nitrate levels below 10, and starts when it detects levels beginning at 3 milligrams.

The new Environmental Working Group analysis follows a broader report the advocacy group released in January. That report showed that one in eight Minnesotans drink nitrate-tainted tap water, and that more than 3,000 households drink from private wells with nitrate concentrations at or above the limit.

The report comes as Minnesota begins implementing the state’s new Groundwater Protection Rule, which sets fall fertilizer restrictions, among other things, to try to control nitrate in runoff. It’s a first, but the nitrate rule has been widely criticized as weak. It does not contain any protections for private wells, for example, and covers only a fraction of the cropland in the state where commercial fertilizer and manure are applied.

Many communities can address high nitrate levels by blending contaminated water with water from cleaner wells. But at least 10 Minnesota communities have been forced to install nitrate-removal systems or drill new wells.

According to state health officials, the typical faucet-mounted water filter won’t filter out nitrate. Removing nitrate requires installing a reverse osmosis or ion exchange system.

Jennifer Bjorhus is a reporter covering the environment for the Star Tribune. She was a business reporter for much of her career but in recent years focused on criminal justice issues, including police use of force and responses to sexual assault.
Residential proximity to concentrated animal feeding operations and allergic and respiratory disease

Amy A. Schultz*, Paul Peppard*, Ron E. Gangnon*,b, Kristen M.C. Malecki*\(^c\)

*Department of Population Health Sciences, University of Wisconsin, Madison, WI, United States of America
\(^c\)Department of Biostatistics and Medical Informatics, University of Wisconsin, Madison, Wisconsin, WI, United States of America

**ARTICLE INFO**
Handling Editor: Olga- Ioana Kalaitzi

Keywords:
Air pollution
Concentrated animal feeding operation
Lung function
Allergies
Asthma

**ABSTRACT**

**Background:** Air emissions from concentrated animal feeding operations (CAFOs) have been associated with respiratory and allergic symptoms among farm workers, primarily on swine farms. Despite the increasing prevalence of CAFOs, few studies have assessed respiratory health implications among residents living near CAFOs and few have looked at the health impacts of dairy CAFOs.

**Objectives:** The goal of this study was to examine objective and subjective measures of respiratory and allergic health among rural residents living near dairy CAFOs in a general population living in the Upper Midwest of the United States.

**Methods:** Data were from the 2008–2016 Survey of the Health of Wisconsin (SHOW) cohort (n = 5338), a representative, population-based sample of rural adults (age 18+). The association between distance to the nearest CAFO and the prevalence of self-reported physician-diagnosed allergies, asthma, episodes of asthma in the last 12 months, and asthma medication use was examined using logistic regression, adjusting for covariates and sampling design. Similarly, the association between distance to the nearest CAFO and lung function, measured using spirometry, was examined using multivariate linear regression. Restricted cubic splines accounted for nonlinear relationships between distance to the nearest CAFO and the aforementioned outcomes.

**Results:** Living 1.5 miles from a CAFO was associated with increased odds of self-reported nasal allergies (OR = 2.06; 95% CI: 1.38, 3.14), lung allergies (OR = 2.72; 95% CI: 1.59, 4.66), asthma (OR = 2.67; 95% CI: 1.39, 5.13), asthma medication (OR = 3.31; 95% CI: 1.65, 6.62), and uncontrolled asthma, reported as an asthma episode in the last 12 months (OR = 2.34; 95% CI: 1.11, 4.92) when compared to living 5 miles from a CAFO. Predicted FEV1 was 7.72% (95% CI: −14.63, −0.81) lower at a residential distance 1.5 miles from a CAFO when compared with a residence distance of 3 miles from a CAFO.

**Conclusions:** Results suggest CAFOs may be an important source of adverse air quality associated with reduced respiratory and allergic health among rural residents living in close proximity to a CAFO.

1. Introduction

Over the last several decades, large livestock farms, including concentrated animal feeding operations (CAFOs), have increasingly replaced small farms across the globe. The change in normative agricultural practices from smaller farms to large-scale farming productions, while more efficient for meat production, may also increase risk of adverse respiratory health or other outcomes among communities living in rural communities. CAFOs increase both the quantity and concentration of airborne particulates, gases, and vapors associated with farming (Schiffman et al., 2001). More than 400 compounds have been found in and around CAFO facilities, including volatile organic compounds (VOCs), endotoxins, ammonia, and hydrogen sulfide (Schiffman et al., 2001). While respiratory health effects among CAFO farm workers are well documented (Douglas et al., 2015; Kirkland and Garry, 2006; Redon, 2006), less is known about the extent to which CAFO air emissions affect the health of nearby residents.

Beyond increasing air emissions, potential for increased exposure to emerging antibiotic resistance microorganisms and outbreaks of zoonotic viral and bacterial pathogens have drawn attention to potential health risks among residents living near CAFOs (Gilchrist et al., 2007; Li et al., 2015; Rogers and Haines, 2005). Several agents, such as ammonia, hydrogen sulfide, endotoxins, and viral and bacterial pathogens from animal manure can be absorbed by dust particles and stay

---

**Abbreviations:** OR, Odds ratio; CI, Confidence interval; FEV1, Forced expiratory volume in one second

*Corresponding author at: 610 Walnut St, Madison, WI 53726, United States of America.

E-mail address: kmalecki@wisc.edu (K.M.C. Malecki).

https://doi.org/10.1016/j.envint.2019.104911
Received 28 September 2018; Received in revised form 7 June 2019; Accepted 8 June 2019
Available online 23 June 2019
0160-4120/ © 2019 Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
SHOW 2008-2016 Cohort (n=5337)

SHOW 2008-2016 Cohort
Rural Residents (n=1856)

SHOW 2008-2016 Cohort
Rural, non-farming Residents
(n=1824)

SHOW 2008-2016 Cohort
Rural, non-farming Residents
With complete asthma and allergy data
(n=1547)

SHOW 2008-2016 Cohort
Rural, non-farming Residents
With complete lung function data
(n=1395)

SHOW 2008-2013 Cohort
Rural, non-farming Residents
With complete data
(n=1019)

Excluded: Urban residents (n=3481)

Excluded: Occupational farmers (n=32)

Excluded: Missing data on:
asthma and allergy outcomes (n=20)
& covariates (n=257)

Missing data on:
Asthma (n=3)
Allergies (n=17)
Income (n=80)
Smoking & BMI (n=175)
Education (n=1)
Physical activity (n=1)

Subset of data used for additional
analyses with detailed allergic outcomes

Fig. 1. Flow chart of the study sample, depicting exclusion criteria and sample size.

Airborne for long periods and travel several miles, potentially exposing nearby residents to elevated levels of livestock-related agents (Cole et al., 2000; Omland, 2002; Dungan, 2010).

Three studies in the United States (U.S.) found the prevalence of asthma to be higher among children and adolescents attending schools (Mirabelli et al., 2006; Sigurdson and Kline, 2006), and living (Pavlonis et al., 2013), near swine CAFOs. Studies among adults have found more mixed results. Two ecological studies among adults in the Netherlands (Trooiveld et al., 2016) and Greece (Michalopoulou et al., 2016) found null results when assessing residential proximity to livestock farms with allergy and asthma outcomes. Yet, an ecological study in North Carolina, U.S. found the prevalence of wheezing to be higher among adults living near swine CAFOs (Wing and Wolf, 2000). Two studies in rural Germany found the number of animal houses near a residence and measured ammonia levels to be associated with decreased lung function in adults (Stolz et al., 2007a; Schulze et al., 2011). However, only measured ammonia levels were associated with sensitization of allergies (Schulze et al., 2011).

Three Netherlands studies found mixed results using general practice electronic medical records (EMR) to identify cases and controls of asthma and allergies. Inverse associations were found between distance to the nearest farm and asthma, allergies, and COPD (Borlée et al., 2015; Smit et al., 2014), and negative associations between the numbers of livestock farms within 1000 m of residence and lung function (Borlée et al., 2017). Yet living within 1000 m of > 11 farms had increased odds of wheezing and COPD (Borlée et al., 2015), and measured ammonia was associated with decreased lung function (Borlée et al., 2017). The only adult study in the U.S. to use EMR found living near a CAFO was associated with increased odds of asthma medication use and asthma-related hospitalizations (Rasmussen et al., 2017).

Several of the aforementioned studies (Sigurdson and Kline, 2006; Wing and Wolf, 2000; Michalopoulou et al., 2016) consisted of people living near 2–3 identified livestock operations, small regions consisting of a few rural towns in Germany (Radon et al., 2007a; Schulze et al., 2011) or a rural county in the U.S. (Pavlonis et al., 2013). While studies in the Netherlands (Borlée et al., 2015, 2017, 2018; Smit et al., 2014) have used population-based study samples using electronic medical records from general practices, only one study in the United States has attempted to do so by using asthma hospitalization, emergency, and medication data from Geisinger Clinic in Pennsylvania (Rasmussen et al., 2017).
et al., 2017). Generating generalizable results from clinic data in the United States can be challenging at those who do not seek medical care due to inconvenience, cost, or lack of insurance go unreported.

The number of studies on the effect of CAFO air emissions exposure on respiratory health among nearby residents is limited and results are inconsistent. Furthermore, many prior studies have grouped exposure to CAFOs, removing individually variability. This study advances understanding of public health implications of CAFOs by using cubic spline regression to examine the association between residential proximity to CAFOs and respiratory health effects in order to account for non-linearity and retain individual levels of exposure. This study uses a well-characterized, rural sample of Wisconsin residents. Wisconsin ranks second after California as the state with the largest number of dairy cows (USDA, 2017); over 90% of its CAFOs being dairy CAFOs (WDNR, 2016). To our knowledge, no studies to date have looked at respiratory effects among residents living near dairy CAFOs.

2. Materials and methods

2.1. Study sample

Data came from the 2008–2016 Survey of the Health of Wisconsin (SHOW) state-wide sample of adults ages 18 and older (n = 5338). SHOW participants are randomly selected using a probability sampling proportion to size with replacement (PPSWR) approach (Nieto and Peppard, 2010). Between 2008 and 2013, a two-stage probability-based cluster sampling was used to randomly select census block groups (stage 1) and household addresses (stage 2) annually within strata of region and poverty level (Nieto and Peppard, 2010). SHOW 2014–2016 cohort was designed as a three-year sample instead of an annual sample as in prior years. A three stage cluster-sampling approach was employed. One county per strata was randomly selected within strata of county mortality rates, followed by random selection of census block groups by poverty status strata. Then 30–35 residential households were randomly selected via US postal service listings.

SHOW recruits 400–1000 participants every year. Across all years of the study, on average 67% of individuals who screen eligible complete each study component (Interview and exam). However, participation rates vary from 47% in some urban communities to >80% in some rural communities.

Fig. 1 describes the analytic sample selected for this study which includes a subset of 1856 (35%) rural participants among the 5338 SHOW subjects. Participants were considered rural if their residence was located in rural census block group defined by the U.S. Census Bureau as having fewer than 2500 people (U.S. Census Bureau, 2015). Additionally, 32 subjects who reported farming as their current occupation were excluded due to increased likelihood of occupational contact with livestock. While livestock contact could be assessed as a surrogate of a higher level of exposure to CAFOs, the number of individuals with occupational exposure was too small to examine this sub-population separately. Since those with livestock contact may or may not live near a CAFO, they were excluded to reduce confounding. Subjects with missing data on any of the respiratory outcomes or confounders of interest were also excluded from analyses, resulting in a final sample size of 1547 for asthma and allergy outcomes, and 1395 for objectively measured lung function outcomes. Detailed allergy data was only collected for 2008–2013 SHOW cohort, resulting in n = 1019 for detailed allergy analyses. All residential household addresses were geocoded using CENTRUS software (Pinney Bowes Inc., Stamford, CT) and linked to the nearest CAFO using ArcGIS v10.3 software (ESRI, Redlands, CA).

2.2. Concentrated animal feeding operations (CAFOs)

Data on CAFO location, type (dairy cow, hog, chicken, or turkey), years of operation and total animal units are maintained by the Wisconsin Department of Natural Resources (WDNR) and Department of Agriculture, Trade and Consumer Protection (DATCP) under the Wisconsin Pollutant Discharge Elimination System (WPDES) program. WPDES falls under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) which requires states to regulate point source pollution to waters of the entire United States. CAFOs are defined by the CWA [Section 502(14)] as point sources, thus requiring a discharge permit and monitoring by WPDES.

CAFOs are defined as an animal feeding operation (AFO) where the following conditions are met: 1) animals are confined for a total of 45 days or more in any 12-month period and 2) animals do not have access to crops, vegetation or forage growth in the normal growing season. AFOs that have 1000 or more animal units (1 animal unit = 1000 pounds of live animal weight) are considered a large CAFO (1000+ cattle, 700+ dairy cows, 2500+ swine, 55,000+ turkeys). Medium CAFOs (300–999 cattle, 200–699 dairy cows, 750–2499 swine, 16,500–54,999) are additionally regulated under WPDES if the facility has a manmade ditch or pipe that carries manure or wastewater to surface water or if the animals come into contact with surface water that passes through the area where they are confined (40 CFR § 122.23(b), 2012).

According to publicly available data downloaded from WDNR WPDES program there were a total of 284 CAFOs operating in Wisconsin in 2016. Ninety percent (244 large, 2 medium) were dairy CAFOs, followed by swine (5 large, 9 medium), beef (10 large, 3 medium), poultry (1 medium, 10 small). Publicly available data were limited, therefore additional data including the location, start date, and end date of all permitted CAFOs established between 2007 and 2015 was obtained via an open records request to the Wisconsin DATCP. The DATCP data was used to ensure CAFOs were in existence during SHOW participants’ year of participation in the study (when residential address and health data were collected). Supplementary Fig. 1 from the WDNR shows the proportion of CAFOs by animal type has remained stable over the last decade, with over 90% of the CAFOs in Wisconsin being dairy.

Residential proximity to the nearest CAFO was used as a proxy to estimate potential exposure to air emissions from CAFOs. Distance from a participant’s residence to the nearest CAFO was calculated using the “Near” tool in ArcGIS (ESRI, Redlands, CA). Participants were linked by cohort year to the nearest CAFO, only including CAFOs that were in existence during both the year they participated AND the year prior.

2.3. Allergy, asthma, and lung function

Self-report history of respiratory allergies and asthma was collected during in-home interviews. Current allergies were defined as having reported “yes” to the survey question “Do you still have allergies or hay fever?” as a follow-up to the question “Has a doctor or other health professional ever told you that you had allergies or hay fever?” Allergy type was defined based on response to the question “Where do allergy symptoms occur?” For this analysis individual with nasal, sinus, lung, eye, and skin as sites of allergies most likely to be triggered by CAFO air emissions were included. Those reporting digestion, food, or insect allergies were unlikely to be related to proximity to CAFOs and were defined as not having respiratory allergies.

Participants were defined as having current asthma if they responded yes to the survey question “Do you still have asthma?” which is a follow-up to the question “Has a doctor or other health professional ever told you that you had asthma?” Those who report having current asthma are also asked “During the last 12 months, have you had an episode of asthma or an asthma attack?” and if they have taken prescription medication to prevent or stop asthma attacks within the last 30 days.

Forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) were measured via spirometry using an electronic peak flow meter (Jaeger AM, Yorba Linda, CA), and validated protocol (Luchtel et al., 1998). Trained technicians gave study participants explicit
directions on how to breathe into the spirometry device. Measurements were considered valid if two FEV1 and FVC readings were within 10% of the highest value measured. FEV1 to FVC ratio (Tiffeneaux index) and percent predicted FEV1 (FEV1 divided by predicted FEV1) were also assessed to account for inter-individual variability in lung function measurement. Predicted FEV1 was calculated using sex, race, age, and height as defined by the NHANES general U.S. population (Hankinson et al., 1992).

2.4. Covariates and confounding

Self-reported demographic data including age (years), gender (male vs. female), education (high school or less, some college, and bachelor’s degree or higher) and household income were gathered via personal interviews. Poverty to income ratios were calculated using U.S. Department of Health and Human Services poverty guidelines and the midpoint of the household income range identified by the participant. Body mass index (BMI) was calculated from measured weight and height as kg/m². Physical activity was defined as Metabolic Equivalent of Task (MET)minutes/week of moderate or vigorous activity using self-report data from a modified International Physical Activity Questionnaire - IPAQ (Craig et al., 2003). Income, BMI and MET-minutes/week were used as continuous variables in all statistical models, but log transformed to adjust for skewness. Additional self-reported questionnaire items assessed as potential confounders include: home smoking policy, household pets, smell of mildew or mold inside, and the use of any pesticides inside the home in the last 12 months. Sensitivity analyses were also run to test for potential confounding by previously identified environmental sources of allergies and respiratory health in the population (Schultz et al., 2017) residential proximity to the nearest primary or secondary roadway and industry were also examined.

2.5. Statistical analysis

Restricted cubic splines functions were applied to the residential distance in order to account for nonlinear relationships between distance to the nearest CAFO and respiratory health. Knots were placed at the minimum, maximum, and 25th, 50th, 75th percentiles of the distance variable (0.24, 6.17, 9.07, 17.9, 69.9 miles). Univariate as well adjusted multiple linear (lung function outcomes) and logistic (allergic and asthma outcomes) regression models were used to examine associations between residential proximity to a CAFO and respiratory health. Potential confounders selected a priori from the literature. Covariates that did not change the main effect estimate by >10% were excluded from the multivariate models. An adjusted odds ratio (OR) or an adjusted beta-coefficient value with two-sided p-value < 0.05 was regarded as statistically significant. To acquire estimates from the spline regression, comparisons were made between different residential distances, while holding confounders constant. Residential distances of interest were chosen a priori from literature estimating air pollution and distance from CAFOs (Schwartz et al., 2011; Williams et al., 2011; Wilson and Serve, 2007; Wang et al., 2013; Michalopoulos et al., 2016), and from univariate spline regression trends between distance to nearest CAFO and each outcome. SAS version 9.4 (SAS Institute Inc., Cary, NC) was used for all statistical analyses. All adjusted analyses included sampling weights to account for sampling design, response rates and spatial clustering.

3. Results

Descriptive characteristics of the study population by residential proximity to the nearest CAFO are presented in Table 1. The majority of the study population (72%) lived >5 miles from a CAFO, 4% (n = 65) lived <1.5 miles of a CAFO and 23% (n = 361) lived 1.5-5 miles from a CAFO. Those living near a CAFO (<1.5 miles) were more likely to be males, never-smokers, younger, less educated and diagnosed with asthma when compared with those living middle-distance (1.5-5 miles) and far (>5 miles) from a CAFO. Those living near a CAFO were also less likely to live near a major roadway and have allergies when compared to the populations living middle-distance and far from a CAFO (Table 1). Unadjusted cubic spline plots revealed the log odds of asthma and allergy outcomes decreased, and lung function increased, as distance from a CAFO increased, leveling off at around 5 miles (Supplementary Fig. 2). Therefore, results include comparisons between distances of 1-3 miles compared with 5 miles from a CAFO.

Close residential proximity to a CAFO (living within 1-3 miles) remained positively associated with reporting any allergy symptoms even after controlling for gender, age, BMI, smoking status, education, income, pet ownership (Fig. 2). Mold in the home, smoking policy in the home, indoor chemical use, and residential proximity to an industrial site and roadway did not change the main effects and were not included in final models. Odds of allergies was >2-fold when comparing living 1 and 1.5 miles from a CAFO to 5 miles from a CAFO (OR = 2.55; 95% CI: 1.49, 4.36 and OR = 2.02; 95% CI: 1.33, 3.08) and decreased as distance from a CAFO increased. Similar associations were seen among those with nasal- and lung-specific allergies, with the strongest associations seen with lung allergies. The adjusted odds of lung allergies was consistently >2-fold higher among those living 1-3 miles from a CAFO when compared to those living 5 miles from a CAFO. Supplementary Tables 1 and 2 show results of all distance comparisons made for the previously mentioned allergy outcomes, along with current allergies assessed with the entire 2008-2016 cohort. While results indicate residential proximity is associated with eye and dermal allergies, none of the results were statistically significant (Supplemental Table 2).

Residential proximity to a CAFO was similarly associated with asthma and asthma control measures, including one or more asthma attacks in the last 12 months or taking asthma medication. Reporting current asthma was consistently about 1.6-1.9 times greater among those living 1-3 miles versus 5 miles from a CAFO (Fig. 3). The odds of ever being diagnosed with asthma was 3.11 (95% CI: 1.49, 4.36) and 2.67 (95% CI: 1.33, 3.08) when comparing 1 and 1.5 miles from a CAFO to 5 miles from a CAFO. Similar to the associations seen with current and nasal-specific allergies, the odds of doctor diagnosed asthma and asthma medication use decreased as distance from a CAFO increased. Those living 1, 1.5, 2, 2.5 miles from a CAFO, asthma medication was 4, 3, 2.5, and 2 times greater, respectively, when compared to those living 5 miles from a CAFO; all associations statistically significant. Odds of an asthma attack were consistently 2-fold higher at 1-3 miles versus 5 miles from a CAFO, with the odds being 2.34 (95% CI: 1.11, 4.92) times higher at 1.5 miles versus 5 miles from a CAFO.

Among the SIOW 2008-2013 cohort, the odds of reporting both allergies of nose or lungs and current asthma was 2.67 (95% CI: 0.97, 6.38) times greater and 2.14 times greater among those living 1 and 1.5 miles from a CAFO when compared to those living 5 miles from a CAFO (Fig. 2). Associations were lower at 2 and 2.5 miles but increased again to 2.74 (95% CI: 1.43, 5.23) when comparing 3 miles to 5 miles from a CAFO. This finding suggests that those in this study population with the presence of asthma or allergies may have allergic asthma. Results of all distance comparisons made with the aforementioned asthma outcomes can be seen in Supplementary Table 3. Similar directional associations are seen when distances of 1-3 miles are compared with 3, 4, and 6 miles as a reference value instead of 5 miles.

FEV1 percent predicted and FEV1/FVC were significantly lower among individuals living 1-3 miles from a CAFO when compared to those living 5 miles from CAFO (Fig. 3). While not statistically significant, Fig. 4 shows FEV1 percent predicted was 11.31 L/s (95% CI: 0.51, 23.14) lower at 1 mile, and 7.00 L/s (95% CI: 2.26, 16.26) lower at 1.5 miles, when compared with those with 5 miles from a CAFO. The difference in FEV1 percent predicted decreased at 2 and 2.5 miles versus 5 miles until it reached 0 when comparing 3 miles versus 5 miles from a CAFO. FEV1/FVC was 0.039 (95% CI: 0.008, 0.07) lower at 1 mile, and 0.027
Table 1
Characteristics of the study population.

<table>
<thead>
<tr>
<th>Residential distance from nearest CAFO</th>
<th>Total study sample (n = 1547)</th>
<th>≤ 1.5 miles</th>
<th>1.5-5 miles</th>
<th>≥ 5 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>682</td>
<td>47.7</td>
<td>44.3</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>865</td>
<td>52.3</td>
<td>55.7</td>
</tr>
<tr>
<td>Age (in years)</td>
<td></td>
<td>320</td>
<td>23.1</td>
<td>18.8</td>
</tr>
<tr>
<td>18-39</td>
<td></td>
<td>711</td>
<td>46.6</td>
<td>50.1</td>
</tr>
<tr>
<td>40-59</td>
<td></td>
<td>516</td>
<td>32.3</td>
<td>31.0</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>485</td>
<td>98.5</td>
<td>93.9</td>
</tr>
<tr>
<td>White (non-Hispanic)</td>
<td></td>
<td>42</td>
<td>1.5</td>
<td>6.1</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>425</td>
<td>38.5</td>
<td>31.0</td>
</tr>
<tr>
<td>H.S./GED or less</td>
<td></td>
<td>656</td>
<td>36.9</td>
<td>38.2</td>
</tr>
<tr>
<td>Some college</td>
<td></td>
<td>466</td>
<td>24.8</td>
<td>30.7</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td>246</td>
<td>6.2</td>
<td>11.6</td>
</tr>
<tr>
<td>&lt; $25,000</td>
<td></td>
<td>401</td>
<td>43.1</td>
<td>23.8</td>
</tr>
<tr>
<td>$25,000-$49,999</td>
<td></td>
<td>590</td>
<td>35.4</td>
<td>45.7</td>
</tr>
<tr>
<td>$50,000-$99,999</td>
<td></td>
<td>310</td>
<td>15.4</td>
<td>16.6</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td>247</td>
<td>13.8</td>
<td>15.0</td>
</tr>
<tr>
<td>Current</td>
<td></td>
<td>488</td>
<td>27.7</td>
<td>32.1</td>
</tr>
<tr>
<td>Former</td>
<td></td>
<td>812</td>
<td>58.5</td>
<td>52.9</td>
</tr>
<tr>
<td>Never</td>
<td></td>
<td>381</td>
<td>20.0</td>
<td>28.0</td>
</tr>
<tr>
<td>25-30</td>
<td></td>
<td>501</td>
<td>38.5</td>
<td>29.9</td>
</tr>
<tr>
<td>&gt; 30</td>
<td></td>
<td>665</td>
<td>41.5</td>
<td>42.1</td>
</tr>
<tr>
<td>Physical activity</td>
<td></td>
<td>392</td>
<td>24.6</td>
<td>27.7</td>
</tr>
<tr>
<td>&lt; 600 met min/wk</td>
<td></td>
<td>1155</td>
<td>75.4</td>
<td>72.3</td>
</tr>
<tr>
<td>≥ 600 met min/wk</td>
<td></td>
<td>493</td>
<td>20.0</td>
<td>28.5</td>
</tr>
<tr>
<td>Proximity to major roadway</td>
<td></td>
<td>1054</td>
<td>80.0</td>
<td>71.5</td>
</tr>
</tbody>
</table>

CAFO: concentrated animal feeding operation; km: kilometer; N: number; H.S.: high school; GED: General Education Development test; BMI: body mass index; wk.: week.

p-trend: statistical significance by Chi-square test.

(95% CI: 0.003, 0.051) lower at 1.5 miles, when compared with 5 miles from a CAFO. Results of all distance comparisons, including FEV1 and FVC outcomes, can be found in Supplementary Table 4.

4. Discussion

These findings add to the emerging body of literature regarding public health impacts of concentrated animal feeding operations among rural populations. Much of the existing research has been conducted in Europe. This one of the first studies to examine how rural respiratory health is potentially influenced by farming practices in a general population based sample of adults in the United States. Among this well-characterized population-based sample, household proximity to a CAFO was associated with numerous respiratory outcomes including increased odds of self-reported allergies and asthma, and decreased lung function.

The use of cubic splines to explore nonlinear relationships between proximity to a CAFO and respiratory health outcomes was a strength of this study. Associations between residential proximity within 3 miles of a CAFO and increased prevalence of allergies, asthma, and decreased lung function were observed. Each of the respiratory outcomes followed a similar nonlinear relationship with distance from CAFOs and a 5 mile reference cut point was determined based on visual plots of the cubic spline functions of distance to the nearest CAFO regressed by each respiratory outcome separately. The non-linearity relationship seen in respiratory outcomes is not surprising as levels of constituents from air emissions from point sources (i.e. airports, roadways, industries, livestock facilities) tend to follow a similar exponential decay as distances from the sources increase (Batterman et al., 2014; Dungan, 2010; Hadlocon et al., 2015; Maantay et al., 2009; Moreira et al., 2005; O'Shaughnessy and Altmair, 2011; Polidori et al., 2010; Zhou and Levy, 2007).

Study findings are consistent with, and add strength to other U.S.-based studies of asthma and allergy symptoms among people living near AFOs or CAFOs. Pavilonis et al. (2013) found cumulative exposure to AFOs < 3 miles from residence was associated with an increased odds of asthma (1.51 p = 0.014) and asthma medication or wheeze (1.36 p = 0.023) among school age children. Similarly, Rasmussen et al. (2017) found adult asthmatics recruited from a clinic based sample and living within 3 miles of a CAFO compared to 3 miles had increased odds of ordering asthma medications (OR = 1.11 [95% CI: 1.04, 1.19]) and asthma hospitalizations (OR = 1.29; 95% CI: 1.15, 1.46). The smaller farm sizes may have contributed to the smaller effect sizes seen in Pavilonis et al. (2013) study. Not to mention, diagnosis of pediatric asthma is based on symptoms, which vary throughout a child's life, and also day to day (Asher et al., 2012; Jacob et al., 2017; Yang et al., 2017). The focus on hospitalizations and emergency department visits (Rasmussen et al., 2017) may have underestimated asthma events by excluding those who live near CAFOs but do not seek medical care due to being uninsured, financially insecure, or far from services.
Fig. 2. Results of logistic regression assessing allergic outcomes by restricted cubic spline of residential distance to the nearest CAFO. Residential distances of 1, 1.5, 2, 2.5 and 3 miles (1.6, 2.4, 3.4, 4.0, 4.8 km) from a CAFO were compared with a residential distances of 5 miles (8.0 km) from a CAFO. Models are adjusted for gender, age, poverty to income ratio, education, BMI, smoking status, pet ownership and proximity to major roadways.

Results showed stronger associations with doctor diagnosed asthma than with current asthma. Discrepancies could be due to several factors, including a lack of clarity regarding the survey question assessing current asthma. Cross-tab frequencies on current asthma and asthma medication in the last 12 months revealed several participants reported not having current asthma because it is under control from taking asthma medication. Discrepancies between current asthma and doctor diagnosed asthma are not uncommon and can be due to several other factors including misdiagnosis, remission and relapse of asthma (Aaron et al., 2017).

Current allergies of any type and nasal allergies were 2.5 times higher at 1 mile from a CAFO, and decreased to 1.3 times higher at 3 miles from a CAFO compared to 5 miles from a CAFO. Lung allergies remained 2.2–2.6 times higher at distances 1–3 miles from a CAFO when compared to 5 miles. The ability to assess allergy by type is a unique contribution, and something few studies have been able to do. Our study confirms findings from a few U.S. studies that have looked at proximity to CAFOs and allergies or allergy-like symptoms. Wing and Wolf (2000) found those living within 2 miles of a CAFO had increased prevalence of running nose, coughing, headache, itchy eyes, running nose, and sore throat. Mirabelli et al. (2005) found stronger associations with adolescents attending schools within 3 miles of a CAFO and asthma when stratified by those with allergies.

Findings in the U.S. are largely in contrast to those found in Europe,
Fig. 4. Results of linear regression assessing (A) FEV1% predicted and (B) FEV1/FVC ratio by restricted cubic spline of residential distance to the nearest CAFO. Residential distances of 1, 1.5, 2, 2.5 and 3 miles (1.6, 2.4, 3.4, 4.0, 4.8 km) from a CAFO were compared with a residential distance of 5 miles (8.0 km) from a CAFO. Models are adjusted for gender, age, poverty to income ratio, education, BMI, smoking status, pet ownership, height, and physical activity.

particularly in Germany and Netherlands, where proximity cut points are typically at 500 m (0.31 miles) or 1000 m (0.62 miles). Several factors may contribute to this. For example, European confined livestock farms are generally smaller than in the U.S., densely clustered, and located in areas of higher population density. Thus, shorter distance cut points and livestock farm counts within 500 or 1000 m are more appropriate. Borlée et al. (2015, 2017) is one of the few studies to assess nonlinear associations using cubic splines of CAFO proximity and nasal allergies, finding inverse results to those seen in this study. Borlée et al. (2015) and Smit et al. (2014) both found inverse associations with doctor diagnosed asthma and allergies using EMR data in the Netherlands. Hoeviveld et al. (2016), another Netherlands study which used EMR data found null results, but did not use individually measured exposure data as seen in the other two Netherlands studies. Radon et al. (2007a) found self-reported asthma and nasal allergies were associated with increased livestock farm odor in Germany, but the number of animal houses near the home was not a predictor of allergies or specific sensitization. Schulze et al. (2011) is one of the few European studies to find those exposed to higher ammonia levels from livestock farms to be 4.2 times more likely to be sensitized against ubiquitous allergens.

Findings from European studies largely suggest livestock farms provide a protective effect, if any, and support the hygiene hypothesis, specifically with allergy endpoints. The most comprehensive studies dedicated to disentangling the various factors of the protection against allergy provided by farming, such as ALEX, GABRIEL, Advanced Surveys, and PASTURE, have been performed in European regions where dairy production is the main activity and where farming is not industrialized; (Altfven et al., 2006; Genin et al., 2011; Riedler et al., 2001) rather in mid-mountain-altitude and among small cheese farms in areas like the Alps (Lis et al., 2008; Roque et al., 2016). In the ALEX and GABRIEL studies, the overall farm effect has been explained by specific and diverse exposure to types of livestock, crops, straw, fodder storage, manure, and unpasteurized milk (Vuitton et al., 2014; Vuitton and Dalphin, 2017). However, the industrialization of farming is thought to have decreased the microbial diversity and increased the abundance of specific bacterial genera which may induce inflammatory response (Kong et al., 2015; Hoivik et al., 2015; Schaeffer et al., 2017). This is further supported by studies showing household dust and the nasal microbiota from farm children to have higher alpha and beta diversity than those found from non-farm children, and lower nasal microbiota diversity to be associated with asthma prevalence (Depner et al., 2015; Pecknoss et al., 2016).

However, protective or null effects have also been seen among adults living near non-traditional, industrialized confined livestock operations in Europe, which are generally smaller in size than CAFOs seen in the United States. Borlée et al., 2015, 2017; Hoeviveld et al., 2016; Radon et al., 2007b; Smit et al., 2014; Michalopoulou et al., 2016) This suggests that the dose of exposure to microbes, in combination with particulate matter, gases, and vapors emitted from livestock operations, may also play a role in the respiratory health effects seen among nearby residents. While it appears both the dose and type of exposure to microbial agents from livestock farms may be of importance, additional research is needed with attempts to identify etiological agents from livestock agents. Differences in the size and management practices of the livestock farms themselves, the microbial diversity emitted, the regulations imposed on them or the populations living near them are all factors which may have contributed to the different results seen in the European studies when compared to the U.S.

Discrepancy in findings across studies in Europe and the U.S. could also be due to varying ways in which asthma and allergies are diagnosed, or defined. Asthma diagnoses are often made based on symptoms and treatment based on severity of symptoms. However, asthma is a heterogeneous disease that manifests differently in different people, symptoms can vary over time and change day to day within the same person, and therefore diagnoses may vary by individual, doctor, or region. (Jacob et al., 2017) Previous studies have shown the challenges to accurately diagnosing asthma have resulted in over- or under-diagnosis of asthma. (Jacob et al., 2017) Furthermore, distinctions between allergic and non-allergic asthma can often not be made without a serological test. All these factors may also contribute to discrepancies in results across the literature.

Lung function was positively associated with proximity to a CAFO, with lung function improving as distance from a CAFO increased. The effect sizes, although most non-significant, were similar to results from European studies of adults in Germany and the Netherlands (Schulze et al., 2011; Radon et al., 2007a, 2007b). A distance of 1.5 miles was associated with −7.0% predicted FEV1 when compared with a distance of 5 miles from a CAFO, Schulze et al. (2011) found a −8.19% predicted FEV1 among those with average ammonia concentration greater than or equal to 19.71 µg/m3 when compared to those with levels below. Similarly Radon et al. (2007a, 2007b) reported a −7.4% predicted FEV1 among those more than twelve animals houses within 500 m of home. While definitions of exposure to CAFO varied, the fact that all three studies found very similar results suggests residential proximity to a CAFO, or many AFOS, is likely associated with decreased lung function.

As one of the first studies in the U.S. to use a randomly selected statewide, population-based sample of rural adult residents to assess
multiple respiratory health effects among people living in proximity to CAFOs, this study has numerous strengths. Prior U.S. studies have tended to rely on grouped exposures, removing individually variability among the exposure (Micirelli et al. 2009; Rasmussen et al., 2017; Sigvardsson and Kline, 2006; Wing and Wolf, 2009). Our study was able to report on the nonlinear association between proximity to the nearest CAFO and respiratory health outcomes in the U.S., providing an important link between dispersion modeling of CAFO emissions and human health effects.

While utilizing a randomly selected statewide sample is a strength of this study, it is also a limitation. Rare exposures, such as living near a CAFO in the U.S., can result in low power and are best studied with cohort studies where subjects are selected by exposure status. Low power may have resulted in our inability to detect interaction with proximity to a CAFO and smoking status. Though we carefully controlled for multiple confounding factors, residual confounding or confounding by other unmeasured factors may affect estimated associations including individuals with potential higher livestock exposures via occupation. However, the number of subjects reporting livestock exposure was small and not sufficient to examine as a separate subpopulation. Similarly, residents in urban areas were not included to reduce bias and reduce potential unmeasured confounding introduced by air pollution sources unique to urban areas. The cross sectional nature of this study also limits conclusions regarding the temporal association between exposure and respiratory outcomes, particularly self-reported asthma prevalence. Self-report is not ideal and can lead to recall bias, however asthmatic and allergic symptoms may go clinically underreported in rural areas, where people may be less likely to seek medical care due to inconvenience, cost, or lack of insurance. While objective and self-report data on asthma was available, this study relied on self-report of allergies. Therefore, results cannot definitively tease out allergic and non-allergic asthma, something that would have strengthened the study and increased comparability with other studies. Furthermore, the lack of allergic sensitization data limits comparisons with other studies.

We were able to acquire retrospective CAFO data and ensure CAFOs linked to participant residences were in existence prior and during their study participation. However, the farm size and type could not be validated from this data. Additionally, we were unable to account for proximity to non-CAFO livestock farms. The assumption being made here is that the distribution of smaller farms is random throughout the study sample, resulting in non-differential classification bias. This assumption results in estimates biased towards the null.

5. Conclusion

In summary, residential proximity to a CAFO among individuals from a randomly sampled general population health survey was positively associated with self-reported nasal and lung allergies, asthmatic outcomes, and objectively measured lung function. This study provides evidence for respiratory health effects among residents living near dairy CAFOs. CAFOs may be an important source to regulate as current evidence suggests that large livestock farms may contribute to health disparities among rural residents. Building on findings from this observational study, future research should consider longitudinal study designs, more refined estimates of exposure source-portioned air constituents in nearby homes, and more systematic tracking and validation of outcomes. More research is also needed to understand the mixtures of airborne agents from nearby livestock facilities in order to identify any etiological agents which may be associated with asthma, allergies, or lung function in residents living near large livestock facilities. Passive air pollution monitoring using filters or dust collection in homes would be useful to collect in order to better understand composition of air particles and how they may change over time. A cohort study which selects study participants by residential proximity and monitors respiratory health symptoms across multiple seasons should also be considered. Alternatively, a case-control study that recruits from hospitals and clinics in areas with a large concentration of CAFOs and could follow-up self-reported symptomology overtime could overcome some existing limitations of this work.

Sources of funding

Funding for SHOW comes from the Wisconsin Partnership Program (PERK) Award (223 PRJ 25DJ). This project was also supported by funding from the National Heart Lung and Blood Institute (1RC2 HL101468) the National Institutes of Health’s Clinical and Translational Science Award (SUL 1IR025011). Authors also acknowledge support from a core grant to the Center for Demography and Ecology at the University of Wisconsin-Madison (P2C HD047873), the National Institutes of Health, National Center for Advancing Translational Sciences CTSA award (ULLTR000427), and National Institute for Minority Health and Health Disparities award (IP60MD0003428).

Declaration of Competing Interest

None.

Acknowledgements

The authors thank the staff and graduate students at the Survey of the Health of Wisconsin (SHOW) for assistance in data processing and analysis. We would also like to thank the Wisconsin Partnership Program for continued funding of this work. We would also like to thank the SHOW participants for their time and contribution to this work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.envint.2019.104911.

References


Johns Hopkins Center for a Livable Future

Nation’s Leading Public Health Organization Urges Halt to All New and Expanding CAFOs

New Policy Implores Agencies to Impose Moratorium to Protect Public Health

Nov 18, 2019

The American Public Health Association (APHA) enacted a new policy statement advising federal, state, and local governments and public health agencies to impose a moratorium on all new and expanding concentrated feeding animal operations (CAFOs). The new policy recommends a complete halt until additional scientific data have been collected and any public health concerns associated with CAFOs are addressed.

The *Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations* statement was developed by APHA members in collaboration with individual members from the Johns Hopkins Center for a Livable Future (CLF). The statement outlines the urgent need for full compliance with the policy and provides twelve action steps that span from ending the routine use of medically important antibiotics in food animal production to providing a mechanism that requires large scale producers to report environmental emissions hazards.

“CAFOs are the dominant production model for food animals in the United States, but government oversight and policies designed to safeguard the health of individuals and the environment from these operations have been inadequate,” says Bob Martin, director of the Food System Policy Program at the CLF. “This policy statement puts the public’s health first and if observed, it has the potential to protect the health of some of our nation’s most vulnerable communities.”

“Since CLF’s founding in 1996, a priority focus of our work has been to understand and address the public health implications of industrial food animal production. Our research and policy activities have linked this method of food production to a number of serious public health challenges,” says Martin Bloem, MD, director of the CLF and the Robert S. Lawrence Professor of Environmental Health with the Johns Hopkins Bloomberg School of Public Health’s Department of Environmental Health and Engineering. “We are pleased that the nation’s leading public health organization has taken a stand on this critical public health issue. All public health professionals, advocates, and policymakers should keep this new APHA policy statement in mind as they work to protect health and improve our food system.”

CAFOs confine large numbers of animals of the same species—such as beef and dairy cattle, swine, broilers (poultry raised for meat consumption) and laying hens—on a small area of land. The scale, density, and practices associated with these operations present a range of public health and ecological hazards, including large volumes of untreated animal waste, the release of environmental contaminants to air, water, and soil, and the generation and spread of antibiotic-resistant pathogens. A growing body of evidence shows how CAFOs are directly associated with occupational and community health risks, as well as the social and economic decline of rural communities.

“Research has consistently found that living near CAFOs is associated with an array of negative health impacts, including respiratory disease, mental health problems, and certain types of infections,” adds Keeve Nachman, PhD, director of the Food Production and Public Health Program with the CLF and an assistant professor with
the Bloomberg School of Public Health's Department of Environmental Health and Engineering. "It's critical that we work diligently and swiftly to close the knowledge gaps related to the public health and environmental challenges associated with this method of food animal production."
Primary Source of Earth Science Information for State of Minnesota

About 21 Scientists and 12 Staff (GIS, Database, IT, Admin)

Nitrate Transport Through the Surface-Groundwater System in Southcentral MN
Nitrater Data: 19,000 samples includes wells (~15,000), springs and surface water samples

Bedrock Geology

Krarl Features

Depth to Bedrock

Nitrate data point

Spring

Sinkhole

Stream

>50 ft

>20 ft

>10 ft

>5 ft

>500 ft

>50 ft
Why are the trends in nitrate over time so variable?

Why the scatter in the correlation between baseflow nitrate concentration and fertilization?

Adding geologic context to address these nitrate-related questions:
Lower Paleozoic sedimentary bedrock variably covered by glaciogenic sediment.

Hydrogeologic Setting, Southwestern Minnesota
Water enters hole at 236 ft depth

Flows uphole at 165 ft depth

Water exits hole

Park Well, Minneapolis, 200595
St. Peter Sandstone example (Van Cleve)

Turbulent flow common
Large volumes of water with fractures accommodate
Calculated KH ranged from 1000 to 40,000 ft/day. Of 12 tested wells, there was a single BPP at top of Hidden Falls. Mfr that dominated hydrualics.
Vertial Fracture Characterization (challenging)
Strongly anisotropic

Fracture/Bed Parallel Parting (BPP) dominated flow

Stacked layers of aquifers and aquitards (several "new" aquitards added)

Summary of hydrogeologic system:

Regional Hydrostratigraphic Framework
Groundwater and surface water are interconnected through the groundwater-surface water system.
MINNESOTA-GROUNDWATER-SURFACE WATER SYSTEM

Schematic Illustration of Typical Southeastern

ADIDING WATER AGE AND CONTAMINATION

Based mostly on published maps and reports from the Minnesota County GeoLogic Atlas program: Minnesota Geological Survey and Minnesota DNR
Minesota Basellow Conditions
Site Specific Example of Typical Southwestern
Results: Not all baseflow is created equal.
Nitrate Pollution: The Focus of Dairy Debate

"Is the nitrate problem getting worse?"

Why Time Matters

"Groundwater are largely the remnants of less growth and Wiirt contain that nitrites in current farming practices as unfair. Efforts to pin nitrate pollution on like Glen Grotch and Duane Wiirt see Winona County Farm Bureau Leaders Stangage stated," addressing it, it's going to get worse. "We have a nitrate problem in Ullica."

By Chris Rogers, Winona Post (10/5/2017)
On which decade are we monitoring—the lag time issue is the problem getting worse? The answer might depend.
Nitrate data from MDA, DNR, MDH, U of M, IA DNR

Is the nitrate problem getting worse?

Many areas show steady increase in shallow aquifers with older water
Commonly used deeper
NO3-N HRL
With variable trends mostly at or above HRL
Young water remains shallow and deeper groundwater

NO3-N in (parts per million)
10
15
20
25

Deeper, older water
Shallow, younger water
Springs

Hennepin
Narvon
Blue Earth
Le Sueur
Pine
Twin Cities
Renville
Douglas
Stearns
Wright
Sherburne
Chisago
Chisago
Pine
Chisago
Carver
Scott
Hennepin
 Ramsey

and springs dominated by young water must be employed.

To track the effectiveness of improved nitrogen management strategies, monitoring with wells very long time to respond to changes at the land surface.

Much of the groundwater we sample can include older water that may take a

For ongoing monitoring:

- In shallower aquifers, highly variable, but perhaps “maintaining,” at a level above the RFL
- Yes, in the deeper aquifers commonly utilized for drinking water

Is the problem getting worse?

TAKE AWAYS
Continuing Research: Hydrogeologic Conditions

Numerical models to predict transport integrated with multiple sets of data for improved...
Add your message to MPCA Commissioner Bishop
about the importance of holding factory farms accountable:

Sincerely,
Name: Nancy Kelley
Town: Byron, MN 55920

EIS
YES!
Please do an EIS! We must at least consider how an enormous mega farm would impact drinking water and air pollution in MN. Foresight is cheaper than decontamination.

Sincerely,

Name: Kekey Koch
Town: Bloomington, MN
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

As a rural family who has to spend over $80/month to make our water drinkable, we need the MPCA to make hard decisions. We need clean drinking water. We need to not burden neighbors or future generations with environmental disaster.

Sincerely,

Name: [Signature]

Town: [Signature]
Add your message to MPCA Commissioner Bishop
about the importance of holding factory farms accountable:

Dear Commissioner Bishop,—I am on a well in sensitive SE MN and concerned about the proposed Daley Farm expansion.

I am worried about water, the air I breathe and impacts on a changing climate. Please deny the permit or at least require an EIS.

Sincerely,

Billy Cummings

Witoka

EIS YES!
Who is going to clean this up if not the state - Do they not care about future generations?

Our family has lived in and around Winona - 25 yrs - college

Sincerely,

Name: Dacia Vandenheuvel Allen

Town: Waseca, Isanti, Burns, Winona

Yes!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Ms. Bishop—

We should not allow expansion of industrial farms without complete process for reuse and recycling of wastes, plus odor control.

Sincerely,

Name: Brian C. Dither

Town: Winnie/Pilgrim

EIS YES!
What a SAD story that they have been allowed to go above and beyond the MN statues! We all need clean water and clean air and if Winona City has also let a cap of AG's why allow anyone to push these limits. Do what needs to be done and stay firm.

Sincerely,

Name: YLL Meyer

Town: New Prague, MN
They should be held accountable
(Everyone else is!)

B.L.A.

My health is so bad from living in
Spa z MN for 30 yrs 3 - Cancers

Sincerely,

Name: Paul/ Betty Allen

Town: Dawson

EIS
YES!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

When pollution increases and we need replacements, those causal changes should have to bare the cost. Every new well is thousands of $.

Sincerely,  
Ed Hunt  
Elk River  

EIS  
YES!
If we are going to support farmers, it should be the small family farmers!

Sincerely, 

Ruth Helgesen

Name: Ruth Helgesen

Town: Garrison, MN 56450
Factory Farms produce vast quantities of manure which make their way into the local environment, polluting our air and water. Several municipal water systems in the midwest must regularly implement costly clean up techniques to remove factory farm pollution from the water supply in order to avoid public health disasters. EIS YES - what is the true impact on drinking water supplies.

Sincerely,

Lynn Albrecht

Name: Lynn Albrecht

Town: Blackley MN

EIS YES!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

ANY BUSINESS OUT OF COMPLIANCE SHOULD BE SHUT DOWN. NOT EXPANDED.

Sincerely,

Name: Rich Menke
Town: Sturgeon Lk MN

EIS YES!
IT IS DISTURBING THAT BIG BUSINESS CONTINUALLY GETS BY SKIRTING REGULATIONS TO THE DISADVANTAGE OF NATURE AND HUMANS.

Sincerely,

RITA MENKE

Town: STURGEON LAKE MN

EIS YES!
Commissioner Bishop,

Please stop the expansion of the Daley factory farm without first completing a full EIS. We need to support sustainable family farms - not corporate factory farms!

Sincerely,

Name: Frankie Chase

 Town: Carlton, MN
This farm should not be able to be so large as to have such a burden on the already contaminated water supply and negatively affect the people and environment in Winona County.

Sincerely,

Tracy Lundahl

Braham, MN
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Dear Commissioner Laura Bishop, we definitely need an EIS for the Daley Farm Expansion Project which defies MEEPA. Stein's denial for an EIS is criminal. Considering the area is already living with contaminated water and poor air quality, my main concern is how long it will take for these conditions to reach us.

Sincerely,

[Signature]

Name: Angelica M. Gomez

Town: Waseca
Good Day to You, Commissioner Bishop & Staff,

Thank you kindly for taking the time to read and consider my message. I am very proud of our state and its commerce, but I must implore you to require an EIS in regards to the expansion of Daley's Farm Factory. Businesses alone have too much financial incentive to be land stewards on their own. Please, take this important step to help govern the preservation of the integrity and purity of Minnesota's land and waters.

Sincerely,

Name: Sydney Brodbee

Town: Stillwater, MN
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Sincerely,

Name: Ms. Donna R. Stewart

Town: Browns Valley

EIS YES!
Dear Sirs:

Please order an EIS or deny the farm expansion. I grew up in Rushford, a beautiful part of SE Minnesota, on a farm. The idea that any farm operation would be allowed to hurt its neighbors for profit is appalling! Please have the courage to do the right thing.

Sincerely,

[Signature]

Name:

Edina, MN.

EIS
YES!
Commissioner Bishop,

Contaminated water and poor air quality is a reality in this area of Minnesota. Please consider the health of residents living in this region. Large scale animal concentrations should not proceed. Thank for your consideration.

Sincerely,

Name: [Signature]

Town: [Signature]
Factory farms practice egregious animal cruelty, where thousands of farmed animals endure immense suffering and pain. Factory farms also are very destructive to the environment.

Sincerely,

[Signature]

Molly Nemec

Lincoln, Minnesota
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

The MPCA should require EIS from factory farms the same as any potential pollution producing entity. The high concentration of animals affects the air quality (methane being one) and water quality. There is also a question of humane treatment of the animals. The county regulations should be respected in all of Minnesota. The county is Sincerely, 

Name: Edna Carlson

Town: Isanti, MN.
Regardless of whether it is a family operation or corporate operation, an increase of this size has the potential for a negative outcome and therefore an impact study is critical.

Sincerely,

Name: Mary Rice * Don Davies

Town: Stanford Township
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Sincerely,

Name: Laura Hochman

Town: Freeport, Minn. 56331

EIS YES!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Sincerely,

Name: CHIP BERKENHAGEN

Town: AITKIN, MN

EIS YES!
I agree with the LSP folks that we need to do an EIS of this huge dairy that is already too large and too many opportunities to pollute the fragiles land/soils of S/E Minn.

Sincerely,

[Signature]

Name: [Signature]

Town: [Town]

EIS YES!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

Please protect the environment and public health and require an Environmental Impact Statement on the Daley Farm expansion.

Sincerely,

Name: Mary Schroeder
Town: New Ulm, MN

EIS YES!
Add your message to MPCA Commissioner Bishop about the importance of holding factory farms accountable:

N. Line 3

N. Management Mine @  
Emil. I already have arsenic in my water from mining 70 yrs. ago.

Sincerely,

Name: HAGENBERG

Town: CROSBY (Perry Lake Twp.)

EIS YES!
Dear Kim:

Please see the March 4, 2020, StarTribune story (Nitrate problem worsening...”) on how more drinking water in rural MInn. has been found to be contaminated by nitrates in fertilizers and manure. The Daley Farms expansion and it's massive manure-yield increase is highly likely to make matters worse.

Let's follow the 'precautionary principle' to ensure people's health and quality of life is respected and is not further threatened. It's the only reasonable and sensible action to take.

We did just that in Blackhoof Twp. here in Carlton County by putting an end to the land application of sewage sludge. Fighting against community values, a farmer was not pleased but he got over it and on with his life, and his farm is doing just fine, as it did before using sludge.

Your understanding and help is much needed. Feel free to forward this communique to those who should probably read it. Thank you very much.

Sincerely,

Tom Richards
Barnum, MN
Dear Kim,

I'm a MN350 volunteer.

I'm writing, on behalf of my two little girls and future generations, to ask you to consider ordering an environmental impact statement for Daley's Farms' greenhouse gas emissions.

The environmental assessment worksheet doesn't seem adequate to me because it ignores the urgency of the climate crisis. I think a more thorough EIS would help you better assess climate risk and better count emissions. Will you consider ordering an EIS?

My girls and I thank you for all the work you do.

Warmly,
Emily
As a soil scientist and a landowner in Zumbro Falls, MN (karst territory), it is incomprehensible to me that an EIS has not been required for Daley Farm’s proposed dairy farm expansion. Besides the very real concern about potential increases in groundwater nitrate concentrations in a sensitive karst region, there are also concerns about greenhouse gas emissions.

Please correct Mr Stine’s mistakes and require a full EIS on both greenhouse gas emissions and the whole project, to bring it in line with the MN Environmental Protection Act.

Thank you,
Deborah Allan
U of M Emeritus Professor

Sent from my iPhone
Commissioner Laura Bishop,

I am a grazing dairy farmer in Canton Township in karst country of southeastern Minnesota.

I have always been concerned with large CAFO’s, but understand more of the detailed issues since our neighbor tried to build a large hog farrowing unit in recent years. Aside from the economics of added community expenses and some businesses negatively affected, environmental issues are of very high concern. I have said for many years, that “Farming is Everybody’s Bread, Butter, and Water”. I still believe that. Especially in this karst geography, the water on our farm comes up, goes down, disappears, seeps, as well as the usual run-off and soak in. Water contamination is a very real concern of mine in any karst region. Lewiston already has high nitrate levels, and risking this CAFO permit for the Daley Dairy is too high of a risk.

The air smells different each season. I can smell the different farm odors from the area farms when at home. Thankfully, none of these smells are too much too often or are too close. I believe the Daley farm would want to minimize any bad odors or greenhouse-gas emissions. I also think that the MPCA’s new Supplemental EAW on greenhouse-gas emissions for Daley Farms mega-dairy expansion application requires: as EIS according to Minnesota Statute 4410.1700, Subpart 2A. (Insufficient information.) Also, the original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

We need protection from any significant, negative environmental effects of industrial-scale animal factories. I believe the MPCA can be the enforcer of regulations for the people and environment.

Respectfully,

Bonnie Haugen

12620 Deer Rd., Canton, Mn. 55922

6 March, 2020
Dear Commissioner Bishop,

The purpose of my note is to comment on the Daley Farm's proposal to expand its dairy operation in Winona County. I am writing as a member of the Land Stewardship Project and a concerned state resident who values sustainability, environmental protection, and livable communities.

According to an article in the March-April 2020 Minnesota Conservation Volunteer magazine, “the southeastern blufflands, for their part, have the highest biodiversity in Minnesota when measured by the number of state-listed rare and animal species and diverse plant communities occupying the steep slopes and river valleys.” We should strive to protect this beautiful and diverse area, not fill it with manure and nitrates. According to the USDA, a mature dairy cow can produce 80 pounds of manure a day. The expanded Daley Farm is expected to produce 46 million gallons of manure a year. This accumulated manure produces many volatile compounds, including greenhouse gases, as well as pathogens, heavy metals, and the residue of hormones and antibiotics. It is not reasonable to expect the surrounding land, air, and water to absorb the manure from thousands of cows all concentrated in one place without negative consequences. This is especially a concern in southeastern Minnesota with its sensitive karst geology and existing problems of nitrates-contaminated groundwater.

In addition to the pollution produced by such a large CAFO, there will be a huge drawdown of the water supply. Is it fair for one enterprise to consume such a large portion of the local natural resources? Winona County is certainly aware of these issues, which is presumably why they set an animal cap of 1,500 AUs. This means that what Daley Farms wants to do, expand to almost 4 times the AU cap, is not permissible without a variance from the zoning ordinances. If such a large variance is going to be given, there should certainly be a very compelling reason. Otherwise, what is the point of having rules and regulations? So, what is the compelling reason here?

Finally, even if this proposed dairy expansion was legally permissible under the local animal unit cap regulations and it was environmentally neutral, which of course it will not be, there would still be the the question: Is confining even more dairy cows and producing even more dairy milk a good and worthwhile thing to do? Since dairy farmers are going out of business every day and consumption of cow's milk is declining as there are ever-more non-dairy options available, the answer seems obvious. The permit should be denied. At the very least, an EIS should be required. Minnesota law requires an EIS whenever a project has the potential for significant environmental impact and certainly the Daley Farm expansion would meet that criteria.

Colleen Vachuska
12557 320th Ave
Comfrey, MN 56019
To whom it may concern,

I am writing to urge Commissioner Bishop to order an EIS or deny the permit on the proposed Daley Farms expansion.

My wife and I are pastured hog farmers in neighboring Houston County. I am concerned about the threats posed by this expansion to drinking water and air quality in this region. Our well already tests high for nitrates and we must use a reverse osmosis system to purify our drinking water.

If the permit is not denied outright, we must order an EIS to better understand the potential negative environmental effects of an expansion this large, especially given the region’s Karst geology. This comes down to a decision between protecting the health and well-being of rural communities or protecting the interests of industrial-scale factory farming. If protecting rural residents from further drinking water contamination is your priority, then denying a permit or ordering an EIS are the only logical actions.

Thank you for your time and consideration,

Nick Nguyen
Nettle Valley Farm
Blackhammer Township, Houston County MN
Dear Ms. Grosenheider:

This is intended as a public comment on the Daley Farms proposed expansion. I ask you to deny the NPDES permit and require an EIS. The Daley Farms operation is better than some, but the proposed expansion obviously is taking a too-large-for-public-safety operation and making it far larger and more concentrated. In the karst region where this sits, the risks to groundwater used by neighbors and nearby communities is too great not to do a complete EIS first.

I am a rural landowner in southeast Minnesota and I have a crop farm. I own a well. Nitrate contamination is a serious problem already for my rural church (we cannot drink the water due to nitrate pollution, the only obvious source of which is leaching from manure and chemical fertilizers) and many of my neighbors. My well is not yet polluted by nitrates, but only because it is a newer and deeper well. The nitrates will eventually reach my well, too. This is a given. I live in the karst region. The Minnesota Geological Survey shows me the risk. Similar risk is caused by the Daley Farms proposal. It is scandalous that MPCA is willing to risk public health by approving such concentrated agricultural operations and doing so little as it does to monitor and enforce rules for the CAFOs already in operation.

The protection of public health really only happens if MPCA is serious about requiring appropriate studies before an industrial operation is built. After-the-pollution-occurs consequences for industrial operations don’t help the neighbors and communities who are harmed. Those consequences, if not excused completely because the pollution is “an act of God,” as I have heard from MPCA staff at a public meeting in my own community, are a mere slap on the wrist for large polluters. You at MPCA do not even have the citizens’ board you once had, apparently because some legislators in the pocket of industrial operators decided the industry could not bear public scrutiny. You need that board reinstated. Without it, though, your professional regulators actually doing their job in the interests of public health, first, is even more important. I’m not observing that in the Daley Farms matter. I attended the first public meeting you held in Lewiston on the Daley Farms proposal. Your people appropriately work with agricultural operation proposers, but what I observed then was MPCA staff working as advocates for Daley Farms instead of for public health. MPCA should be an advocate for public health first.

We have a groundwater pollution crisis in southeast Minnesota. This is obvious to experts such as Mr. Runkel from the University of Minnesota. The lack of adequate study of groundwater and a comprehensive plan to address it means that proposals such as the Daley Farms expansion are wildly inappropriate at this time. The EIS needs to be done. Whether it is a regionwide EIS or one specific
to Daley Farms, no permits should be issued for operations this size until we have done the EIS. There are other sources than just agriculture for nitrate pollution, surely, but most of it in our region is obviously the result of industrial agriculture. Let’s not pretend otherwise. Nitrate pollution shortens lives and kills people, especially the very young and the elderly.

Daley Farms is an industrial operation. It appears to be owned by family members, but is not otherwise recognizable as a “family farm” operation. It has grown to the point where it poses obvious risks to its neighbors and nearby communities. The karst region is most of southeast Minnesota, but it isn’t endless. If Daley Farms needs to be bigger to compete, they can do it where the risks to public health are lower. No industry, even if it’s agriculture, has a right to impose such significant risk to its neighbors’ health and property.

MPCA is obviously an agency that has been captured by some of the industries it regulates. One of those is agriculture. MPCA will not regain credibility with the public until you begin requiring the largest industrial operations to do what the law and public safety requires—start with an EIS and do not issue an NPDES permit, please.

Barton L. Seebach
15534 403rd Avenue
Canton, MN 55922
Dear Commissioner Bishop,

The purpose of my note is to comment on the Daley Farm’s proposal to expand its dairy operation in Winona County. I am writing as a member of the Land Stewardship Project and a concerned state resident who values sustainability, environmental protection, and livable communities.

According to an article in the March-April 2020 Minnesota Conservation Volunteer magazine, “the southeastern blufflands, for their part, have the highest biodiversity in Minnesota when measured by the number of state-listed rare and animal species and diverse plant communities occupying the steep slopes and river valleys.” We should strive to protect this beautiful and diverse area, not fill it with manure and nitrates. According to the USDA, a mature dairy cow can produce 80 pounds of manure a day. The expanded Daley Farm is expected to produce 46 million gallons of manure a year. This accumulated manure produces many volatile compounds, including greenhouse gases, as well as pathogens, heavy metals, and the residue of hormones and antibiotics. It is not reasonable to expect the surrounding land, air, and water to absorb the manure from thousands of cows all concentrated in one place without negative consequences. This is especially a concern in southeastern Minnesota with its sensitive karst geology and existing problems of nitrates-contaminated groundwater.

In addition to the pollution produced by such a large CAFO, there will be a huge drawdown of the water supply. Is it fair for one enterprise to consume such a large portion of the local natural resources? Winona County is certainly aware of these issues, which is presumably why they set an animal cap of 1,500 AUs. This means that what Daley Farms wants to do, expand to almost 4 times the AU cap, is not permissible without a variance from the zoning ordinances. If such a large variance is going to be given, there should certainly be a very compelling reason. Otherwise, what is the point of having rules and regulations? So, what is the compelling reason here?

Finally, even if this proposed dairy expansion was legally permissible under the local animal unit cap regulations and it was environmentally neutral, which of course it will not be, there would still be the the question: Is confining even more dairy cows and producing even more dairy milk a good and worthwhile thing to do? Since dairy farmers are going out of business every day and consumption of cow’s milk is declining as there are ever-more non-dairy options available, the answer seems obvious. The permit should be denied. At the very least, an EIS should be required. Minnesota law requires an EIS whenever a project has the potential for significant environmental impact and certainly the Daley Farm expansion would meet that criteria.

Colleen Vachuska
12557 320th Ave
Comfrey, MN 56019
Hello Kim,

Below please find my comment to be submitted with the Daley Farm’s Proposed Expansion EAW. Thank you for your assistance.

Have a nice day,
Melia Haugen

The EAW, even with the supplemental pieces, continues to require an EIS due to insufficient information as required by the criteria within Minnesota Statute 4410.1700, Subpart 7.

We are in a dire situation regarding the climate, water, and soil – all of our environment. The MPCA’s mission is to “protect and improve the environment and human health,” not to help factory farms get their expansion applications completed and approved.

I have read all of the comments that were submitted previously regarding this expansion proposal. Only 12% of the comments submitted by the public were in support of the expansion out of more than 600 comments. On top of that, only 2 comments actually stated that an EIS was not needed; that’s roughly 1/3 of 1%. Clearly there is a much bigger issue here that at the least requires an EIS.

It is flabbergasting that the commissioner would suggest conducting a generic EIS because there is so clearly an issue with groundwater contamination in our area, yet he’s willing to approve of this expansion project which will only further contribute to this already dismal situation. This is extremely disheartening and clearly does not align with the MPCA’s mission.

There are three options here and two of them would be appropriate in this situation, either denying this application altogether or requiring an EIS be conducted. You have a 2/3 chance of getting this right and putting yourself on the right side of history, rather than further contributing to the demise of our environment and subsequent negative impacts on human health. It would be entirely negligent of the commissioner and the MPCA to approve of this application at this time.

Please take the appropriate steps to achieve your mission of PROTECTING AND IMPROVING THE ENVIRONMENT AND HUMAN HEALTH.
MPCA comment on Environmental Review and Feedlots

5 March 2020

Dear Commissioner Bishop:

Daley Farm’s proposed expansion of its mega-dairy threatens both the water and the land in Winona County. As a conservationist, member of the Land Stewardship Project, and lifelong Minnesotan from farm families, I am asking you to recognize the potential for an adverse environmental impact of a larger factory farm. Please exercise your power to call for a thorough environmental review.

As the current federal administration dismantles environmental protections, we Minnesotans are counting more than ever on our Minnesota Pollution Control Agency to ensure the safety of our drinking water and conserve the integrity of our natural ecosystems.

With a judicious effort to ensure a complete environmental impact review, you can help restore the confidence that your predecessor destroyed when he failed to act on this and other issues of vital importance to the health of citizens, local economies, and our natural world.

Sincerely,

Kathleen Weflen

Kathleen Weflen
1245 Fairmount Avenue
Saint Paul, Minnesota 55105
kathleen.weflen@gmail.com
651-600-9583

*Somewhere, something incredible is waiting to be known.*  Carl Sagan
Hi Kim,

Attached are Minnesota Milk’s comments on the Daley Farms of Lewiston LLP project.

Lucas

Lucas Sjostrom
Executive Director | Minnesota Milk
O: 320-346-2216
M: 320-249-8701
lucas@mnmilk.org
@Lucas_MN_Dairy

MnMilk.org
MMPA Cover-FB

This email is confidential and intended only for the addressee. If you are not the addressee or the addressee's employee, agent or representative, you are prohibited from copying it or from disclosing it to any other person. If the email has one or more attachments, and you are not the addressee or the addressee's employee, agent or representative, you are prohibited from opening, copying or disclosing any of them to any other person. Please notify us by replying to this email if you have received this message in error. Please delete the message and any attachments that you have opened. Thank you.
March 6, 2020

VIA EMAIL ONLY
kim.grosenheider@state.mn.us

Ms. Kim Grosenheider  
Environmental Review  
Minnesota Pollution Control Agency  
520 Lafayette Road North  
St. Paul, Minnesota 55155-4194

Re: Public Comments for Minnesota Milk Producers Association

Dear Ms. Grosenheider:

The Minnesota Milk Producers Association submits the following comments regarding the environmental review and permitting for a dairy modernization and expansion project proposed by Daley Farm of Lewiston LLP in Winona County. Minnesota Milk Producers Association understands that the scope of this comment period is limited to the greenhouse gas issue and that the MPCA is not accepting and will not consider comments on other issues related to the Daley Farm project. As such, we are limiting our comments and will not address other aspects of the environmental review on the Daley Farm project.

1. **MPCA’s Decision to Conduct a Second Comment Period on the Daley Farm Environmental Assessment Worksheet Is Improper.**

As an initial matter, however, Minnesota law establishes one 30-day public comment period on an environmental assessment. The statute also expressly limits the information upon which the responsible governmental unit must base its decision on the need for an environmental impact statement to “the environmental assessment worksheet and the comments received during the comment period.”

The MPCA held a public comment period on the Daley Farm project from October 1, 2018, through November 15, 2018, and the agency received 615 public comments on the project during that time. Although the Minnesota Court of Appeals reversed the MPCA’s original negative declaration on the need for an environmental assessment worksheet for the project due to a procedural error, neither the applicable statutes and regulations nor the court’s opinion authorize the MPCA to conduct a second comment period on a project. Instead, the law requires the MPCA to make its decision on the
need for an environmental impact statement on remand based solely on the environmental assessment worksheet itself and the comments received during the original comment period.

2. **The MPCA’s Use of Population-Based Emission Factors to Estimate Greenhouse Gas Emissions Is Improper.**

In its Supplement to Environmental Assessment Worksheet for Daley Farm’s project, the MPCA estimated the greenhouse gas emissions that would occur from Daley Farm’s facilities (both the current facilities and the facilities that would be constructed as part of this project) using population-based emission factors that were developed by the EPA to complete emissions inventories for large areas or groups of facilities. These emissions factors are based on average emissions that occur across the entire population of facilities for which the emission factor was developed. Within these populations, however, the EPA has acknowledged that actual emissions may vary from facility to facility. This variability is particularly prevalent in livestock facilities, where air emissions depend on numerous site- and operation-specific factors:

Generating reasonably accurate estimates of air emissions from AFOs [animal feeding operations] is difficult. The operating environment for these farms is complex. The species of animals are varied (e.g., swine, beef and dairy cattle, poultry), and farm practices differ not only between species, but also among farms for each species. The operations vary in size . . . and differ by region across the country. The chemical composition of the emissions varies depending on animal species, feeding regimes and practices, manure management practices, and the way in which the animals are housed. Much of the air emissions come from the storage and disposal of the manure . . . that is part of every AFO, but some also comes from dust produced by the handling of feed and the movement of animals on manure, as well as from the animals themselves. Meteorologic conditions, of course, are an important factor. Estimates of emission rates generated in one type of AFO may not translate readily into others.

*National Research Council, The Scientific Basis for Estimating Emissions from Animal Feeding Operations 1* (National Academy Press 2002), available at https://www3.epa.gov/ttnchie1/ap42/ch09/draft/interimanimalfeed.pdf. In other words, a farm is not a factory, and an animal is not widget. While a widget factory may consistently operate in the same manner day after day—and thus produce consistent emissions—a farm is a complex environment involving biological processes that are constantly changing and that are highly dependent on the surrounding conditions.
Quite simply, population-based emissions factors are not intended, and have not been scientifically validated, to be used to estimate the emissions from any particular facility. And even if it were appropriate for certain types of facilities (such as factories) that are highly controlled environments, the use of population-based emissions factors is not appropriate to estimate emissions from a particular farm.

3. Utilizing CO₂-e is not appropriate for biogenic methane from livestock

The United Nation’s Food and Ag Organization Global Dairy Platform 2019 report declares that “Dairy products are a rich source of essential nutrients that contribute to a healthy and nutritious diet. With demand for high-quality animal sourced protein increasing globally, the dairy sector is well placed to contribute to global food security and poverty reduction through the supply of dairy products. In so doing, it is essential that sector growth is sustainable in terms of the environment, public and animal health and welfare and in terms of development, poverty alleviation and social progress.”

With an organization declaring dairy is an important part of the future of feeding the world, we would be better off focusing on making dairy production more efficient per greenhouse gas emissions. Between 2005 and 2015, North America is the only region that lowered both carbon footprint per gallon of milk, as well as total dairy carbon footprint – and the region did all this while increasing milk production. Therefore, the best way to lower global dairy emissions is to support efficient production, like that found in Minnesota or the United States, and exemplified by Daley Farms of Lewiston, LLP. This would likely be the same if similar reports were created for other animal products produced in the United States.

Second, there continues to be evidence that accounting on short-lived climate pollutants (SLCPs) is incorrect. As seen recently in Allen (2018)¹, changes to this accounting would allow a much lower effect. As seen in the next section, simple estimates show that the Daley Farm, and all existing Minnesota farms, would not have a significant effect even under current calculations. A more appropriate calculation as seen in Allen would raise the limit for “significant” even further.

Between these two items, it is not too radical to exclude all feedlots from future GHG emissions calculations through EAW and EIS processes.


An environmental impact statement is only required to be completed for a project if information received in connection with the environmental assessment worksheet demonstrates that the project has a “potential for significant environmental effects.”

According to the Supplement to Environmental Assessment Worksheet, the MPCA estimates that Daley Farm’s proposed modernization and expansion will increase greenhouse gas emissions by 20,300 metric tons of CO\(_2\)-e per year as compared to the current facility. But this estimate (as discussed above) is calculated using a population-based emissions factors that reflects emissions from an “average” dairy farming operation. In other words, this estimate does not account for a number of manure management practices (including without limitation the timing of manure application, use of nitrogen stabilizing additives, planting of cover crops) that Daley Farm has voluntarily agreed to include in its permit and that the MPCA has recognized will decrease greenhouse gas emissions from a farming operation. See MPCA & Minn. Dep’t of Commerce, Greenhouse Gas Emissions in Minnesota: 1990-2016, available at https://www.pca.state.mn.us/sites/default/files/iraq-2sy19.pdf. As a result, it is likely that Daley Farm’s facilities and operations would actually produce fewer greenhouse gas emissions than the MPCA estimates as a result of the enhanced BMPs that Daley Farm has agreed to implement.

The Supplement to Environmental Assessment Worksheet also states that the MPCA’s estimate of 20,300 tons of CO\(_2\)-e emissions per year for Daley Farm’s proposed project does not include aspects of the project—including increased planting and use of alfalfa, pastures, and cover crops—that will actually remove carbon from the atmosphere and sequester it in the soil. The agency, however, does not quantify the benefits of these carbon sinks or deduct these benefits from its estimates of the overall emissions estimates for the project. Thus, the agency’s estimate of 20,300 tons of CO\(_2\)-e emissions per year overstates the actual net impact of the Daley Farm project.

As stated previously, recent scientific studies suggest that the CO\(_2\)-e standard that the MPCA used to estimate the greenhouse gas emissions in the Supplement to Environmental Assessment Worksheet does not accurately assess the impact of short-lived climate pollutants (such as methane) on global climate. Michelle Cain et al., Improved Calculation of Warming Equivalent Emissions for Short-Lived Climate Pollutants (Sept. 2019), available at https://www.nature.com/articles/s41612-019-0086-4.
But even assuming, for the sake of argument, the accuracy of the MPCA’s estimate that Daley Farm’s proposed project would increase greenhouse gas emissions by 20,300 tons of CO₂-e, the MPCA and Minnesota Department of Commerce estimate that the total greenhouse gas emissions in Minnesota in 2016 were 154.2 million metric tons of CO₂-e. *Greenhouse Gas Emissions in Minnesota: 1990-2016* (Jan. 2019), at p. 5, available at https://www.pca.state.mn.us/sites/default/files/iraq-2sy19.pdf. And the EPA estimates that the total greenhouse gas emissions in the United States in 2018 were 6,677.8 million metric tons of CO₂-e. *Draft Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018*, at ES-4, available at https://www.epa.gov/sites/production/files/2020-02/documents/us-ghg-inventory-2020-chapter-executive-summary.pdf. Thus, Daley Farm’s proposed project would represent, at most, only 0.01 percent of the annual greenhouse gas emissions in Minnesota or less than 0.00003 percent of the annual greenhouse gas emissions in the United States.

The nature of the global dairy industry provides important context in considering the potential environmental effects of Daley Farm’s proposed project. Milk is a commodity for which there is a global demand that will be satisfied whether the cows producing the milk are located in Minnesota, Mexico, India, or anywhere else. Similarly, any greenhouse gas emissions resulting from dairy production will impact the global climate regardless of where the cows are located.

But dairy producers in the United States are far more efficient than dairy producers in other parts of the world—for example, the average dairy cow in the United States produces 22,248 pounds of milk per year, as compared to 10,500 pounds of milk per year for dairy cows in Mexico and 2,500 pounds of milk per year for dairy cows in India. In other words, dairy producers in the United States can produce the same amount of milk with fewer dairy cows. And because most greenhouse gas emissions from dairy production are based on the number of cows, increasing dairy production in the United States would result in a net decrease in the number of dairy cows—and thus the total amount of emissions—needed to supply the global demand for milk. See Frank Mitloehner, *Livestock’s Contributions to Climate Change: Facts and Fiction*, available at http://cekern.ucanr.edu/files/256942.pdf. In other words, Daley Farm’s proposal to expand its dairy herd in Minnesota can be expected to reduce the total number of dairy calls in the world and will result in a net reduction in greenhouse gas emissions.

Ultimately, however, the question before the MPCA is whether Daley Farm’s proposed modernization and expansion project—which may, at most, result in an increase of 20,300 metric tons of CO₂-e emissions per year—has a “potential for significant environmental effects.” The Supplement to Environmental Assessment Worksheet specifically addresses this question:
The assessment of GHG emissions and climate change is extremely complex. Currently it is not possible to model the physical impacts of global or regional climate change, such as storm frequency/intensity or temperature increases, caused by incremental GHG emissions, such as those from the Project. . . . Existing scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts.

The Supplement also specifically acknowledges that “[t]he Project’s incremental contribution to global GHGs cannot be translated into effects on climate change globally or regionally.” In other words, the MPCA has already acknowledged that there is no scientific basis to conclude that a miniscule increase in greenhouse gas emissions such as the agency estimates for Daley Farm's project will have any measurable effect—let alone any significant effect—on the global climate. The completion of an environmental impact statement will not provide any new information that would alter this fundamental reality. Accordingly, the MPCA should again issue a negative declaration on the need for an environmental impact statement for the Daley Farm project and re-issue the amended NPDES permit for the project.

5. **The MPCA Should Apply Existing Regulations to Establish Uniform Guidance for When Environmental Assessment Worksheets for Feedlot Projects Are Required to Consider Greenhouse Gas Emissions.**

Finally, the quick manner in which the MPCA has approached the environmental review for the Daley Farm project has caused confusion for all Minnesota livestock farmers regarding the environmental review process for new or expanding feedlot projects. This type of decision-making is not good for either project proposers or the general public.

Fortunately, existing standards would allow the agency to clarify this issue consistent with current regulations. In this regard, Minnesota Rule 4410.4300, subpart 15(B), requires that an environmental assessment worksheet must be completed for a “stationary source facility” that generates 100,000 tons or more per year of greenhouse gas emissions. To the extent the MPCA intends to continue relying on emissions factors to estimate greenhouse gas emissions from individual feedlots, the agency could easily develop guidance to determine the number of animals for each species would exceed this threshold. For projects below that number, the MPCA could determine upfront that the project does not have the potential for significant environmental effects from greenhouse gas emissions and that such emissions need not be included in the environmental assessment worksheet—on the other hand, projects that exceed the number could include the calculation in the environmental assessment worksheet to
Ms. Kim Grosenheider  
March 6, 2020

allow the agency to further consider whether a potential for significant environment effects exists. This process would allow everyone—farmers and the public—to know the rules of the game in advance and would allow the MPCA to reasonably apply a uniform standard.

Thank you for your attention concerning this matter.

Sincerely,

Lucas Sjostrom  
Executive Director  
Minnesota Milk Producers Association
Dear Ms. Grosenheider,

As a resident of southeast Minnesota and a member of the Land Stewardship Project and the Lake City Environmental Commission I have attended and provided testimony in several public hearings on factory farm proposals. From these experiences, I am highly concerned over the ease at which these proposals have been approved.

I have closely studied results of private well testing in our region and have been shocked by the high percentage of these wells that already exceed the maximum safe standard for nitrate content. Unquestionably, our region is already steeped in a water quality crisis. Granting approval for projects of the size and scope proposed by Daley Farms would add additional fuel to a fire that is already out of control.

Because Daley Farms has remained out of compliance with regulations for runoff and other issues for over 22 years, what incentive would they have to comply if their present expansion proposal were to be approved? If we have learned anything from this it is to deny Daley Farms’ proposal or any similar venture that prioritizes financial gain over protection of human health and the environment. After all, this is the central mission of the MPCA.

Please forward my comments to Commissioner Laura Bishop together with my request that she use the authority of her office to deny Daley’s proposal.

Thank you,

Dennis Hatleli

Sent from Mail for Windows 10
Dear Ms. Grosenheider:

I am writing in regards to the Daley Farms Environmental Assessment Worksheet (EAW), asking that the MPCA order a full Environmental Impact Statement. As a parent and an advocate for regenerative farming practices, I work to ensure that the food we eat is produced in a way that preserves our climate - because food and a habitable planet are two things that we can't live without.

The Daley Farms EAW downplays the urgency of the climate crisis. The MPCA measured the methane emitted by dairy cows and their manure on a 100-year timeframe rather than a more-accurate 20-year timeframe that reflects the urgency of the climate crisis. The MPCA also assessed Daley Farms’ greenhouse gas emissions in terms of its contribution to global climate change. No single project in Minnesota could measurably impact climate change on a global scale; but Governor Walz has made climate change a priority and has described it as an “existential threat,” and Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050. The MPCA must consider Daley Farms’ emissions in terms of Minnesota’s climate goals.

The EAW should also be strengthened by including the things Daley Farms could do to mitigate its greenhouse gas emissions. The MPCA did not fully examine the climate benefits of regenerative farming practices. Well-managed grazing systems, more diverse crop rotations, and planting perennial grasses build soil health, protect water quality, and increase a farm’s resilience to climate impacts. The MPCA should encourage these alternatives to new or expanding CAFOs by specifically identifying mitigation measures to offset emissions. The Daley Farms EAW identifies just one CO2 mitigation measure -- planting alfalfa -- which would reduce the project’s greenhouse gas pollution by just 1,000 tons per year, or about 3 percent of the more than 32,000 tons of CO2 equivalent emissions expected from this project. These greenhouse gas emissions will hinder Minnesota’s ability to meet its climate goals.

Given that agriculture and forestry account for a quarter of Minnesota’s greenhouse gas emissions, the state will not meet its climate goals without changes in the agriculture sector. This is our opportunity to set a new precedent in how the MPCA assesses the environmental impact of these large-scale farms, and show the next generation that we care about their food and their planet as much as we care about our own.

Thank you,
Sarah Riedl
To whom it may concern:
Attached please find my comments on the Supplement to the Environmental Assessment Worksheet, Daley Farm Expansion

Sincerely
Angela Anderson
March 5, 2020

Dear Commissioner Bishop,

On February 4, 2020 I attended a public information/comment meeting in Lewiston, called by the MPCA to comment on the supplement, addressing GHG emissions potential, to the original EAW 2018/19 for the Daley Dairy expansion from 2275 AUs at present to 5967 AUs as proposed.

The first thing I noticed as I was getting out of the car in Lewiston was the pungent unpleasant smell from the existing Concentrated Animal Feeding Operation (CAFO) of 2275 AU. I find it outrageous that one business can inflict this kind of environmental degradation, air and drinking water pollution on a daily basis to all the people living in the area. To increase the suffering to almost 3 times the size of that CAFO is an unimaginable environmental burden. Would you want to live like that? It is my understanding that we the taxpayers pay for MPCA’s service as an oversight regulating agency to protect us the majority from individual family enterprises like the Daley’s from health threatening pollution. My impression of the meeting was that MPCA saw nothing wrong in giving the permit.

(A few years ago I had an unpleasant experience of a similar kind. I was walking in the prairies of Blue Mounds State Park when I noticed the constant smell of concentrated manure. I asked later where this smell came from and was told that it came from a large confinement hog operation 20 miles to the west, the wind was blowing from the west as it often does in MN).

The original EAW for the Daley Dairy expansion did mostly address water pollution in the Karst area of SE Minnesota where fractious rock presents a rapid conduit to the groundwater sources of the whole area. Because of this unusual geology the groundwater in most of SE Minnesota is very susceptible to nitrogen contamination in today’s high chemical fertilizer input agriculture. The nitrogen level is already border line in this part of the state and injecting pure nitrogen from the manure lagoons annually into the fields will further accelerate groundwater pollution.

If you know anything about soil as living medium you would know that the highly compacted medium we call soil, of today’s monoculture, high input agriculture, is not living soil, it lacks soil microbial diversity and structure to utilize fertilizer and have water/fertilizer holding capacity. It will not be able to utilize the manure that is injected annually into the ground most of it will run-off into streams and straight into groundwater. There is not enough land to deal with the proposed massive manure lagoons.

Furthermore Daley farms does not own enough land to use what accumulates in the proposed lagoons on a yearly basis. 42% of the lagoon sludge will be used by other landowners. Who will monitor what happens on land not owned by the Daley’s?

The Supplement to the original EAW does not present concrete and sufficient information on GHG emissions for this project to move forward. The prescribed mitigation measures are really just window dressing and most likely will not be enforced, because someone would have to oversee these actions continuously. As it stands Daley farms is and has been out of compliance with existing state regulations.
for run-off and other issues filed by the MPCA’s feedlot Division that have gone unenforced for over 22 years.

It is ridiculous to compare this proposed expansion with ‘odor emissions typically associated with a dairy farm’; 86% of dairy farms in Minnesota have fewer than 200 cows and they process their manure as a dry system.

In the case of CAFOs such as the existing and proposed Daley expansion the main GHGs are methane and nitrous oxide which far more damaging and persist longer in the atmosphere than C02. A chart presented by MPCA shows agriculture ranking third, slightly less than Transportation, in GHG emissions statewide. Wouldn’t it be wise to reduce GHG emissions on more than one front, MPCA just talked about transportation being the main culprit, especially since methane and nitrous oxide are far more damaging to the environment. In the face of climate change immediate reduction of GHG is needed?

Between 1990 and 2017 methane emissions related to manure have risen 66%. Liquid manure systems produce more methane than dry manure systems as is typical on smaller more dispersed operations. The EPA has found that the majority of the manure–sourced emissions is coming from concentrated swine and dairy operations. Methane releases have increased 134 percent for dairy CAFO’s in particular (The Land Stewardship Letter Vol 37). There is an accumulative effect with each new operation coming on line. One would think it would be best to disallow more CAFO’s to be built. Rather than an EIS a moratorium on CAFO’s is needed as part of immediate climate action. The accumulative effects of more CAFO’s are highly unsustainable.

It is also highly troubling that the USDA Environmental Quality Incentives Program (EQIP) gives property tax exemption for manure lagoons, encouraging the practice. EQIP also provides cost share and incentive payments to deal with natural resources concerns; it has become a gravy train for factory farming. CAFO’s are damaging natural resources of an area, they destroy any sense of integrated sustainable farming in the image of nature, diversity is needed not monoculture. No wonder CAFO’s are increasing as the Federal Government encourages the practice. Few funds are available for smaller operations that may use the money for sustainable practices. Another government subsidy available thru the USDA ‘s Farm Service Agency encourages the building of CAFO’s, as the majority of loans are guaranteed by that agency (The Land Stewardship Letter Vol 37). Big government is in fact encouraging the proliferation of CAFO’s and is not serving the majority of the population. Our taxes again are used to inflict harm on the majority of the population.

When will this end? Government, local and federal appears to harm the majority in favor of a few.

Sincerely

Angela Anderson

1121 North 4th Street

Stillwater, MN 55082
Cafo’
Ms. Kim Grosenheider:

My name is Bill Adamski, a resident of Minneapolis.

I am providing comments on MPCA’s recent actions and documents regarding the proposed expansion to the Daley Farms, as follows:

- Supplement to the Environmental Assessment Worksheet (EAW) - Alternative EAW Form for Animal Feedlots (Jan 2020, 11 pages).

- Proposed modified MPCA permit MN0067652 (National Pollutant Discharge Elimination System Permit [NPDES], Individual animal feedlot (Jan 2020, 56 pages).

You are well aware of the regulatory and litigative history surrounding this proposed massive expansion (by approximately 3000 cows). The previous actions are highly relevant as to how and why we are at this point in a very contentious regulatory process for this proposal.

As such, a brief history of it is entered after my comments - to be included in the record.

Sincerely,

Bill Adamski
4433 Garfield Ave. S.
Minneapolis, MN 55419
adamski.bill@gmail.com

---------------------

Comments

No EIS was conducted – at least at this time. The MN Court of Appeals ruling urged, but did not demand that the MPCA conduct an EIS. In the Supplemental EAW (Jan 2020) – the MPCA simply states “The MPCA Commissioner will make a final decision on the need for an EIS after the end of the comment period.”

The scale of this proposed massive expansion demands that an EIS be completed to fully evaluate its substantial impact on the environment, as follows:

- According to the St. Paul Pioneer-Press (Oct 17, 2019) The Minnesota Center for Environmental Advocacy (MCEA) had documentation that claimed that the expanded
operation would make the Daley Farms overall - the state’s 43rd largest emitter of GHGs.

Consequently, in adhering to the State of Minnesota’s claim to be taking serious action to mitigate those GHG emissions that will exacerbate global warming – the proposed Daley Farms expansion should be considered a major source that must targeted for reducing GHG emissions.

- The MPCA employed a seemingly complex GHG emission factor developed by the U.S. EPA that converts emissions of the two dominant feedlot gases (methane \([\text{CH}_4]\) and nitrous oxide \([\text{N}_2\text{O}]\)) into “carbon dioxide – equivalent” (“\(\text{CO}_2\text{-e}\)”) emissions. The EAW notes that this method supposedly accounts for the different “global warming potentials” (GWP – equivalent to \(\text{CO}_2\) in GHG impact potential) among various GHG types.

The MPCA, in its Supplement to the EAW – did not provide either the calculation method used to derive annual “\(\text{CO}_2\text{-e}\)” emissions from the Daley Farms feedlots (either existing or proposed operations) – nor a cited US EPA reference on this method.

Nevertheless, it must be strongly noted that both methane (\(\text{CH}_4\): GWP 104 \(\text{CO}_2\text{-e}\) [source: Wikipedia]) and nitrous oxide (\(\text{N}_2\text{O}\): GWP 310 \(\text{CO}_2\text{-e}\) [source: Wikipedia]) are extremely potent GHG emission types.

Consequently, even accounting for these gases’ substantial GWPs – calculating their \(\text{CO}_2\text{-e}\) emissions may be erroneously extending out the GHG’s impact over a much longer time frame (upwards of 100 years[?]) – at the expense of assessing GHG impacts on more-relevant (e.g., 20-year) timeframe that reflects the urgency of the climate crisis.

- The MPCA, in its supplement to the EAW, seems to minimize the Dairy’s air emissions: "The Project will release air and odor emissions typically associated with a dairy farm". However, in Minnesota - the average dairy herd size is around 180 to 200, and the median size is around 100 cows (Pipestone County Star, June 4, 2018). Consequently, the proposed Daley expansion -- adding 3,000 cows to its existing 1,500 -- would make this mega-dairy almost 50 times bigger than a median-sized Minnesota dairy.

- An EIS is desperately needed so that the MPCA can evaluate the climate benefits of alternative farming systems. Well-managed grazing systems, more diverse crop rotations, and planting perennial grasses build soil health, protect water quality, and increase a farm’s resilience to climate impacts.

The MPCA should encourage these alternatives to new or expanding confined animal feeding operations (CAFOs) by specifically identifying mitigation measures to offset GHG emissions. The Daley Farms EAW identifies just one \(\text{CO}_2\) mitigation measure (planting alfalfa), which would reduce the project's greenhouse gas pollution by only about 1,000 tons per year, or about 3% of the more than 32,000 tons of \(\text{CO}_2\text{-e}\) emissions the MPCA estimates will come annual from the entire expanded operations.

- According to the MPCA’s original Daley Farms EAW – its proposed expansion would result in the entire operation generating 46 million gallons of liquid manure annually. According to
the Land Stewardship Project (LSP) -this unspeakably massive amount of effluent, even under highly controlled operations, seriously threatens the groundwater in Minnesota’s vulnerable karst area, which is composed of porous limestone that creates sinkholes and disappearing springs. This geology can allow surface pollution to seep into the groundwater in a matter of hours. As a result, this part of the state has long had problems with groundwater pollution.

In yesterday’s (March 5) Minneapolis Star-Tribune – an article highlighted a new report by the Environmental Working Group (EWG) – entitled "In Minnesota’s Farm Country, Nitrate Pollution of Drinking Water is Getting Worse". This report states that "...between 1995 and 2018 - tests detected elevated nitrate levels in the tap water supplies of 115 rural Minnesota community water systems. In that period this toxic compound levels rose in 72 water systems (63%)."

The report also notes that "..Nitrate is a primary chemical component of fertilizer and manure that can run off from farms and seep into drinking water supplies."

- The proposed dairy expansion will result in the overall operations annually consuming 92 million gallons of the area’s groundwater. According to the LSP - this would be three times the annual average water consumption of the nearby city of Lewiston. This excessive H2O demand could put a strain on the area’s aquifer, especially in times of drought.

- As indicated in the MPCA’s supplement to the EAW – there is still the possibility that the MPCA may conduct a full EIS of this proposed project. If so, many of the points made in these comments, as well as those could be seriously addressed.

-------------------------

A brief regulatory and litigative history of the proposed Daley Farms expansion.

For this highly controversial proposal to expand the Daley Farms’ dairy herd by 3000 cows - the MPCA did an initial Environmental Assessment Worksheet (EAW) in Sept 2018. After a public comment period, the MPCA issued the original permit [MN0067652] in Jan 2019.

Fortunately, the Minnesota Center for Environmental Advocacy [MCEA] and the Land Stewardship Project [LSP], through litigation, called attention to the MPCA’s substantially inadequate EAW. In their joint lawsuit of the MPCA – the MCEA and LSP pointed out that the agency glossed over the increasingly damaging impacts that the Daley expansion could have on ground water and greenhouse gas (GHG) emissions from cows. Indeed, the original EAW did not address GHG emissions at all.

The MCEA and LSP asserted that the MPCA should conduct a much more rigorous environmental impact statement (EIS). An EIS would seriously address potential substantial impacts from GHG emissions as well as possible increased ground water contamination. An EIS would also contain project alternatives and cite cumulative impacts if the proposed expansion became a reality.

In Oct 2019 the Minnesota Court of Appeals largely agreed with the plaintiffs. The Court put a halt to the proposed expansion, revoked the permit and referred the project back to the MPCA for further analysis, especially regarding GHG emission impacts. While the Court did not demand that the MPCA conduct an EIS, it did order the agency to reconsider whether one was
necessary.

Subsequently, the MPCA did an assessment of the increased GHG emissions that would come from the expanded dairy herd. It detailed this assessment in a supplemental EAW (Jan 2020) – not an EIS.

From this EAW, the agency modified its original permit (# MN0067652) for the proposed project. The MPCA had originally approved this permit in Jan 2019, only to have the Minnesota Court of Appeals revoke it in Oct 2019.
Hi Ms. Grosenheider,

Thank you for opening up the comment period for additional questions to the Daley Farms EAW supplement as it relates to greenhouse gases. My information/questions are below:

Name: Stacia Sonderman  
Address: 925 N 16th St. W, Clear Lake, IA 50428 
Email: stacia_sonderman@diamondv.com  
Section: Greenhouse Gas Emissions

Questions:
The number of cows in Winona County, MN has decreased by over 7,000 cows from 2007 to 2017 according to a news source in the Post Bulletin. I’m sure with the recent downturn in the dairy economy that the number is now closer to 9,000 cows. The number of cows the Daley’s are proposing to add is much less than this number so will that be taken into consideration as it relates to greenhouse gas emissions. Also, a true measure of greenhouse gas emissions should be based on the unit of measure and in the case of a dairy cow that is pounds or gallons of milk. Will that be used to assess the impact on greenhouse gas emissions since the average dairy cow today makes several more pounds of milk then the average dairy cow of 2007. On a gas emission per pound of milk the dairy industry is doing much better!

Thank you for taking these questions and I look forward to your response.

Sincerely,
Stacia Sonderman
March 5, 2020

Katrina Kessler;

Given prior disregarded EAW comments regarding the high number of undrinkable private wells that exist within the four townships that encompass the Daley Farm of Lewiston LLP, what actions are being taken by the MPCA to protect the water health of Southeastern Minnesota citizens?

Given that the Daley Farm of Lewiston LLP has twenty three years of ongoing manure lagoon violations, what specific plan does the MPCA have to continue to monitor and respond to the situation?

GHG: Will the MPCA be monitoring GHG emissions at the facility? What GHG protocols will be used to monitor GHG at the Daley Farms of Lewiston, LLP? What instruments will be used to test the emissions of GHG at the facility? What will the testing schedule consist of i.e. number of tests and timeline, duration of tests and testing process? How will the public access the results of GHG monitoring at the Daley Farms of Lewiston LLP?

Please explain rationale for not ordering an EIS given the study by Minnesota Chief Geologist Anthony Runkel that nitrate levels in deeper aquifers are shown to be increasing and if continuing at the current rate will rise above 10mg/L within 10 years.

Thank and hopefully,

Amy Cordry

26006 County Road 9

Winona, MN 55987
Dear Kim Grosenheider,

I am writing to ask Commissioner Bishop to deny a permit for the Daley Farm's mega-dairy in Winona County, but if this is not forthcoming, then I ask that she please use her authority to order an EIS on the Daley Farm's application for a mega-dairy in Winona County. The MPCA's new Supplemental EAW on greenhouse-gas emissions for Daley Farms' mega-dairy expansion application requires an EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION AND the original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

I own and manage a farm in Olmsted County which has similar karst features that make pollution quickly seep into and contaminate local ground waters, and we work hard to make sure that we are careful stewards of the water that leaves our farm and enters surface and ground waters because we do not want to harm anyone downstream of us. Considerable research has been done linking nitrates in drinking water to various health concerns, and a farm of this type greatly increases the risk for this type (and other types) of pollution. It is unfair to saddle an entire community with this risk for the benefit of one company, and the economic benefits of a farm this large generally go to those who own the businesses who supply farm inputs largely outside of the communities in which the mega-dairies operate. (Not that any economic benefit is worth putting people at known, serious, and entirely unavoidable risk for serious health issues.)

Thank you for your time and consideration.

Sincerely,
Angela Smith
Oronoco, Minnesota
Commissioner Laura Bishop should order an EIS or DENY permitting on the Daley Farms expansion of their factory farm proposal. Their present mega dairy has been out of compliance with state regulations violations which have gone unenforced for over 22 years!

The MN Court of Appeals was correct when it overturned the MPCA’s negative declaration for an EIS. They seem to have a better understanding of science and the environment than the MPCA staff doing the permit reviews & recommendations. This tell me nothing has changed with the review staff since maybe the 80’s & 90’s when our area had many applications for mega hog factory farms. The staff needs a science background to be effective and efficient for the public good.

The Daley permit should be denied and the remediable work done to avoid environmental consequences.

Sincerely.

Virginia Homme  3051  140th St., S.E., Granite Falls, MN  56241 320-564-2206
Hello,

I am concerned about the damage to the environment that mega-dairies and CAFA’s might do.

Both my wife and I grew up on farms in southern Minnesota. We currently live on the farm where my wife grew up near Comfrey MN. Our well is contaminated with nitrates. We use a reverse osmosis filter for our drinking water. We have three large hog barns within a couple miles of us having thousands of animals. None of these barns are on farms, but built in isolation to separate the owner from the pollution it causes. The area is becoming more and more depopulated as it becomes harder to live. The family farm is dying. It is being replaced by the factory farm. But these factory farms are trying to sneak by with laws the relate to farms and real people, while they should be held to the same standards as any other industry. They should be responsible for all of the pollution that they cause,

The Daley Farm is an example of a farm that is in name only. It is a factory. You should adhere to the Minnesota Environmental Policy Act (MEPA) for the benefit of the residents of Winona County and the rest of Minnesota and the world. The wealth gained by the owners of the Daley Farm is at the expense of everyone else, near and far.

Commissioner Bishop should use the power she has under to order an EIS or deny the permit on this massive animal factory proposal. People living in Winona County, along with all southern Minnesota’s communities, are in a nitrate-induced drinking water crisis. Nitrates in drinking water result in serious health issues. Please take this seriously.

Peter Vachuska
12557 320th Ave
Comfrey MN 56019
507.240.0811
We feel that there should no problem with the Dailys moving forward with there expansion. They are very good stewards to the land.
Dear Kim,

I respectfully request that the MPCA deny the dairy cow expansion to the Daley CAFO. In fact, no more factory farms should be permitted. Why? They all pollute the air, soil and water required for all life on this planet. My mom, who died in 2002, used to point out that farm country was more polluted than the city. She didn't exaggerate. I became aware of these polluters thanks to her.

Secondly, the "get big or get out" dictum (which may have originated in MN) has now exponentially increased the financial challenge for smaller operations and beginning farmers. The result: hungry farmers (!), increased number of suicides, fewer farmer landowners...

We need gvt agencies to support sustainable agriculture not to sign off on its demise. It's time for the MCPA to fulfill its mission: control pollution!

Sincerely,

MaryLou Wilm
Mpls MN
Dear MPCA,

In brief I will express my reservations for allowing the expansion of the Daley Dairy due to the environmental impact and risks of this proposed mega-dairy project.

The risks include increased ground water contamination, increased greenhouse gas emissions and there are likely many other environmental concerns associated with this project.

I know that the dairy industry has consolidated to improve efficiency and the economics of a difficult industry. However by accounting for the environmental costs borne by all Minnesota citizens, as well as the national and international impacts of watershed pollution and air pollution of these mega-dairy operations, allowing these projects cannot be justified. Instead it is appropriate to look at limiting the size of food animal operations to create sustainable small farm operations that will support many more families and not create the intense point source pollution created by the mega-farms.

Sincerely,

Michael Overend, DVM
557 Scenic Drive
Two Harbors, MN
(218) 591-2514
drmoverend@gmail.com
We support the Daley’s project
Thank you,

David Heublein
Heublein Seeds
507-459-2087
Dear Ms. Grosenheider, I am writing in support of permitting the planned expansion of the Daley farm. Agriculture's share of greenhouse gases worldwide was 24% in the last decade. In the United States, the contribution by ag was only 9%. Farmers and ranchers continue to use conservation efforts and technology to lead the way on this front. AMAZINGLY, dairy cattle account for less than 1% of greenhouse gases.

The absurdity of denying a permit based on the idea of greenhouse gas emissions not being tested, overwhelms me. The Environmental Protection Agency has been unable to create accurate models for livestock facilities' impact on air quality because there are too may variables in the process. The Minnesota Pollution Control Agency, following a detailed analysis, concluded that the Daley Family's project will not have any negative environmental impacts.

81% of the population of the U.S. live in cities and suburbs. As that segment of the country becomes less and less in touch with agriculture, they have less understanding of what we do. We, as farmers, rely on MPCA to use accurate and reliable science when evaluating permits. We should be able to trust this agency to have our best interests at heart when the science leads that way. Yet we continually find ourselves at odds with the agency because of their "interpretation' of rules that aren't "law". This leads to misunderstanding, especially from people that don't understand the industry, or worse, are opposed to it and use this venue to try and end it.

"What people don't understand, they fear. What they fear, they regulate'. Regulations should be made and upheld based on the right factors, not on emotion. I would strongly voice my support to approve this permit post haste. Marlin Fay Grand Meadow area farmer
Good morning Ms. Kim Grosenheider

Their is a handful of people that think the Daley Family should not expand their milking operation but they are not looking at the whole picture. The expansion will actually help the area as a whole. It will be better for the land and environment because they will be planting more grasses and legumes for feeding the cattle which this area really needs. They will be using the manure as fertilizer which is much better than buying commercial fertilizer because it adheres to the soil much better and the plants will get to use more of the nutrients from it. They will also be creating more opportunities for families in the area with employment opportunities which will include but not limited to caring for the animals and operating machinery. Local ag dealers for machinery, livestock supplies vendors, veterinarians, auto dealers, grocery stores, pharmacies, schools and many others will all benefit from just this one family, as they will be putting a couple million dollars or more into the local economy every year which this area really needs.

The MN PCA has already done a detailed analysis of the project and concluded that the project will not have any negative environmental impact on the area. I am hoping that you and your agency will use sound science in making your decision.

I am a small farmer my self, I own two hundred acres but I know that farmers like me cannot produce enough food feed and fiber to feed the world. We need hard working people like the Daley's to meet the needs of the growing population that the world is experiencing so please do not be the agency that holds them back, they have been waiting to long and have spent way to much time and resources trying to get this done.

I pray you will make right decision soon and give them the okay to get started.

Thank you for your time.

Scott Winslow

23195 County 8

Fountain MN 55935

507-951-0363
Please find comments attached from Minnesota Farm Bureau regarding the Daley Farm Environmental Assessment Worksheet.

Thank you,

Amber Hanson Glaeser
Director of Public Policy
Minnesota Farm Bureau
Office: 651-768-2103
Cell: 507-272-6677

Please note the change in my email address.

Disclaimer:
This email message and any attachments are intended only for the use of the intended recipient, and may contain information that is privileged, confidential and/or exempt from disclosure under applicable law. If you are not the intended recipient or an authorized representative of the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by replying to this email, and delete or destroy all copies of the original message and attachments thereto. Email sent to or from FBL Financial Group, Inc. and its Affiliates may be retained as required by law, regulation or business practice.

For security reasons we strongly discourage the submission of sensitive or personal information, such as credit card numbers, social security numbers, or bank account information, through email. Email may not be a secure method of communication. Any email may be copied and held by various computers as it makes its way from our server to yours. Persons not participating in our communications may be able to intercept the communications while being transmitted or stored. If you prefer that we communicate with you via a non-electronic method, please advise us of the same.
March 6, 2020

Ms. Kim Grosenheider
Environmental Review
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194
kim.grosenheider@state.mn.us

Dear Ms. Grosenheider:

On behalf of the nearly 30,000 Minnesota Farm Bureau families from across the state, the Minnesota Farm Bureau Federation (MFBF) appreciates the opportunity to provide the following comments on the Daley Farm Environmental Assessment Worksheet.

1. The MFBF believes the MPCA does not have the legal authority to solicit or receive additional public comments on the Daley Farm EAW because the required comment period has closed. Minnesota law provides a specific procedure regarding the environmental assessment worksheet (EAW) process under Minn. Stat. ch. 116D and Minn. R. ch. 4410. The statute and the rules provide a 30-day public comment period for an EAW. The responsible governmental unit (in this case, the MPCA) must base its decision on the contents of the worksheet itself and “the comments received during the comment period.” Minn. Stat sec. 116D.04, subd. 2a(d). The MPCA held a public comment period on the Daley EAW from October 1, 2018 through November 15, 2018. It should be noted the MPCA unilaterally - and in our opinion, illegally - extended the 30-day comment period to 45 days in order to give interested parties an additional 15 days to submit comments on the Daley project. There is no provision in the statute or the rules to reopen an EAW comment period. Because the comment period closed on November 15, 2018, the comment period provided by Minnesota is now over and the MPCA lacks the legal authority to re-open a second public comment period. Minnesota law requires the MPCA to base its decision on the need for an environmental impact statement (EIS) from the comments received during the initial comment period only.
2. **Applying population-based emission factors to a specific, individual farm is misplaced.** The MPCA has chosen to use population-based emission factors in its Supplement to the Daley EAW. These emission factors were developed by the U.S. Environmental Protection Agency (EPA) to be used across *groups of facilities* or over *large geographic areas*. They were not designed to be used to analyze emissions from individual facilities. The EPA emission factors are based on *average* emissions from groups of facilities, and even the EPA itself has acknowledged that actual emissions can vary greatly from individual farm to individual farm. Therefore, using an average emission factor and applying it to an individual farm fails to take into account the actual emissions-reduction practices that occur or will occur on an individual farm. The use of population-based emission factors in the Daley EAW is an inappropriate use of those factors.

3. **The greenhouse gas emissions from a single farm do not have a significant effect on the environment.** In order for an EIS to be warranted in a proposed feedlot project, the underlying EAW must show that the proposed project has a “potential for *significant* environmental effects.” Minn. Stat. sec. 116D.04, subd. 2a(a) and Minn. R. 4410.1700, subp. 1. As stated above, The MPCA has chosen to use population-based emissions emission factors in its Supplement to the Daley EAW. These emission factors are used across groups of facilities or over large geographic areas. They were not designed to be used to analyze emissions from individual facilities. Because the emission factors are based on *average* emissions, the MPCA cannot conclusively state that the Daley project will have a significant effect on the environment. In fact, the opposite is true because the Daley Farm has voluntarily agreed to utilize prudent timing of manure applications, use of nitrogen stabilizing additives, and use of cover crops in its permit in an effort to limit and offset greenhouse gas emissions. The Daley Farm does not have a “potential for *significant* environmental effects” as outlined in Minn. Stat. sec. 116D.04, subd. 2a(a) and Minn. R. 4410.1700, subp. 1.

4. **Permittees should be afforded uniform guidance using existing law when considering greenhouse gas emissions analysis for feedlot permits.** Our final comment is that the haphazard, off-the-cuff manner in which the MPCA has approached the environmental review for the Daley Farm project has caused considerable confusion for all Minnesota livestock farmers regarding the environmental review process for new or expanding feedlot projects. This type of rudderless decision-making is not good for either project proposers or the general public. The MPCA has changed the rules in the middle of the game with respect to the Daley EAW. We urge the MPCA to return to using existing regulations and uniform procedures established under Minn. Stat. ch. 116D and Minn. R. ch. 4410 when assessing greenhouse gas emissions for the Daley project and for all future feedlot projects.

Sincerely,

[Signature]

Kevin Paap  
President
Hello,

My name is Janel Dean. I am a rural resident of Winona county and am very worried about climate change. Our home was hit by the flood of 2007. Science tells us- I listen to Climate Cast on MPR - that Minnesota is becoming wetter and experiencing heavier storm events due to change in climate. We need to change how we do things to have a positive affect on climate change. Because agriculture and forestry account for a quarter of Minnesota’s greenhouse gas (GHG) emissions, and because Minnesota is nowhere near target on meeting goals of the Next Generation Energy Act of Minnesota, agricultural sector decisions need to be re-examined.

Now is not the time to be allowing already large feedlots to increase in size. Especially in areas near the Lewiston area that already have compromised ground water. Minnesota’s ground water quality is also not getting any better. People need this water for drinking.

Please don’t allow this feedlot to get any larger. It’s already over the limit of animal units in Winona County. It would make more sense to downsize this operation by 1/4 to meet climate goals. Please don’t permit expansion. Or at least do a complete EIS that will consider GHG emissions and water quality concerns for communities and rural residents. But I wonder why when it’s clear that Minnesota is already over the limit of greenhouse gas emissions.

Sincerely,

Janel Dean

18508 Middle Valley Rd.

Minnesota City, MN 55959

Sent from my iPad
These comments are meant to go to Commissioner Laura Bishop. I was given your email to do that.

Dear Commissioner Bishop,

I am a member of the Land Stewardship Project concerned about the effects of large scale farming on our state’s land, air and water, and farming communities. I’m writing in support of residents in Winona County who will be negatively impacted if a proposed expansion of Daley Farm is allowed to proceed.

Daley Farm is already in violation of Winona County’s animal unit cap of 1500 animal units. Their proposal to expand their dairy herd by 3,000 cows will put them at almost four times that cap. This will only add to the strain on the region’s water supply and air quality, not to mention exacerbate climate change for us all by the increase in greenhouse gas emissions the cows will emit. At the very least, an Environmental Impact Statement (EIS) needs to be conducted on this proposed project. In fact, Minnesota law requires it.

I’m asking you to order an EIS for this project; if not, then to deny their expansion permit altogether.

Sincerely,

Lori Wellman
Hello. My name is Julie Gordon. I am a resident of Rochester, MN and a member of Land Stewardship Project. I am writing today to ask Commissioner Bishop to use her power under the MEPA to order an EIS or deny permit for this huge factory farm. I was vaguely familiar with the concept of a factory farm, but first really understood their impact on local environments, on farmers and on communities a few years back. At a friend’s urging, I attended a meeting of farmers and community members who were organizing to oppose a factory farm. I heard presentations from experts on the environmental impacts and then comments from operators of small family farms and from folks living in the community. It was an eye opening experience. The known environmental impacts are horrendous, including: nitrates leaking into aquifers, increase in greenhouse gas emissions, and foul smells. Then there are the unknown impacts and the cumulative effects over time. Although social impacts are not directly in your area of concern, as a mental health professional I heard long time farmers and their neighbors express grief, deep sadness and anger and I saw several individuals cry during the meeting. These factory farms are pockets of environmental and social and economic disasters and are preventable. Please use your power to protect the people, land and water of rural Minnesota. Thank you.
Good evening Kim,

I hope you will accept these comments on behalf of the Minnesota Pork Producers Association for the Daley Farm Project. I had sent an email earlier this afternoon and received a bounce back email saying the message was undeliverable but did not see that message until after the 4:30 deadline.

I apologize for the inconvenience and ask that you will still accept our comments.

Kind regards,
Lauren

Lauren Servick
Director Marketing and Public Policy Engagement
Minnesota Pork Producers Association
Minnesota Pork Board
507-345-8814 office
507-514-1028 cell
lauren@mnpork.com
March 6, 2020

VIA EMAIL ONLY
kim.grosenheider@state.mn.us

Ms. Kim Grosenheider
Environmental Review
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota  55155-4194

Re:   Public Comments for Minnesota Pork Producers Association
      Our File No.  30344-002

Dear Ms. Grosenheider:

The Minnesota Pork Producers Association submits the following comments regarding
the environmental review and permitting for a dairy modernization and expansion project
proposed by Daley Farm of Lewiston LLP in Winona County. The MPCA previously solicited and
received public comments on this project in October and November 2018 but recently
prepared and published a Supplement to Environmental Assessment Worksheet in response to
a Minnesota Court of Appeals' decision holding the agency failed to consider greenhouse gas
emissions related to the project.  Based on this context, as well as the language of the Notice
and Supplement itself, the Minnesota Pork Producers Association understands that the scope
of this comment period is limited to the greenhouse gas issue and that the MPCA is not
accepting and will not consider comments on other issues related to the Daley Farm project.
As such, we are limiting our comments and will not address other aspects of the environmental
review on the Daley Farm project.

I.   The MPCA’s Decision to Conduct a Second Comment Period on the Daley
     Farm Environmental Assessment Worksheet Is Improper.

     As an initial matter, however, Minnesota law establishes specific procedural
     requirements that apply to the environmental review process.  See generally Minn. Stat. ch.
     116D (2019); Minn. R. ch. 4410.  These laws and regulations establish one 30-day public
     comment period on an environmental assessment worksheet (focused on whether on
     environmental impact statement is required because the project has the “potential for
     significant environmental effects”).  Minn. Stat. § 116D.04, subd. 2a(a), (d); accord Minn. R.
     4410.1700, subps. 1-2.  The statute also expressly limits the information upon which the
     responsible governmental unit must base its decision on the need for an environmental impact
statement to “the environmental assessment worksheet and the comments received during the comment period.” Minn. Stat. § 116D.04, subd. 2a(d); accord Minn. R. 4410.1700, subp. 3. As noted above, the MPCA held a public comment period on the Daley Farm project from October 1, 2018, through November 15, 2018, and the agency received 615 public comments on the project during that time. And although the Minnesota Court of Appeals reversed the MPCA’s original negative declaration on the need for an environmental assessment worksheet for the project due to a procedural error, neither the applicable statutes and regulations nor the court’s opinion authorize the MPCA to conduct a second comment period on a project. Instead, the law requires the MPCA to make its decision on the need for an environmental impact statement on remand based solely on the environmental assessment worksheet itself and the comments received during the original comment period.

II. The MPCA’s Use of Population-Based Emission Factors to Estimate Greenhouse Gas Emissions Is Improper.

In its Supplement to Environmental Assessment Worksheet for Daley Farm’s project, the MPCA estimated the greenhouse gas emissions that would occur from Daley Farm’s facilities (both the current facilities and the facilities that would be constructed as part of this project) using population-based emission factors that were developed by the EPA to complete emissions inventories for large areas or groups of facilities. These emissions factors are based on average emissions that occur across the entire population of facilities for which the emission factor was developed. Within these populations, however, the EPA has acknowledged that actual emissions may vary from facility to facility. This variability is particularly prevalent in livestock facilities, where air emissions depend on numerous site- and operation-specific factors:

Generating reasonably accurate estimates of air emissions from AFOs [animal feeding operations] is difficult. The operating environment for these farms is complex. The species of animals are varied (e.g., swine, beef and dairy cattle, poultry), and farm practices differ not only between species, but also among farms for each species. The operations vary in size . . . and differ by region across the country. The chemical composition of the emissions varies depending on animal species, feeding regimens and practices, manure management practices, and the way in which the animals are housed. Much of the air emissions come from the storage and disposal of the manure . . . that is part of every AFO, but some also comes from dust produced by the handling of feed and the movement of animals on manure, as well as from the animals themselves. Meteorological conditions, of course, are an important factor. Estimates of emission rates generated in one type of AFO may not translate readily into others.
National Research Council, *The Scientific Basis for Estimating Emissions from Animal Feeding Operations* 1 (National Academy Press 2002), available at https://www3.epa.gov/ttnchie1/ap42/ch09/draft/interimanimalfeed.pdf. In other words, a farm is not a factory, and an animal is not widget. While a widget factory may consistently operate in the same manner day after day—and thus produce consistent emissions—a farm is a complex environment involving biological processes that are constantly changing and that are highly dependent on the surrounding conditions.

Quite simply, population-based emissions factors are not intended, and have not been scientifically validated, to be used to estimate the emissions from any particular facility. And even if it were appropriate for certain types of facilities (such as factories) that are highly controlled environments, the use of population-based emissions factors is not appropriate to estimate emissions from a particular farm.

### III. Daley Farm’s Proposed Project Does Not Have a Potential for Significant Environmental Effects from Greenhouse Gas Emissions.

An environmental impact statement is only required to be completed for a project if information received in connection with the environmental assessment worksheet demonstrates that the project has a “potential for significant environmental effects.” Minn. Stat. § 116D.04, subd. 2a(a) (emphasis added); Minn. R. 4410.1700, subp. 1. “The operative word here is ‘significant.’” *Heartwood, Inc. v. U.S. Forest Service*, 380 F.3d 428, 432 (8th Cir. 2004); see also *In re Enbridge Energy, Limited Partnership*, 930 N.W.2d 12, 19 (Minn. Ct. App. 2019) (recognizing that “Minnesota courts have in appropriate circumstances relied on federal caselaw applying [the National Environmental Policy Act]” in interpreting the Minnesota Environmental Policy Act). “Evaluating an action’s environmental ‘significance’ requires analyzing both the context in which the action would take place and the intensity of its impact.” *American Rivers v. Federal Energy Regulatory Comm’n*, 895 F.3d 32, 49 (D.C. Cir. 2018).

According to the Supplement to Environmental Assessment Worksheet, the MPCA estimates that Daley Farm’s proposed modernization and expansion will increase greenhouse gas emissions by 20,300 metric tons of CO$_2$-e per year as compared to the current facility. But this estimate (as discussed above) is calculated using a population-based emissions factors that reflects emissions from an “average” dairy farming operation. In other words, this estimate does not account for a number of manure management practices (including without limitation the timing of manure application, use of nitrogen stabilizing additives, planting of cover crops) that Daley Farm has voluntarily agreed to include in its permit and that the MPCA has recognized will decrease greenhouse gas emissions from a farming operation. See MPCA & Minn. Dep’t of Commerce, *Greenhouse Gas Emissions in Minnesota: 1990-2016*, available at https://www.pca.state.mn.us/sites/default/files/Iraq-2sy19.pdf. As a result, it is likely that Daley Farm’s facilities and operations would actually produce fewer greenhouse gas emissions than
the MPCA estimates as a result of the enhanced BMPs that Daley Farm has agreed to implement.

The Supplement to Environmental Assessment Worksheet also states that the MPCA’s estimate of 20,300 tons of CO$_2$-e emissions per year for Daley Farm’s proposed project does not include aspects of the project—including increased planting and use of alfalfa, pastures, and cover crops—that will actually remove carbon from the atmosphere and sequester it in the soil. The agency, however, does not quantify the benefits of these carbon sinks or deduct these benefits from its estimates of the overall emissions estimates for the project. Thus, the agency’s estimate of 20,300 tons of CO$_2$-e emissions per year overstates the actual net impact of the Daley Farm project.

Finally, recent scientific studies suggest that the CO$_2$-e standard that the MPCA used to estimate the greenhouse gas emissions in the Supplement to Environmental Assessment Worksheet does not accurately assess the impact of short-lived climate pollutants (such as methane) on global climate. Michael Cain et al., Improved Calculation of Warming Equivalent Emissions for Short-Lived Climate Pollutants (Sept. 2019), available at https://www.nature.com/articles/s41612-019-0086-4.

But even assuming, for the sake of argument, the accuracy of the MPCA’s estimate that Daley Farm’s proposed project would increase greenhouse gas emissions by 20,300 tons of CO$_2$-e, the MPCA and Minnesota Department of Commerce estimate that the total greenhouse gas emissions in Minnesota in 2016 were 154.2 million metric tons of CO$_2$-e. Greenhouse Gas Emissions in Minnesota: 1990-2016 (Jan. 2019), at p. 5, available at https://www.pca.state.mn.us/sites/default/files/Iraq-2sy19.pdf. And the EPA estimates that the total greenhouse gas emissions in the United States in 2018 were 6,677.8 million metric tons of CO$_2$-e. Draft Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018, at ES-4, available at https://www.epa.gov/sites/production/files/2020-02/documents/us-ghg-inventory-2020-chapter-executive-summary.pdf. Thus, Daley Farm’s proposed project would represent, at most, only 0.01 percent of the annual greenhouse gas emissions in Minnesota or less than 0.00003 percent of the annual greenhouse gas emissions in the United States.

The nature of the global dairy industry provides important context in considering the potential environmental effects of Daley Farm’s proposed project. Milk is a commodity for which there is a global demand that will be satisfied whether the cows producing the milk are located in Minnesota, Mexico, India, or anywhere else. Similarly, any greenhouse gas emissions resulting from dairy production will impact the global climate regardless of where the cows are located.
But dairy producers in the United States are far more efficient than dairy and meat producers in other parts of the world—for example, the average dairy cow in the United States produces 22,248 pounds of milk per year, as compared to 10,500 pounds of milk per year for dairy cows in Mexico and 2,500 pounds of milk per year for dairy cows in India. In other words, dairy producers in the United States can produce the same amount of milk with fewer dairy cows. And because most greenhouse gas emissions from dairy production are based on the number of cows, increasing dairy production in the United States would result in a net decrease in the number of dairy cows—and thus the total amount of emissions—needed to supply the global demand for milk. See Frank Mitloehner, *Livestock’s Contributions to Climate Change: Facts and Fiction*, available at http://cekern.ucanr.edu/files/256942.pdf. In other words, Daley Farm’s proposal to expand its dairy herd in Minnesota can be expected to reduce the total number of dairy cows in the world and will result in a net reduction in greenhouse gas emissions.

Ultimately, however, the question before the MPCA is whether Daley Farm’s proposed modernization and expansion project—which may, at most, result in an increase of 20,300 metric tons of CO2-e emissions per year—has a “potential for significant environmental effects.” The Supplement to Environmental Assessment Worksheet specifically addresses this question:

The assessment of GHG emissions and climate change is extremely complex. Currently it is not possible to model the physical impacts of global or regional climate change, such as storm frequency/intensity or temperature increases, caused by incremental GHG emissions, such as those from the Project. . . . Existing scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts.

The Supplement also specifically acknowledges that “[t]he Project’s incremental contribution to global GHGs cannot be translated into effects on climate change globally or regionally.” In other words, the MPCA has already acknowledged that there is no scientific basis to conclude that a miniscule increase in greenhouse gas emissions such as the agency estimates for Daley Farm’s project will have any measurable effect—let alone any significant effect—on the global climate. The completion of an environmental impact statement will not provide any new information that would alter this fundamental reality. Accordingly, the MPCA should again issue a negative declaration on the need for an environmental impact statement for the Daley Farm project and re-issue the amended NPDES permit for the project.
IV. The MPCA Should Apply Existing Regulations to Establish Uniform Guidance for When Environmental Assessment Worksheets for Feedlot Projects Are Required to Consider Greenhouse Gas Emissions.

Finally, the manner in which the MPCA has approached the environmental review for the Daley Farm project has caused confusion for all Minnesota livestock farmers regarding the environmental review process for new or expanding feedlot projects. This type of decision-making is not good for either project proposers or the general public.

Fortunately, existing standards would allow the agency to clarify this issue consistent with current regulations. In this regard, Minnesota Rule 4410.4300, subpart 15(B), requires that an environmental assessment worksheet must be completed for a “stationary source facility” that generates 100,000 tons or more per year of greenhouse gas emissions. To the extent the MPCA intends to continue relying on emissions factors to estimate greenhouse gas emissions from individual feedlots, the agency could easily develop guidance to determine the number of animals for each species would exceed this threshold. For projects below that number, the MPCA could determine upfront that the project does not have the potential for significant environmental effects from greenhouse gas emissions and that such emissions need not be included in the environmental assessment worksheet—on the other hand, projects that exceed the number could include the calculation in the environmental assessment worksheet to allow the agency to further consider whether a potential for significant environment effects exists. This process would allow everyone—farmers and the public—to know the rules of the game in advance and would allow the MPCA to reasonably apply a uniform standard.

Thank you for your attention concerning this matter.

Very truly yours,

David Preisler
Chief Executive Officer
Minnesota Pork Producers Association
Hello,

After learning of the Daley Farm expansion, I was extremely disheartened to hear the negligence of the situation. This farm is looking to expand from 1728 to 4628 cows and calves. To pretend this would not impact the environment is a gross oversight on your part. The new Supplemental EAW on greenhouse-gas emissions for Daley Farms' mega-dairy expansion application requires an EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION, and the original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7. Please do your due diligence and complete an EIS.

Thank you,
Areanna Lakowske
Dear Commissioner Bishop,

We are very concerned about the impact of the expansion of the Daley dairy farm, an expansion that will turn an already huge dairy farm into a mega-dairy farm. Why? Because of the deteriorating quality of the water in our aquifers—which already have nitrate levels that are too high. The expansion of this huge dairy farm puts our aquifers at much greater risk. We are not picking on the Daley’s who seem like very good and ambitious people. But there is no concrete proof that any farmer could 100% insure that there will be no contamination from such a huge manure source. In fact, there is plenty of reason to believe that at some point there will be a system breakdown in a holding basin or transport system.

Given the unique nature of our karst region, any leakage will ultimately contaminate our aquifers. In a lecture on February 24 at Winona State University's Stark Hall, Anthony Runkel, Chief Geologist with the Minnesota Geological Survey said that without a doubt that the problem with nitrates in our deeper aquifers is getting worse—and this is almost exclusively caused by large farms and poor land management. When it comes to protecting our land and water from the significant, negative environmental effects of industrial-scale animal factories, the environmental review and feedlot regulatory, oversight, and enforcement system clearly isn’t working. We are counting on you to help fix it.

Further, it seems that Minnesota State 4410.1700 was not followed when the previous commissioner agree to waive the requirement for an EIS. Given the huge impact on the drinking water in our county, regulators must put this request to the most rigorous scrutiny—even a 1% chance of failure will hurt thousands of people. We have lived in Winona county for nearly 25 years and it is one of the most beautiful areas in the world! This beauty and the purity of our air and water must be protected and the laws that serve to do this must be followed. We are counting on you to make this happen, please!

Sincerely,
Brian & Betty Singer-Towns
1261 W. Broadway
Winona, MN 55987
bsingert@gmail.com
Please include my attached letter to the comments.

Thank you,
Brent & Polly Greden
18753 Bear Creek Dr.
Rollingstone, MN 55969

Sent from Mail for Windows 10
We are writing in support of the on-going application process for the Daley Family Farms. We have written in support previously, so we will try to limit our comments about greenhouse gases as you asked.

There is no standard set for greenhouse gas emissions for farms in Minnesota. Furthermore, neither the MPCA nor the Minnesota courts have required a dairy farm to predict potential greenhouse gases. How would you determine whether the Daley farm is producing more by expanding? I do not believe anyone has come up with a system that can indiscriminately prove the amount of carbon they are producing. Even the Federal government has stated that it is unable to create an accurate model for how livestock farms impact the air quality. There are WAY too many variables to predict this accurately. I urge the MPCA to follow the lead on the EPA in not trying to predict this in a false way.

Winona County has lost more cows in the last few years than the Daley’s want to add. The total number of cows in Winona County will not change, which in turn will not change the greenhouse gases that Winona County is producing. By using every efficient process that they can, the Daley family and many other farmers in Winona County are producing more milk with less cows. This alone is reducing carbon compared to farms in the past.

Growing alfalfa and cover crops has proven to reduce the amount of carbon in the air. Daley’s have been committed to doing both of these things already, which are reducing carbon. If all the acres that they have in alfalfa were turned into row crops instead the carbon gases would increase!

The Daley’s have done everything the MPCA has asked them to do. They spread their manure at the correct rate, they plant cover crops, they have the proper manure storage, and they have the proper silage run-off lanes. They are committed to the land they farm. They drink the water that so many people have claimed they have contaminated, which again, please PROVE to me that it is the Daley manure that is causing wells to be high in nitrates, it cannot be done, again there are too many variables.

We need to keep moving forward, using all of the new technology that is offered to us. Many people have an ideal that farms should be run the way our grandparents did it. I for one do not want to milk 5 cows every morning to get milk for my cereal! We need to let the experts do these jobs for us. They can do it the most efficient and safe way possible. We need to let this family continue to keep up with the times and let them grow!

Thank you,

Brent & Polly Greden
Dear Kim,

I am writing with my concern about the Daley Farms expansion permit. As a member of MN350 and an advocate for Regenerative Agriculture, I believe that if Daley Farms wants to expand they should have to demonstrate offset of the potential waste and pollution on the site. Integrating managed grazing, rather than just building a feedlot would do much to begin restoring the site including:

- Clean up already degraded aquifers by allowing precipitation to filter through healthy soil sponge.
- Reduce rain run off by absorbing more precipitation. This rain generally carries manure residue, nitrates and phosphates to the water it is running into.
- Reduce depletion of top soil. The average farm loses 4 tons of top soil/acre/year.
- Supply a better source of food (grasses) to the animals. Grass also works to dispose of manure by composting into the ground and growing the soil vs allowing methane to escape into the atmosphere.
- Minimize bare ground which allows carbon to escape the soil and heats the atmosphere.

30% of Minnesota agriculture has moved to Regenerative methods. These farmers are helping the environment while provide abundant and healthier sources of plants and animals for human consumption.

To allow expansion, REGENERATIVE METHODS must be applied!

The Regenerative Secret

Thank you for your consideration.

Kate
--
Kate Anderson
952-486-9658
k8anderson3396@gmail.com
Thank you for the opportunity to comment on this supplement to the original EAW.

The supplement is inadequate, and this project requires an Environmental Impact Statement (EIS) for the reasons I'll outline below in addition to previous comments submitted by the public, including myself, in favor of an EIS on the original EAW.

4410.1700 DECISION ON NEED FOR EIS, Subp. 7, B. Cumulative potential effects. This would require studying how much greenhouse gas (CHG) is emitted by neighboring farms as well as any industry in the City of Lewiston. There's a small farm directly across from Daleys with dairy cattle, for example. There is a lot of fog around Lewiston when there is not in St. Charles. How does the topography and row upon row of corn in the area effect CHG entrapment. Speaking of which, there goes your "mitigation." I see corn as far as the eye can see, not cover crops.

From the EAW supplement: "Additional CO2-e could be avoided by Daley’s and likely neighbor’s Daley Farms of Lewiston, LLP - 2018 Dairy Expansion Environmental Assessment, Utica Township, Minnesota 6 Worksheet increased use of cover crops." This is faith not science in the absence of effective regulation.

4410.1700 DECISION ON NEED FOR EIS, Subp. 7, C. Extent to which the environmental effects are subject to mitigation by ongoing public regulatory authority. They most certainly are not, at least any effective regulatory authority. One Winona County feedlot officer, and they are not going out there unless there's been a complaint. The MPCA itself does not show up until there's been a spill. These facts in combination with Daley Farms' failure to act in good faith for close to 30 years (and not simply in terms of animal cap) should give MPCA good cause to doubt their ability to comply with any new regulation. In addition, the Daleys doxed private citizens not on the Board of Adjustment during that hearing. Wanton disregard for the safety of others does not inspire the public to put faith in largely voluntary compliance.

Finally, from the EAW supplement, the MPCA simply has no effective method as of today to measure CHG. That is an argument for an EIS and due diligence by your own admission:

"There are no Minnesota or National Ambient Air Quality Standards for GHGs. The assessment of GHG emissions and climate change is extremely complex. Currently it is not possible to
model the physical impacts of global or regional climate change, such as storm frequency/intensity or temperature increases, caused by incremental GHG emissions, such as those from the Project...There is currently an absence of regulatory guidance for analyzing GHG emission impacts. If, in the future, climate models improve in their predictive capacity or more regulatory guidance is provided, MPCA will incorporate those tools into its environmental review process at that time."

Sincerely,

Tessa Schweitzer
1272 Richland Avenue
Saint Charles MN 55972
(507)932-4564
(507-313-4884
schweitzertessa@hotmail.com
Dear Mr. Grosenheider and MPCA Commissioner Laura Bishop,

I’m writing to object to the MPCA staff’s findings on Daley’s Greenhouse Gas Emissions as so ordered by the court in the EAW’s failure to include such findings. The science has not been proven one way or the other for this specific site proposal. Extrapolations from various other country-wide locations are very much in the speculative guesstimate realm, and disingenuous. Therefore an EIS is the remedy, pure and simple.

But, I’m more perplexed over the first negative determination by former Commissioner John Linc Stine that an EIS was not warranted.

In citing facts that the karst area surface and groundwaters of southeastern Minnesota are already under assault, polluted by nitrates, and that drinking water is unsafe in more and more wells, Mr. Stine avoids the science and controversy with the CAFO industry by handing off the recommendation to the EQB to suggest a region wide generic nitrate EIS. Knowing full well that such a proposal will entail kicking-the-can-around-the-play-lot while Daley bulldozes their permits through various agencies with the MPCA stamp of approval.

The MPCA is being played by Daley Farms. By allowing the negative EIS to stand and fumbling the Greenhouse Gas Emissions, but by all appearances make a hard work effort to arrive at not negative GGE finding to please the court, Daley would then use the granted MPCA permit to go back to the Winona County Board of Adjustment and slap the permit all over the table claiming that if the MPCA says its “OK,” then the BOA has to grant them the variance against the codified county ordinance absolute Animal Unit limit. This then becomes a test case for corporate farms to railroad local control out of the several state counties.

The purpose of the MPCA is not to accommodate the wishes and desires of any and all CAFO but rather to protect the health and safety of all denizens in the state, no cherry picking. Mr. Stine did a disservice to the State Of Minnesota in his arbitrary declaration to negate an EIS for the Daley expansion.

Commissioner Bishop has the power and discretion to set the MPCA locomotive back on the right track. The EIS derailment must be mitigated by ordering the EIS that should have been logically determined initially.

Respectfully,

Bruce A. Kuehmichel
1105 E.Caledonia Street
Caledonia, MN 59921

Since 2011, anti-frac sand mining activist, Houston County Protector. It’s all about the drinking water, a public right, not just a private one.
Dear Commissioner Bishop,

As a member of MN350, I’m working to tackle the climate crisis. As a Minnesotan, I’m engaged in protecting the state’s natural resources. And as an aunt, I’m working to preserve our planet for my nieces and nephew. One of my nieces is a student at Winona State University, and I’m concerned the proposed expansion by Daley Farms would affect her health, as well as the health of everyone in the surrounding community. The expansion also would be detrimental to Minnesota’s environment and contribute to climate change. Please deny the permit. The health and environmental risks are too great not to do so.

One of my biggest concerns is the effect of our changing weather patterns on Daley Farms’ manure lagoons. As the MPCA has reported, climate models for Minnesota indicate the state’s rainfall will likely happen less frequently but with more intensity. The U.S. Army Corps of Engineers has told cities along the river from Winona to Guttenberg, Iowa, to monitor and brace for potential flooding in the weeks and months ahead. Last March, eight Northwest Iowa animal feeding operators reported flooding-related manure discharges, according to Iowa DNR records. If the manure lagoons breach, it would have devastating effects on surrounding communities and waterways. Daley Farms is located in the state’s karst region, an environmentally sensitive area prone to groundwater contamination. Communities in the region already are living with contaminated water. As climate change worsens, our state will experience more extreme weather events, including storms and floods that increase the risk of breached or overflowed manure lagoons. MPCA did not account for this in its Environmental Assessment Worksheet.

In November, the American Public Health Association issued a policy statement calling for a moratorium on the expansion of existing concentrated animal feeding operations until regulation and enforcement conditions are in place to adequately protect the public’s health. The Centers for Disease Control and Prevention also has determined that they pose risks to public health and the environment.

Beyond the health risks of the Daley Farms expansion, my other main concern is the increase in greenhouse gas emissions it will have. The MPCA’s Environmental Assessment
Worksheet undercounted greenhouse gas emissions by not considering emissions from building construction and associated energy use; transportation of manure, equipment, and milk; and increases associated with animal feed production. The Minnesota Environmental Quality Board noted in its 2019 Minnesota Environment and Energy Report Card that the state is not on track to meet its climate goals of reducing annual greenhouse gas emissions by 80% between 2005 and 2050, with the interim goal of 30% by 2025. Agriculture and forestry account for a quarter of Minnesota’s greenhouse gas emissions, and the state will not meet its climate goals outlined in the Next Generation Energy Act without changes in the agriculture sector.

In its 2019 report, “Methane Emissions in the United States: Sources, Solutions and Opportunities for Reduction,” the EPA noted that the agricultural sector is the leading source of U.S. methane emissions. NASA reports that one ton of methane has a global warming potential that is 84 to 87 times greater than carbon dioxide over a 20-year period.

This past October, the MPCA identified opportunities for changing land use, cropping practices, and nutrient reduction in its "Greenhouse gas reduction potential of agricultural best management practices" report. Yet the Daley Farms EAW identifies just one CO2 mitigation measure — planting alfalfa — which would reduce the project's greenhouse gas pollution by just 1,000 tons per year, or about 3 percent of the more than 32,000 tons of CO2 equivalent emissions expected from this project. The MPCA should specifically identify mitigation measures to offset emissions, encouraging alternative farming systems such as well-managed grazing systems, more diverse crop rotations, and planting perennial grasses to build soil health, protect water quality, and increase Daley Farms' resilience to climate impacts.

By denying this permit, the MPCA has an opportunity to drive meaningful environmental change for Minnesota and set an example for other top agricultural states. Our shared future depends on these kinds of decisions.

Sincerely,

Jenny Scholtes
There must be an Environmental Impact Statement before moving forward with the Daley Farms mega-dairy expansion. Mega-farms in general are almost always environmental nightmares -- it seems unlikely that if an honest environmental impact statement is done, this project would pass muster!

Sincerely,
Wendy Fassett
Minnesota resident
The new Supplemental EAW on greenhouse-gas emissions for Daley Farms’ mega-dairy expansion application requires an EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION, and the original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

Minnesota is at the head of the largest freshwater river in the united states-we are the land of 10,000 lakes. Keeping our waters and wetlands free of landslides of manure, while having methane-emitting cows both consuming 100 million gallons of water a year and damaging our waters and contributing to climate change is simply not an option.

Approving this expansion would be extremely irresponsible. At the minimum, an EIS should be completed. But in reality, we already know that this expansion has the power to cause great environmental harm, and this is a fact that cannot be ignored. Thank you for working to protect the environment for us and generations to come.

Melissa Herold
Commissioner Bishop,

For the sake of our future generations, expansion of the factory dairy farm cannot happen. A business's bottom line should never come before the long-term health of our people and the health of our environment.

I was born and raised in Winona and have never left. I attended Winona State and graduated with honors with a degree in Health Promotion - Community Health. I went on to conduct research with Gundersen Health System in the Community and Preventive Care department under Epidemiologist, Dr. Brenda Rooney. I have been trained on nutraceuticals and lifestyle coaching from a number of Naturopathic Nurse Practitioners and Physicians. My focus on natural healthcare led me to my current position of taking over Blue Fruit Farm where we grow a number of Certified Organic perennial fruits all of which have astounding health benefits. These experiences have taught me the best thing we can do for the long-term and sustainable health of our population, is to focus on preventing detrimental health disparities. Prevention is key as once the damage is done, it is often too late to reverse the devastating affects. The same is true for the health of our environment.

My partner, Luke, and I (both Winona natives) plan to start a family and it deeply saddens us to see family farms shut down or file bankruptcy due to huge factory farms monopolizing the market. What saddens us more is knowing that we will be bringing children into this world with a very real possibility that they may not have clean air and drinking water due to huge factory farms like the Daley's. I understand that the Daley's are looking out for their family and the bottom line of their business, but this issue needs to take into account the tens of thousands of other families in Winona county that will be affected by this decision for decades if not centuries to come.

I, on behalf of all of Luke and my family and friends throughout Winona county, ask you to consider the following for the Daley Farms' mega-dairy expansion application requirements:
1. An EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION and,
2. The original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7

Thank you for considering my thoughts and for your time reading,

Katie

--
Katie Lange
Farm Operator
Blue Fruit Farm
Re: Daley Farms of Lewiston, LLP – 2018 Dairy Expansion. Public comment on Supplement to Environmental Assessment Worksheet (EAW)

Commissioner Laura Bishop,

I request that you use the power you have under the Minnesota Environmental Policy Act (MEPA) to order an in-depth EIS or deny permitting on the Daley Farms massive animal factory proposal.

I am a resident of Goodhue County in Minnesota and have reviewed information about the request of Daley Farms to expand its dairy facility in Winona County. I understand that the Court of Appeals overturned the permit granted by the MPCA to Daley Farms and ruled that the agency did not consider the effects of greenhouse gas emissions when it failed to require an in-depth Environmental Impact Statement (EIS) on the Daley Farm proposed expansion. An in-depth EIS must be completed in order to determine the impact of an expansion on the community’s water, air and land.

I live in a rural part of Goodhue County and am concerned about the impact greenhouse gases have on our climate, including methane emitted from livestock. My health is adversely affected by poor air quality, and find it necessary to avoid going outdoors when air quality deteriorates. This affects my ability to work in my gardens and enjoy time in the outdoors.

I am also concerned about the presence of nitrates in drinking water. Recently, the state conducted a test of our well water for nitrate levels. Nitrates in drinking water clearly pose a health threat. Excessive amounts of nitrates in our drinking water was of grave concern to us.

It was with relief that we were told the nitrate levels were within acceptable limits. I could not imagine what we would have done if the nitrate levels were high, what potential health risks were we facing, and what would we have to do, and how expensive it would be, to correct the problem.

I have read that some Lewiston residents water testing reports found nitrate levels in their drinking water at 13 milligrams per liter and that the “safe” drinking water limit for nitrates is 10 milligrams per liter and for trout streams, the limit is 5 milligrams per liter.

I receive periodic updates on air quality and water issues from the MPCA. And, as stated on the MPCA’s website, “Water is one of Minnesota’s most abundant and precious resources.”

I think that because of the grave concerns for the contamination of ground water in the karst region that an in-depth EIS should be conducted regarding the impact this would have on the quality of the ground water. The potential of harm to the large number of people living in this region as compared to the benefit to one dairy farm clearly requires that the MPCA do whatever is necessary to review the impact and to require Dairy Farms to comply with any mitigating practices necessary to prevent harm.

The proposed expansion clearly has the potential to create irreversible environmental effects with cumulative potential effects to the air, water, and the land. There is insufficient information to make “...a reasoned decision about the potential for, or significance of, one or more possible environmental impacts...” as per Minnesota Statute 4410.1700, Subpart 2a. If there is not a thorough EIS of the project the MPCA will not be able to order or evaluate
a mitigation plan much less enforce one. And if the environmental effects cannot be anticipated and controlled, the permit must be denied. As per Minnesota Statute 4410.1700, Subpart 7.

We need to know that the state will protect all citizens, and especially the rural community, from the significant, negative environmental effects of industrial-scale animal factories and that the environmental review and regulatory, oversight, and enforcement systems work for the benefit of the citizens of Minnesota.

Former Commissioner Stine's refusal to follow Minnesota Environmental Policy Act (MEPA) regulations constitutes a grave injustice to the residents of Winona County and all of the surrounding karst region. The MPCA must uphold this duty and recommend an in-depth EIS or deny the Daley farm permit.

Submitted by Virginia Lynn, 26728 144th Avenue Way, Welch, MN 55089
Dear Kim,

I am very concerned about the increasing risk to our groundwater in this sensitive karst region. This environmentally sensitive region can not tolerate the increasing concentration of animal agriculture and the animal waste generated without damage to a fundamental resource we all rely on. An environmental impact statement must be added to the EAW already in progress for the Daley Farm application for expansion.

Thank You,
Jo Marie Thompson
Norwalk, WI - your neighbor in this sensitive karst geology region
608-377-2784
Kim,
My name is Steve Jorissen, president of Northeast Metro Climate Action and I am writing to request a full Environmental Impact Statement on the Daley Farms permit. We ask that the MPCA consider the states goals to reduce carbon emissions and air quality standards when assessing the farm's environmental impacts. Concentrated Animal Feeding Operations such as this are major contributors to methane emissions which are far more potent GHGs than CO2. We urge the MPCA to take a stand in favor of regenerative agricultural practices and pasture fed livestock in maintaining and improving MN air quality and GHG emissions.

Best regards,
Steve Jorissen, PhD
Northeast Metro Climate Action
March 4, 2020

Dear Ms Grosenheider:

As an elder with life-long roots in rural southeastern Minnesota, karst country, I write to remind you of the necessity for an EIS for Daley Farm’s application to expand its mega-dairy in Winona County.

Minn. Statute 2210.1700, Subp. 7 lists criteria: “to decide whether a project has the potential for significant environmental effects” and must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

Insufficient Information is a trigger for an EIS. The MPCA Staff admitted in their Feb. 4 public meeting in Lewiston that the field of Greenhouse Gas mitigation is so new that they do not yet know or have standard tools to use to quantify a full GHG life-cycle analysis of this project. They also admitted that there is no level that would be too high to permit.

Glossing past this missing information would be directly against Governor Walz’ Executive Order 19-37 that aims to reduce greenhouse gases as a way to combat climate change.

In order to restore the public’s trust in the MPCA to protect our air, water, and health, you must either deny this application or require an EIS for the entire project.

Sincerely,

Bonita Underbakke

34526 State Hwy. 16

Lanesboro MN 55949
Dear Ms Grosenheider:

As an elder with life-long roots in rural southeastern Minnesota, karst country, I write to remind you of the necessity for an EIS for Daley Farm's application to expand its mega-dairy in Winona County.

Minn. Statute 2210.1700, Subp. 7 lists criteria: “to decide whether a project has the potential for significant environmental effects” and must consider type, extent and reversibility of environmental effects as well as cumulative potential effects.

Insufficient Information is a trigger for an EIS. The MPCA Staff admitted in their Feb. 4 public meeting in Lewiston that the field of Greenhouse Gas mitigation is so new that they do not yet know or have standard tools to use to quantify a full GHG life-cycle analysis of this project. They also admitted that there is no level that would be too high to permit.

Glossing past this missing information would be directly against Governor Walz’ Executive Order 19-37 that aims to reduce greenhouse gases as a way to combat climate change.

In order to restore the public’s trust in the MPCA to protect our air, water, and health, you must either deny this application or require an EIS for the entire project.

Sincerely,
Bonita Underbakke
34526 State Hwy. 16
Lanesboro MN 55949
Please accept this letter in response to the Daley Farms proposal.

Thank you.
Margot Monson

--
Margot Monson,  Entomologist, Beekeeper
22 Ludlow Ave.
St.Paul, MN  55108
651-644-3749
Commissioner Bishop:
I live in St Paul and have many farm families as friends and as sources for our own organically grown meats and vegetables.

As an aquatic biologist I understand what it takes for aquatic habitats, be they rivers, creeks, lakes, or ponds, and wetlands to be healthy. There must be diverse and sustainable populations of macroinvertebrates, fish, vegetation, fungi, and many plant and animal microorganisms, phytoplankton and zooplankton in order for these habitats to have ecological integrity.

The proposal by the Daley Farms to expand their facility from 1500 animals to 4500, or from the Winona Co Set unit cap of 2275 animals units to 5968 AUs is absolutely unconscionable from the standpoint of environmental health, not to mention human health.

These farms exist in the fragile Karst region of our state, so by definition, the impact of any effluent discharge from the manure stored in earthen-sided lagoons, could be serious, as well as runoff from fields where crops are grown with fertilizers and pesticides entering the ground waters and aquifers. Currently 40% or more of MN lakes and rivers are polluted, failing to meet state water quality standards with nitrate laden drinking water, and this is especially so in southeastern MN. It is frankly unbelievable that Commissioner Stine denied the need for an EIS and then granted an individual NPDES permit. The office of the MPCA is supposed to be protecting our resources from pollution. Not only was he disregarding the health of humans and all living organisms in this region, but he
ignored Minn. Statute 4410.1700, Subp.7 Criteria: “to decide whether a project has the potential for significant environmental effects” must consider type, extent, and reversibility of environmental effects as well as cumulative potential effects.

At least the MN Court of Appeals can be credited for the common sense in overturning MPCA’s negative declaration for an EIS, and considered the climate change implications as well since they didn’t address the greenhouse gas emissions.

It was shocking to learn that Daley farms has been out of compliance with state regulations for run-off and other issues, having violations filed by the MPCA feedlot division that have been unenforced for 22+ years. Really?

It is laughable to believe that Daley Farms will actually be evaluating weather conditions, wind speed/direction and humidity before manure application to minimize public impacts. Since the EAW only covers the Daley property, there may be as much as 42% of the acreage receiving manure that will not be monitored.

There are other issues to consider such as how this number of animals can live in confined quarters without necessitating the use of huge amounts of antibiotics, which when used prophylactically have been proven to end up in the animal products that we consume. I know you must be aware of the
problem of increasing antibiotic resistance, and this is not healthy for the animals nor humans.

There are so many reasons to deny this increased operation since there are other assumptions about air and odor emissions defined for the 86% of dairy farms with less than 200 cows, and this farm will be 9-23 times the average MN dairy.

We need to return to diversified agriculture with the small and moderate sized farms that once made this state in ecological balance, with healthy water, soil, and wildlife in abundance. We most assuredly need Commissioner Bishop to do her job and enforce the current regulations on the books by ordering an EIS, OR denying permitting on such a huge confined animal operation. The citizens of MN deserve better.

Sincerely,

Margot Monson
22 Ludlow Ave
St Paul, MN 55108
Dear Kim Grosenheider,

We need to do right by our struggling Family farmers. As a consumer our family won’t buy milk from mega dairy farms.

You don’t need a detailed Argument about nitrate pollution, methane damage, karst geology or the oversupply of milk and all the government subsidies that go with it. Please protect our communities and their resources And refuse the Daley Mega Dairy.

Sincerely, John Klein

Sent from my iPhone
From: Mary Jo Bibby
To: Grosenheider, Kim (MPCA)
Subject: Daley mega dairy
Date: Thursday, March 5, 2020 6:24:25 AM

This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Commissioner Bishop - We beg you to require an EIS on the proposed Daley farm request. We all deserve healthy drinking water.
Thank you,
Mary Jo Bibby
MN resident and citizen of planet earth
Please convey to Commissioner Bishop it is time to look at the facts of what a mass concentration of cattle contributes to our water resources like the Daley Farm is proposing. Yes, they are rather good soil conservation stewards with crops grown for dairy, but what they are proposing is like managing the environmental issues of a city. Even with the rather moderate sized farms around our farm south of Winona, we are watching our well water nitrate count continue to elevate to a point we have to tell our guests it's up to them if they want to drink the water or bring their own, even though the water has good taste. It seems water is still taken for granted around here. Do our residents really want an eventual necessity of piping in water or carrying drinking/cooking/even bathing water for miles every day? If it can happen other places in the world, how soon before it happens here if the short sited sway of the political powers get their way?
Sincerely,
Joan Redig
rural Winona/Houston
joanredig@yahoo.com
I own an organic farm in southeastern Minnesota and am aware that the nitrate levels in our drinking water are rising.

I implore you to do everything possible to investigate and understand the environmental harm that the expansion of the Daley Mega-Dairy Expansion will cause.

What should be the first and foremost concern is the health of the people who live in this area. Unless there is adequate research to really know what potential dangers exist we are not getting the protection we deserve.

Lois Brink
Dear Kim Grosenheider and Commissioner Laura Bishop,

Once again, I urge environmental protection authorities to vigorously regulate and oversee farming and livestock operations (in this particular instance, the proposed Daley mega-dairy expansion), because human health and livelihood depend on healthy soil, water and air.

I live in Brown County, along the Minnesota River (recently called the most polluted river in Minnesota), in an area where creeks, streams and wells are increasingly polluted. Most of the local farmers try to be good stewards of the environment. Still, over-reliance on chemical fertilizers and pesticides, draining wetlands, plowing up buffer zones, mono-cropping, improper manure management, over-use of antibiotics for livestock, over-use of water to produce ethanol, etc. threaten food-producing resources, air quality, and human health.

I recently read Timothy Egan’s *The Worst Hard Time*, and viewed Ken Burns’ documentary about the Dust Bowl Era. History can repeat itself, and with a vengeance. Industrial agriculture and factory-style livestock operations may have short-term benefits, but they don’t work in the long-run. Their grim track-record includes polluted and depleted water, eroded and poisoned soil, foul air, antibiotic-resistant super-bugs, and compromised human health.

Communities, businesses and farmers should be good stewards of life-giving and -sustaining resources in their region. Regulatory and oversight agencies should do everything in their power to hold us all accountable.

I urge the MPCA to conduct a thorough environmental review of the proposed Daley Dairy expansion, and such a review must include an Environmental Impact Statement.

Sincerely,

Chris Loetscher
New Ulm, MN
MPCA staff members have never recommended an EIS on a large animal factory. Courage means following Minnesota law to protect all of Minnesota's citizens, not just those seeking to create profit at the expense of the environment. MPCA's new Supplemental EAW on greenhouse-gas emissions for Daley Farms' mega-dairy expansion application requires an EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION. The original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

We need Commissioner Laura Bishop to use the power she has under the Minnesota Environmental Policy Act (MEPA) to order an EIS or deny permitting on this massive animal factory proposal. Winona County's citizens, along with all southeastern Minnesota's karst region communities, are in a nitrate-induced drinking water crisis NOW. A number of studies have been published since October 2018 which link nitrates in drinking water to health issues, including cancer. It's time to STOP pouring gasoline on a fire by ignoring the consequences we know are presented by this factory farm.

Kay Slama
cell (320) 905-6051
slama@morris.umn.edu
Commissioner Bishop,

Reliable information tells me that MPCA’s new Supplemental EAW on greenhouse gas emissions for the Daley Farms expansion REQUIRES the following:

An EIS according to Minnesota Statute 4410.1700, Subpart 2a and
The original EAW requires an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

The groundwater contamination of my neighbors is more than a public health "nuisance".

Thank you for reviewing the data and issuing a new ruling that reflects the needs of good quality water for every-day citizens as opposed to giant operations.

Steve Bibby
Winona, MN
Hi Kim,

My name is Lisa Chou, I’m a 26-year-old graduate student the University of Minnesota, and I’m extremely concerned about climate change. I heard that the MPCA is assessing the greenhouse gasses (GHGs) of CAFOs like Daley Farms and wanted to ask for an EIS on the GHG supplement and the entire project. As someone who is studying food science and has worked in the food industry, I understand that the agriculture industry is responsible for a significant amount of Minnesota’s GHG emissions, and without urgent and massive changes, there is little hope that we can meet the goals outlined in the Next Generation Energy Act. If that happens, young people like myself and children across our state and world will be left dealing with the extreme climate, economic, and social outcomes caused by decisions that policymakers like the MPCA made. There are a few other points that the MPCA missed in the EAW that must be included for a comprehensive assessment:

- **benefits of alternative farming systems:** Well-managed grazing systems, more diverse crop rotations, and planting perennial grasses build soil health, protect water quality, and increase a farm’s resilience to climate impacts. The MPCA should encourage these alternatives to new or expanding CAFOs by specifically identifying mitigation measures to offset emissions.

- **undercounting emissions:** The MPCA significantly undercounted emissions by ignoring GHGs from building construction and associated energy use; transportation of manure, equipment, and milk; and increases associated with animal feed production.

- **climate risk:** When storms or floods hit, manure lagoons can breach and release their waste into the environment. This poses a massive risk to surrounding communities and waterways. As climate change worsens, Minnesota will experience more extreme weather events, including storms and floods. The MPCA did not account for the damage that breached or overflowed manure lagoons could cause.

- **faulty underlying assumptions:** "The Project will release air and odor emissions typically associated with a dairy farm" (Supplement to EAW). Around 86 percent of dairy farms in Minnesota have fewer than 200 cows. The Daley expansion -- adding 3,000 cows to its existing 1,500 -- would make this mega-dairy nine to 23 times bigger than the typical Minnesota dairy.

- **driving the dairy crisis:** The dairy crisis that is pushing thousands of small and midsized dairies out in Minnesota and Wisconsin is largely caused by an overproduction of milk, which drives prices down. Minnesota alone lost 315 dairies in 2019. The construction of large-scale mega dairies will increase this trend of overproduction, further threatening small to midsized dairy farmers in our state.
Please consider these important points and conduct a more thorough Environmental Impact Statement for Daley Farms so that everyone in Minnesota can have a more livable climate for years to come.

Sincerely,
Lisa Chou

--

Lisa Chou (she/her/hers)
Food Science M.S., Environmental Health minor, expected 2020
University of Minnesota-Twin Cities
lisa.chou@uwalumni.com | 920-940-4647
Kim Grosenheider  
Project Manager  
Daley Feedlot Expansion  

Ms. Grosenheider,

I am writing in support of the MPCA requiring an EIS for the Daley Feedlot Expansion.  

I am a lifelong resident of Houston County. I had a dairy farm for 37 years near La Crescent.  

While I no longer milk on my farm I am concerned about ground water contamination. I represented Houston and Fillmore County in the Minnesota House in 2007-2008. I was responsible for updating the 1989 Groundwater Protection Act during that session.  

You may recall that in August of 2007 we had 17 inches of rain in less than 24 hours. Because of that nearly 2 dozens large manure lagoons overflowed. As a result widespread ground water contamination occurred and a vary large number of private wells tested positive for elevated levels of coliform bacteria. It took a couple years for this to flush out of the groundwater. All of these lagoons were build according to state regulations at the time of their construction.  

The point being that often in our efforts to protect our natural resources, “we don’t know what we don’t know.” There are often too many variables and the variables are not easy to measure and mitigate.  

An EIS is a concerted attempt to reduce the amount of what we don’t know. There is substantial new research that has come out recently that raises more concerns about the impact of the Daley Feedlot Expansion on our groundwater. I know that others have submitted this information to you.  

I am particularly concerned that new research indicates that nitrates are concentrating in the aquifers in southeastern Minnesota.  

I realize that the scope of your present assessment is somewhat narrow and limited. In reading over the EAW, it’s clear the issue of greenhouse gas emissions have not been adequately addressed to date by MPCA.  

But I would also strongly argue to you and to Commissioner Bishop that former Commissioner Stine made a mistake in not ordering an EIS for the Daley Feedlot Expansion. Certainly in light of the new research that has come out recently it would
be appropriate for you to recommend and EIS to Commissioner Bishop and for her to order it.

Again, I hope you will take this opportunity to advocate to Commissioner Bishop that an EIS is necessary in response to recent new research indicating the potential impact of this proposal on southeastern Minnesota.

Thank you for considering these comments in reviewing the current EAW on the Daley Feedlot Expansion.

Ken Tschumper
1640 Tschumper Rd,
La Crescent MN. 55947
507-894-4248
ktschump@acegroup.cc
Dear Kim:

Our names are Herb Inderrieden and Carol Inderrieden, ages 75 and 72, respectively. We are residents of Grove Township, Stearns County, Mn, both born and raised here in Grove Twp. We are members of the Land Stewardship Project and request that you require an Environmental Impact Statement be done on the projected expansion of the Daley Dairy Farm in Winona County, MN. Here in Stearns County, Grove Twp., we are rural residents surrounded by two large dairy operations, one within a mile of us with 300 cows and another about 2 miles away of 700 cows. When they chisel in the liquid manure, we can hardly stand it. In addition, our well water is high in nitrates and contaminants and questionable as safe for us to drink. Stearns County is and particularly our township is not recognizable in comparison to when we were children growing up here. We both grew up on small diversified dairy farms. Most woods, swamps and trees in our area have been destroyed by row crops and large dairies. Ag practices these past 20 years have almost eliminated gophers, garter snakes, most desirable birds and small desirable creatures. There are very few pheasants and desirable game birds around these days. Between the ag chemicals and habitat destruction, the rural quality of life out here in Stearns County has been greatly reduced by “Big Ag” operations. Please don’t let this happen to the rural residents of Winona County. If you need verification of how this area has changed over the past 30-40 years, check with our daughter, Carla Inderrieden, who works in the St Paul office of MPCA as a sustainability coordinator; she will tell you. She can attest to how rural MN has changed, not for the better. Please again, require an EIS of Daley Farms. Thanks for your time.

Herb & Carol Inderrieden
34974 Overton Rd
Melrose MN 56352
Dear Ms. Grosenheider,

I am writing in regard to the proposed expansion of Daley's Farm in Winona County. As a member of the Land Stewardship project, and a citizen concerned for the health and safety of my fellow Minnesotans, I would like to urge you to ask Commissioner Laura Bishop to order an Environmental Impact Statement or to deny permitting for the expansion of cows at Daley's Farm. The massive increase of animals is likely to be a burden on the water supply, air quality, and other parts of life in Winona County. While I understand that the state wishes to encourage industry, this seems like a proposal that will damage the area in the long run.

People all over the state can be concerned about moves like this. Please do the right thing for citizens and the environment.

Sincerely,
Laurel Zaepfel
teamzaepfel@gmail.com
An EIS is in order for the super large dairy farm proposals, especially in areas of MN where sensitive groundwater resources are at risk.
Hello,

I am a farmer, a daughter of a farmer, and a healthcare provider. And, I know that I and all Minnesotans deserve to share clean air and water which is essential for life. So I am deeply concerned about the risk of contamination of the shared aquifer posed by the expansion of the Daley Farms dairy farm in Winona County.

The karst ground of this region makes it especially vulnerable to contamination, and this risk calls for the highest level of assessment before permitting another industrial agricultural operation that might cause significant health problems, including cancer, for this region far into the future. The previous EAW did not do justice to the residents of this area.

I respectfully request that Commissioner Bishop use the power that she has under the MEPA to order an EIS or deny permitting of this operation of such a size that has the potential to harm so many people. Doing so would help to reassure Minnesotans that the Commissioner believes that the environmental review and enforcement system is working to protect the air and water that we all share, not the financial interests of a few.

Thank you,

Theresa Zeman
507.330.2151 mobile
former resident of rural Winona County

Kindness is in our power, even when fondness is not.

Samuel Johnson
Dear MPCA,

Please conduct an in-depth environmental impact report: on the one end this could show us if there are potentially disastrous impacts on our shared resources; or on the other end, it would calm and address our fears that it could. The expansion of gigantic farms has the potential to have devastating effects on the shared, public resources that make Minnesota great and that impact people's lives: they can pollute the air we breathe and water we drink, have major impacts on the water table, let alone the economic impact on small, often family farmers. At the very least, this is concern that is on many people's minds, and the MPCA could, in service to the public, address that concern through a trusted report. It's of the utmost important that before an expansion like this happens, the public has all of the information about the potential impacts.

Thank you,

Sean

(Sent via Greener Pastures)
Name: Rose Kelly

Email: rosekelly17@gmail.com

Subject: Public Comment - Do a thorough environmental review of Daley Farms proposed expansion

Message: Failing to conduct a thorough environmental review of the proposed Daley Farms expansion is a failure of our government's duty to protect the safety of our people and our environment. Combating climate change should be a priority and I believe this expansion would threaten our environment. But without a thorough environmental review we cannot be sure. Please put the lives of your constituents and their environment before factory farming. Conduct an environmental review of the proposed Daley Farms expansion.

(Sent via Greener Pastures)
From: Squarespace
To: Grosenheider, Kim (MPCA)
Subject: Form Submission - Public Comment - Daley Farms expansion - Public Comment: do an EIS thorough environmental review of the proposed Daley Farms expansion
Date: Friday, March 6, 2020 5:22:25 PM

This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Name: Sarah Carroll

Email: togreenerpastures@gmail.com

Subject: Public Comment: do an EIS thorough environmental review of the proposed Daley Farms expansion

Message: To whom it may concern,

The MPCA should conduct an environmental impact statement and do a thorough environmental review of the proposed Daley Farms expansion in Utica Township, Winona County, MN.

No factory farm should harm our environment or public health. Yet the proposed Daley Farms expansion is extremely troubling- between the massive greenhouse gas emissions and the threats of manure entering drinking water in this delicate karst landscape, the Daley Farms expansion presents real risks to our health and environment. The public lacks information about the comprehensive impact of this expansion.

According to MCEA and Land Stewardship Project:

1. With the expansion, Daley Farms would emit 1,217,247 kg of methane per year, making it the 43rd largest greenhouse gas emitter in the state.

2. Daley Farms is located in karst region, a geological feature that makes it easy for runoff to enter groundwater and pollute residents’ drinking water. There are sinkholes near proposed manure-spreading areas, making it unacceptably risky that manure will enter groundwater.

3. Daley Farms has 1728 cows right now. The expansion would bring the number of cows to 4628. In contrast, the typical dairy in Minnesota has 200-500 cows.

4. The expansion means Daley Farms would generate 46.2 million gallons of manure per year, which it proposes spreading on a 10 mile radius of cropland nearby.

We need a food and farming system that puts our environment and health first. We should be doing everything we can to support pasture-based, regenerative farms- not greenlighting factory farms to get even bigger without doing sound analysis on the true impacts communities face.
I urge the MPCA to conduct a thorough environmental impact statement to properly review the impacts of the Daley Farms proposed expansion.

Sincerely,
Sarah Carroll
Founder and Director of Greener Pastures
togreenerpastures@gmail.com
Minneapolis, MN

(Sent via Greener Pastures)
Name: Brandi Bonde

Email: harmonyfarmreiki@gmail.com

Subject: Public comment: environmental hazards of mega dairy

Message: There needs to be a thorough impact review of the proposed expansion of the Daley Farm, including increased traffic, smell, impact to surrounding property values, run-off and water quality.

(Sent via Greener Pastures)
Name: Hannah Shireman

Email: hshirema@gmail.com

Subject: Public Comment: the Daley Farms Expansion Deserves a Thorough Environmental Review

Message: Dear Kim Grosenheider,

I am writing to you to express concerns I have after learning about the potential expansion of the Daley Farm in Utica Township in Winona County. As I am sure you know, farms of this scale can have negative environmental impacts that the average citizen may not know about. I grew up in an agricultural community and have only recently learned about the harmful effects of things like groundwater degradation that large farm operations can cause. It is up to experts like you to ensure this information is available to citizens.

The work you do at the Minnesota Pollution Control Agency to monitor environmental quality is incredibly important. I hope you will take the steps necessary to ensure this project is not negatively impacting our public or environmental health.

I am specifically asking that your office conduct a thorough environmental review of this proposed expansion before allowing the project to move forward. This project is huge and I believe it is important to fully understand how the Daley Farms expansion will impact our land, water, and air.

Thank you for the work you do to protect our environment as well as your thoughtful consideration of this request.

Best,
Hannah Shireman

(Sent via Greener Pastures)
This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Name: Julia Wilber

Email: juliaannwilber@gmail.com

Subject: Through environmental review of Daley Farms Expansion

Message: We need a thorough environmental review of the proposed Daley Farms Expansion.

With the expansion, Daley Farms would emit 1,217,247 kg of methane per year, making it the 43rd largest greenhouse gas emitter in the state. Daley Farms is located in karst region, a geological feature that makes it easy for runoff to enter groundwater and pollute residents’ drinking water. There are sinkholes near proposed manure-spreading areas, making it unacceptably risky that manure will enter groundwater.

An environmental review here is critical because Daley Farms is located on delicate karst geography- manure can enter into karst features and enter groundwater, polluting people’s drinking water. And Daley Farms is projected to emit over 1.2 million kg of methane every year, contributing to climate pollution when we should be focused on reducing our greenhouse gas emissions.

(Sent via Greener Pastures)
Hi Kim,

Please find the above referenced comments of Fresh Energy attached.

Kind regards,
Margaret

Margaret Cherne-Hendrick, PhD
Director, Beneficial Electrification
Fresh Energy
Direct 651 294 7143 | Mobile 541 829 9944 | she/her/hers
www.fresh-energy.org | @MCherneHendrick

Practical policy. Brighter future. **Support our work today.**
STATE OF MINNESOTA
POLLUTION CONTROL AGENCY

March 6, 2020

In the Matter of Draft Supplemental
Environmental Assessment Worksheet
for Daley Farms of Lewiston, LLP 2018
Dairy Expansion

COMMENTS OF FRESH ENERGY

Fresh Energy appreciates the opportunity to submit comments on the Supplemental Environmental Assessment Worksheet (“EAW”) for the proposed dairy expansion of Daley Farms of Lewiston, LLP (“Daley Farms”).

Fresh Energy requests that MPCA revise the Supplemental EAW as described in this comment to include an assessment of methane emissions using current global warming potential (GWP) values as determined by the Intergovernmental Panel on Climate Change (IPCC), evaluated at both 20- and 100-year time horizons, to fully assess the project’s environmental and climate effect. We also recommend that MPCA assess improved calculations of warming-equivalent emissions, such as GWP*/GWP-we, for short-lived climate pollutants like methane.²

INTRODUCTION
The global warming potential (GWP) of a greenhouse gas is used to build predictive models of climate change, evaluate and prioritize emissions regulations, and better understand the drivers of global climate change. As such, the GWP assigned to a greenhouse gas has far-reaching environmental, political, and economic consequences. The GWP metric has long been identified as an oversimplified model, desirable for its simplicity, transparency, and comparability among different greenhouse gases.

¹ IPCC. 2013. AR5 Climate Change 2013: The Physical Science Basis, page 714. Link
However, greenhouse gases are highly variable, both in their residence time in Earth’s atmosphere as well as their post-emission atmospheric interactions.

GLOBAL WARMING POTENTIAL
Global warming potential (GWP) is a measure developed to quantify the relative effects of greenhouse gases on global climate change. The GWP index provides a time-integrated measure of the radiative forcing (RF, measured in Watts/meter$^2$) of one kilogram of a greenhouse gas released to the atmosphere relative to that of carbon dioxide, a metric otherwise known as a ‘CO$_2$ equivalent’. Radiative forcing is a time-integrated measure of radiative efficiency (Watts/meter$^2$ x ppb), a per molecule measure of how effective a gas is at restricting long-wave radiation from leaving Earth’s atmosphere and escaping back to space.

No greenhouse gas is identical. Different greenhouse gases have very different RF potentials, post-emission atmospheric interactions, and residence times. For example, carbon dioxide has a lifetime of around 100 years while that of methane is only about 12 years. Despite this difference the 100 year time horizon has become the standard for comparison across greenhouse gases. This time horizon was chosen, rather arbitrarily, as a compromise to simultaneously evaluate both long- and short-lived climate pollutants.

SHORT-LIVED CLIMATE POLLUTANTS
Although all IPCC reports reference at least three different time horizons under which to evaluate greenhouse gas emissions in Earth’s atmosphere (20-year, 100-year, and 500-year), most primary scientific literature leading up to the Kyoto protocol as well as climate policy following the Kyoto protocol has adopted the 100 year horizon as standard. The demand to make GWPs comparable across many gases necessarily sacrifices a great deal of accuracy in determining actual effects on climate change. In particular, use of the 100 year time horizon does not reveal the true warming potential of short-lived climate pollutants like methane.

---

3 IPCC. 1990. AR1: Scientific Assessment of Climate Change. Link
Table 1  GWP and atmospheric lifetime for two of the most effective greenhouse gases; carbon dioxide and methane. As carbon dioxide is the reference for GWP, its associated values are all listed as one. Climate-carbon feedbacks (cc fb) refers to the post-emission atmospheric interactions between temperature change, atmospheric carbon dioxide levels, and the carbon cycle (with higher global temperatures, the sequestration of carbon in land and ocean sinks is forecasted to decline).

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Chemical Formula</th>
<th>Lifetime (years)</th>
<th>GWP 20 years</th>
<th>GWP 100 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>100.0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Methane (AR1, 1990)⁷</td>
<td>CH₄</td>
<td>10.0</td>
<td>63</td>
<td>21</td>
</tr>
<tr>
<td>Methane (AR2, 1995)⁸</td>
<td>CH₄</td>
<td>12.0 ± 3</td>
<td>56</td>
<td>21</td>
</tr>
<tr>
<td>Methane (TAR, 2001)⁹</td>
<td>CH₄</td>
<td>12.0</td>
<td>62</td>
<td>23</td>
</tr>
<tr>
<td>Methane (AR4, 2007)¹⁰</td>
<td>CH₄</td>
<td>12.0</td>
<td>72</td>
<td>25</td>
</tr>
<tr>
<td>Methane (AR5, 2013) no cc fb¹¹</td>
<td>CH₄</td>
<td>12.4</td>
<td>84</td>
<td>28</td>
</tr>
<tr>
<td>Methane (AR5, 2013) with cc fb¹²</td>
<td>CH₄</td>
<td>12.4</td>
<td>86</td>
<td>34</td>
</tr>
</tbody>
</table>

Additionally, the GWP for methane has been updated over time as the IPCC has refined its assessment of post-emission atmospheric interactions when calculating RF (Table 1). However, many state and federal agencies have been slow to adopt the most current global warming potential (GWP) values as determined by the IPCC, even under a 100 year time horizon (Table 2).

---

⁷ IPCC. 1990. AR1: Scientific Assessment of Climate Change, page 60. Link
⁹ IPCC. 2001. TAR Climate change 2001: The Scientific Basis, page 47. Link
¹¹ IPCC. 2013. AR5 Climate Change 2013: The Physical Science Basis, page 714. Link
¹² Id.
Table 2  GWP values and time horizons for methane used by the various federal, state agency, and local government to inform greenhouse gas inventories.

<table>
<thead>
<tr>
<th>Organization</th>
<th>GWP, 20 years</th>
<th>GWP, 100 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Agency</td>
<td>NA</td>
<td>25</td>
</tr>
<tr>
<td>Minnesota Pollution Control Agency</td>
<td>NA</td>
<td>25</td>
</tr>
<tr>
<td>City of Minneapolis</td>
<td>NA</td>
<td>28</td>
</tr>
</tbody>
</table>

In general, the GWP metric is problematic because it is based on RF and does not actually reflect the impact of greenhouse gas emissions on global temperature.\(^{16}\) Greenhouse gases have different residence times, variable RF values, and different emission regimes (ie. pulse vs. consistent production). Therefore, a gas’ ability to trap long-wave radiation in the Earth’s atmosphere, alone, is not a good measure of its cumulative impact on the Earth’s climate.\(^{17,18}\) Given the clear limitations of the GWP metric, there is now growing interest in developing and adopting improved calculations of warming-equivalent emissions.\(^{19,20}\)

CONCLUSION

Current atmospheric concentrations of methane are higher than they have been within the last 800,000 years and they are continuing to rise at record rates (Figure 1).\(^{21}\) In light of these realities, many within the scientific\(^{22}\) as well as agricultural communities\(^{23}\) are calling for a reevaluation of the GWP metric. The GWP*/GWP-we is one such metric that shows potential in capturing the different behaviors of both long- and

---


\(^{15}\) City of Minneapolis. Minneapolis Greenhouse Gas Emissions Tracking. Accessed 3-6-20. [Link](#) (contact the City Coordinator’s Division of Sustainability, Luke Hollenkamp at Luke.Hollenkamp@minneapolismn.gov, for current protocols)


\(^{17}\) Id.


\(^{19}\) Shine. 2009. The global warming potential – the need for an interdisciplinary retrial. Climate Change. 96:467-472.


\(^{23}\) National Farmers Union. Farming organisations ask IPCC to consider new GHG metric. Accessed 3-6-20. [Link](#)
short-lived climate pollutants as well as their impact on global mean surface temperature.²⁴

**Figure 1** Concentrations of methane in Earth’s atmosphere from 1983 to 2020.²⁵

With respect to the Daley Farms Supplemental EAW, we recommend that MPCA assess improved calculations of warming-equivalent emissions, such as GWP∗/GWP-we, with special attention given to short-lived climate pollutants like methane. At a minimum, we request that MPCA revise the Supplemental EAW to include an assessment of methane emissions using current global warming potential (GWP) values as determined by the IPCC,²⁶ evaluated at both 20- and 100-year time horizons, to fully assess the project’s environmental and climate effects.

---
²⁶ IPCC. 2013. AR5 Climate Change 2013: The Physical Science Basis, page 714. [Link](#)
/s/ Margaret Cherne-Hendrick
Fresh Energy
408 Saint Peter Street, Suite 220
St. Paul, MN 55102
651.294.7143
cherne-hendrick@fresh-energy.org
Dear Commissioner Bishop,

I am a member of the Land Stewardship Project concerned about the effects of large scale farming on our state’s land, air and water, and farming communities. I’m writing in support of residents in Winona County who will be negatively impacted if a proposed expansion of Daley Farm is allowed to proceed.

Daley Farm is already in violation of Winona County’s animal unit cap of 1,500 animal units. Their proposal to expand their dairy herd by 3,000 cows will put them at almost four times that cap. This will only add to the strain on the region’s water supply and air quality, not to mention exacerbate climate change for us all by the increase in greenhouse gas (GHG) emissions the cows will emit. At the very least, an Environmental Impact Statement (EIS) that includes a GHG component needs to be conducted on this proposed project. In fact, Minnesota law requires it.

I’m asking you to order an EIS for this project; if not, then to deny their expansion permit altogether.

Sincerely,
Lori Wellman
Kim,

My name is Pete Sajadi, I was born and raised in Minneapolis Minnesota, so many things
make this place special, the Mississippi River, 10,000+ lakes, boundary waters, Diversity of
cultures, memories and loved ones.

The sad part I see as well as many others is the destructive Factory Farms and Conventional
Agro-chemicals industry that have contaminated the environment we call home.

The facts are out, the Agro-chemical corporations corruptions, the falsehood deceptions
exposed. Did you know that Monsanto (now merged with Bayer) have and are being displayed
worldwide for their dark history in spreading of toxic chemicals such as: Agent Orange,

Round Up has poisoned and killed more than just weeds, and is currently revealed as not
safe/nor edible and Monsanto has and is being exposed for trying to cover up its dangers to the
people, the animals and the environment.

See...

https://usrtk.org/pesticides/glyphosate-health-concerns/

https://www.gmwatch.org/en/

Excellent podcast series that expose the dangers from Glyphosate/Round Up:
https://www.stitcher.com/podcast/jeffrey-smith-2/live-healthy-be-well

Kim please be honest and look around, the Climate is changing, the Factory Farm Animals
Tortured and Suffering, The once beautiful Mississippi River has been contaminated with the
Factory Farm runoff/Fertilizer/chemicals, the Gulf of Mexico has huge dead zones where the
Mississippi pours into, our Prairie grasslands and much needed plantlife root systems have
been decimated our groundwater supplies contaminated.

It's overwhelming and these are the clear and factual consequences of the destructive practices
in our Nations Conventional Agriculture/Chemical industry.

A recent article in the Star Tribune shows...
"Minnesota’s honeybee and native bee populations have been cut to a fraction over the past 20
years, while monarch butterflies have fallen by at least 70% across the continent.
Up the food chain, once-common prairie birds such as redheaded woodpeckers have been nearly wiped out of Minnesota, along with hibernating bats and other species.

The main culprit over and over again is some combination of a loss of habitat, a loss of food along with increased pesticide use or an introduction of disease."

Article can be read here: http://m.startribune.com/restoring-the-health-of-grasslands-isn-t-as-simple-as-converting-farmland/567809952/

Article on Dead Zone in Gulf of Mexico

Article in Factory Farms/Agro-chemicals contaminated are water sources

What's the Solution and Action we must take now?

We must Turn from promoting/supporting Factory Farms and We must Turn from using these destructive Agro-chemicals/mutant Genetically Altered crops. We must begin truly caring for the land and lead by example in being good stewards of the environment. We must join the Regenerative Agriculture Movement and begin learning to work in harmony with the amazing Biodiversity in healthy ecosystems that are free from Factory Farms, GMOs and Chemicals.

The Voice in the Wilderness is crying out: The soil, the land, the plants, the forests, the water, the air, the animals, the birds, the bees, the honest people, we all stand and bear witness that we cannot continue in destroying the earth.

Please do not close your eyes and ears to this cry, Please do your part in the healing and care for our home.

Please see the link below to see a Beautiful Story of Minnesota Farmer transiton to Regenerative Agriculture...

https://farmersfootprint.us/watch/

Additional information on the Regenerative Agriculture movement and Beneficial resources...

https://regenerationinternational.org/
https://mainstreetproject.org/
https://landstewardshipproject.org/
https://rodaleinstitute.org/
http://beesafempls.org/
https://www.centerforfoodsafety.org/
https://responsibletechnology.org/
https://www.gmwatch.org/en/

In Truth and Love from
Pete Sajadi in Fridley MN
#6122673487
Please be honest we cannot continue to take the Agro-chemical corporations bribes that have manipulated and exploited our Nation and natural resources.

Sent from my Sony Xperia™ smartphone

---- Original Message ----
Subject: Tell Minnesota to Get Serious About Climate and Agriculture
Sent: Mar 5, 2020 7:54 PM
From: Sarah Riedl <sarahr@mn350.org>
To: MN350 Solutions <mn350-solutions@googlegroups.com>
Cc:

In case anybody missed the MN350 email that went out today, our team has assembled some talking points and instructions for submitting comments! It's super easy to do - all it takes is an email - so please take a few minutes to read over the talking points, pasted below. Thanks in advance to everyone who takes this opportunity to influence the MPCA's methodology and advocate for a more regenerative food system!

-Sarah

For the first time, the Minnesota Pollution Control Agency (MPCA) is assessing the greenhouse gas emissions of a concentrated animal feeding operation (CAFO) in its environmental review process. This is precedent-setting, and MN350's Food Systems Team is taking the opportunity to influence the state's decisions about new and expanding CAFOs. Agriculture and forestry account for a quarter of Minnesota's greenhouse gas emissions, and the state will not meet its climate goals outlined in the Next Generation Energy Act without changes in the agriculture sector.

This process is the result of a proposed expansion by Daley Farms. The farm is in Winona County, in the state's karst region, an environmentally sensitive area prone to groundwater contamination. The greenhouse gas emissions from Daley Farms would be significant and will hinder Minnesota's ability to meet its climate goals. Yet the Daley Farms Environmental Assessment Worksheet (EAW) inadequately assesses the farm's environmental impacts, is filled with faulty assumptions, and ignores the urgency of the climate crisis. The MPCA is accepting comments until 4:30 p.m. Friday, March 6, and we must tell the agency to move beyond this inadequate EAW and order a full Environmental Impact Statement (EIS).

You can easily submit your comments via email to the MPCA's Kim Grosenheider. For optimal impact, write in your own words, share a bit of your experience (as an MN350 member, farmer, rural resident, etc.), and ask for an EIS on the greenhouse gas supplement and the entire project. Or ask the MPCA to deny permitting.
Below are just a few critical points that the MPCA missed in the EAW and that need to be included in a truly comprehensive assessment:

- **Downplaying the climate crisis:** The MPCA downplayed the urgency of the climate crisis in multiple ways. First, it measured the methane emitted by dairy cows and their manure on a 100-year timeframe rather than a more-accurate 20-year timeframe that reflects the urgency of the climate crisis. Second, the MPCA assessed Daley Farms’ greenhouse gas emissions in terms of its contribution to global climate change. No single project in Minnesota could measurably impact climate change on a global scale, and the MPCA must consider Daley Farms’ emissions in terms of Minnesota’s climate goals.

- **Ignoring the climate benefits of alternative farming systems:** The MPCA did not fully examine the climate benefits of alternative farming systems. Well-managed grazing systems, more diverse crop rotations, and planting perennial grasses build soil health, protect water quality, and increase a farm’s resilience to climate impacts. The MPCA should encourage these alternatives to new or expanding CAFOs by specifically identifying mitigation measures to offset emissions. The Daley Farms EAW identifies just one CO2 mitigation measure -- planting alfalfa -- which would reduce the project’s greenhouse gas pollution by just 1,000 tons per year, or about 3 percent of the more than 32,000 tons of CO2 equivalent emissions expected from this project.

- **Undercounting emissions:** The MPCA significantly undercounted emissions by ignoring GHGs from building construction and associated energy use; transportation of manure, equipment, and milk; and increases associated with animal feed production.

- **Climate risk:** When storms or floods hit, manure lagoons can breach and release their waste into the environment. This poses a massive risk to surrounding communities and waterways. As climate change worsens, Minnesota will experience more extreme weather events, including storms and floods. The MPCA did not account for the damage that breached or overflowed manure lagoons could cause.

- **Faulty underlying assumptions:** "The Project will release air and odor emissions typically associated with a dairy farm" (Supplement to EAW). Around 86 percent of dairy farms in Minnesota have fewer than 200 cows. The Daley expansion -- adding 3,000 cows to its existing 1,500 -- would make this mega-dairy nine to 23 times bigger than the typical Minnesota dairy.

- **Driving the dairy crisis:** The dairy crisis that is pushing thousands of small and midsized dairies out in Minnesota and Wisconsin is largely caused by an overproduction of milk, which drives prices down. Minnesota alone lost 315 dairies in 2019. The construction of large-scale mega dairies will increase this trend of overproduction, further threatening small to midsized dairy farmers in our state.

The MPCA is accepting comments until 4:30 p.m. on Friday, March 6. We encourage you to share your concerns about the current EAW and call for a more thorough Environmental Impact Statement that would ensure a deeper consideration of the important issues listed above. Email comments to:

Kim Grosenheider (kim.grosenheider@state.mn.us)
Resource Management and Assistance Division
Minnesota Pollution Control Agency

Thank you for supporting our vision of a more regenerative food system!

Sarah Riedl
MN350 Food Systems Team

--
You received this message because you are subscribed to the Google Groups "MN350 Solutions" group.
To unsubscribe from this group and stop receiving emails from it, send an email to mn350-solutions+unsubscribe@googlegroups.com.
To view this discussion on the web visit https://groups.google.com/d/msgid/mn350-solutions/e1c1878f-2714-4cde-bc9d-d115909ae7b6%40googlegroups.com.
Hello Ms. Grosenheider,

Please receive my attached comments regarding the Daley Farm of Lewiston proposed expansion.

Thank you,

Tim Ahrens
In the Findings of Fact, MPCA used the phrase “beyond the scope” 68 times to dismiss over 30 citizen-raised issues. These were the issues raised:

1. commenters concerned the project will reduce their quality of life
2. commenter asks MPCA to consider events that seem unlikely but could cause damage to the environment (ex. of frac sand mine incident where they had to breach the retaining wall)
3. commenters state that Daley’s existing operations exceed the Winona County AU cap
4. commenters ask if Daley is allowed to exceed the Winona County AU cap when others are denied exception from the AU cap
5. commenter asks how many AUs Daley had at the time of the Winona County AU cap ordinance passage and how many they have today
6. commenters concerned about the process and financial burden of the DNR well dispute process
7. commenters state that when nitrates are found in drinking water, follow up tests often show that the same wells and aquifers are contaminated with pesticides, and that the EAW does not address pesticide measurement and mitigation
8. commenter asks if the nitrogen drinking water standard is reasonable and how the project will change nitrogen in drinking water
9. commenter states that the EAW contains no analysis of project stormwater runoff impact on water quality, water temperature, turbidity, sediment load, and nutrient, pathogen, and pesticide contaminants in affected trout streams
10. commenters ask how damage would be undone and how much time restoration might take if there was a manure pit failure
11. commenter ask what volume of rainfall would cause the manure basin to overflow, if it is at 90% capacity when the rainfall begins
12. commenter asks how Daley’s proposed expansion would impact the resilience of the region to withstand frequent extreme weather events
13. commenter states that there was no analysis of traffic safety on Hwy 14 (additional accidents and fatalities expected from increased traffic/road use)
14. commenter asks if the project will emit neonicotinoid insecticide dust in the cropland acres, which has been linked to colony collapse disorder in honeybees and the decline of native pollinators.
15. commenters ask why MPCA oversight and enforcement should be trusted when the MPCA has for years had full awareness of active noncompliance with the zero discharge requirement at Daley’s existing operations
16. commenter ask why there are not governmental agencies taking enforcement action and public meetings over farming operations that don’t take care of their land and cause soil erosion
17. commenter ask why there are not governmental agencies taking enforcement action over farming operations that apply too much nitrogen in the form of commercial fertilizers
18. commenters state that the economic impacts of the operations needs to be analyzed, including the impacts to neighboring family-owned and moderate-size dairy farms
19. commenters state that the project proposer ignored labor laws
20. commenter states concern over the low price of milk and asks how the proposer will make a go at it without cutting corners in safety, quality, and animal welfare
21. commenter is concerned the project will reduce real estate values
22. commenter asks what the health impacts are on humans from consuming milk with pesticide residues
23. commenter asks how many dairy cows are there today compared to five years ago
24. commenter states that dairies are immoral
25. commenters state that the project promotes animal cruelty
26. commenter states the decline of pollinators and asks if Daley uses Roundup Ready crops and seeds treated with neonicotinoid insecticides
27. commenter asks how big factory farms must get before we realize we have lost all perspective, common sense, and dignity regarding the way we raise our food (corporate farming/corporate economics forcing out small farmers)
28. commenter states that consumers are increasingly concerned that non-organic milk contains pesticide residues and asks if the milk from Daley contains pesticide residues
29. commenter asks if there are any mechanisms in the EAW process to allow for input from youth under 18
30. commenters state that dairy is detrimental to human health
31. commenter asks what the life expectancy of the proposed expansion is
32. commenter suggests that guidelines be developed for mega-dairy farms in Minnesota so that future requests are placed within a forum that does not pit environmentalists against business and economic interests (too much US vs. THEM in our discourse)
33. commenter asks what the average mortality rate for a dairy farm in Minnesota is and how that compares to Daley’s project mortality rate

While these concerns may very well be beyond the scope of an EAW, a majority of them are precisely within the scope of an EIS.

Regarding Response Comment 8-12 – commenter asks how Daley’s proposed expansion would impact the resilience of the region to withstand frequent extreme weather events. As stated in Minn. R. 4410.1700, Subpart 7, “In deciding whether a project has the potential for significant environmental effects, the following factors shall be considered, ... cumulative potential effects. The RGU shall consider the following factors: whether the cumulative potential effect is significant; whether the contribution from the project is significant when viewed in connection with other contributions to the cumulative potential effect; the degree to which the project complies with approved mitigation measures specifically designed to address the cumulative potential effect; and the efforts of the proposer to minimize the contributions from the project.” This concern couldn’t be more relevant and couldn’t better epitomize the definition of cumulative environmental effects laid forth in the criteria. For those reasons, I’ll ask again, “how would the Daley’s proposed expansion impact the resiliency of the region to withstand frequent extreme weather events?”

Regarding Response Comment 13-1 – commenters state concern over antibiotics use in the project and antibiotic resistance development. I understand that the FDA only allows antibiotics for animal health, but that doesn’t mean that antibiotics won’t be used, collected in manure lagoons, and applied to fields, which in turn means an EIS is required to study these potential environmental effects.

Regarding Response Comment 15-20 – the commenter asks what contaminants are found in process wastewater that is added to the manure basin (including chlorine, acids, detergents, antibiotics, chlorhexidine, and barn pesticides) and how this impacts soil organisms, groundwater, and drinking water when applied to the soil. The MPCA’s response simply states that Daley’s will continue to clean
their milking equipment and discharge wastewater that is added to the manure basin. This does not answer the question but instead validates a need for a researched answer. The MPCA’s response confirms that cleaners are being discharged into manure lagoons and eventually manure application sites. The response does not address the clear potential for significant environmental impact due to the land application of these contaminants. An EIS is the only proper avenue for analyzing the discharge of chlorine, acids, detergents, antibiotics, chlorhexidine, and barn pesticides and their cumulative effects. This also isn’t the first time within this MPCA Findings of Fact that the MPCA failed to properly address antibiotic use and discharge. The responses to comments regarding antibiotic use are a twisted maze of evasion, jumping response to response (“see responses to comments _____”) without ever actually answering the question about how antibiotic use within the project will impact the environment. This is especially concerning given the proposed drastic increase in animal units, which in turn will mean a drastic increase in the amount of antibiotics used within the facilities. Combine that with the fact that animals are shown to require more medication in a CAFO environment. I would like to request that antibiotic usage and the subsequent land application and impacts on groundwater and surface water be examined in an EIS.

The MPCA presents a list of seven options in which Daley’s will utilize two or more of the practices for manure application. Within the Findings of Fact, the MPCA presents this list of options 10 times in response to submitted concerns. At the simplest level, there are 21 potential combinations of two manure application practices (7 choose 2). To know the mitigation potential of these combinations of practices would require at least 21 separate analyses not present in the EAW. For example, how has the MPCA projected the total potential mitigation value of the combination of #1 and #2? How has the MPCA projected the total potential mitigation value of the combination of #1 and #5? How has the MPCA projected the total potential mitigation value of the combination of #3 and #5? How has the MPCA compared the potential mitigation effects of each of these potential combinations? For what duration must Daley’s maintain the same combination of manure application? How does the MPCA and the EAW take this into account? Please don’t use this list 10 times in the Findings of Fact and add it to the NPDES draft permit and then tell me that questioning the full extent of potential manure application combinations is “beyond the scope of the EAW.”

In Daley’s very township and in their very neighborhood, the over-concentration of animal agriculture and the over-application of nitrogen has more than the potential for significant environmental effects. The over-concentration of animal agriculture and the over-application of nitrogen have been the demonstration of significant environmental effects. According to the Minnesota Department of Agriculture, an estimated 1,324 residents of Winona County have water that isn’t safe to drink. We can only expect this number to increase. Anthony Runkel from the Minnesota Geological Survey and the University of Minnesota tells us that nitrate levels are continuing to increase in the aquifers that we’re drinking from. It is insanity to introduce even more of the same contaminate that is already preventing 1,324 residents from having access to safe drinking water, especially in absence of a full EIS.

I would also like to note that two of the comments previously submitted appear to be inaccurate or partially missing. Comment #10 submitted by Amy Cordy appears to be missing the back page of her hand-written comment (the sentence is clearly cut off and there is an arrow drawn on the page indicating that the comment continues on the back side). Comment #190 submitted by Kevin is duplicated and also shown in the row for comment #191 which is allegedly supposed to be from Mike.
Buringa but is clearly signed by Kevin Schmitz. I assume this was a simple error but consider each comment to be a valuable part of the record.

Finally, as you know, and I assume you may have been present, on May 1st, 2019 the Environmental Quality Board met. A large portion of the meeting was a reflection and suggestions for improvement to the environmental review process. John Herman, whom I understand played a major role in founding the environmental review process said, “Alternatives are key...MEPA depends upon an analysis of alternatives.” He also mentions that economic considerations alone are not themselves a defense. John Herman suggests that in evaluating alternatives, Minnesota Environmental Reviews would receive an F because it simple isn’t being done. Fortunately in the case of the Daley’s proposed expansion, the Winona County Board of Adjustments has already concluded there are reasonable alternatives.

The Board recognized the only reason to concentrate animals and manure to this extreme is economic which isn’t itself a defense. It is a feasible alternative to board these thousands of animals and millions of gallons of manure on multiple sites. The Winona County Board of Adjustment’s decision represents a material change in Daley’s EAW. The EAW under Section 10 titled Permits and Approvals Required: Animal Unit Cap Variance states the variance is to be applied for. That status is no longer accurate as the variance has been denied.

We ask that you find, as our county has already found, that the alternatives to this permit proposal are more reasonable than the proposal itself. We ask that you elect not to consider Daley’s permit application in light of the fact that Daley’s have been denied permits and approvals that Section 10 of their EAW require.

Thank you very much reviewing these comments and concerns. Please make the decision that does the best to protect and improve the environment and human health.
Dear Kim,

Please find attached official comments from the Institute for Agriculture and Trade Policy on the Draft Supplemental Environmental Assessment Worksheet for Daley Farms of Lewiston, LLP 2018 Dairy Expansion.

Thank you,

Tara Ritter  
Senior Program Associate 
218-831-0763  
Institute for Agriculture and Trade Policy  
www.iatp.org
Institute for Agriculture and Trade Policy  
Comments on the Draft Supplemental Environmental Assessment Worksheet for Daley Farms of Lewiston, LLP 2018 Dairy Expansion

The Institute for Agriculture and Trade Policy (IATP) thanks the Minnesota Pollution Control Agency (MPCA) for the opportunity to comment on the draft Supplemental Environmental Assessment Worksheet (SEAW) for Daley Farms of Lewiston, LLP 2018 Dairy Expansion.

IATP is a 33-year-old organization based in Minneapolis. We work at the local, state, national and international levels to create fair and sustainable agriculture and trade systems. IATP was born in response to the family farm crisis of the 1980s, and we continue to pursue policy solutions that benefit family farmers, rural communities and the environment. Minnesota, as one of the largest agricultural states in the country, has a critical role to play in setting the precedent for how state governments handle climate change and agriculture.

We envision an animal agriculture system that keeps small and mid-sized farmers on the land, sequesters carbon and protects water quality. However, agricultural consolidation has pushed dairy farmers off the land, resulting in mega-farms that concentrate profits in the hands of the few, emit potent greenhouse gases methane and nitrous oxide and contaminate groundwater. Minnesota has an imperative to create an environment conducive to small and mid-sized dairy farmers raising animals in ways that protects the planet.

The Daley Farms expansion runs completely counter to the climate-friendly animal agriculture system that Minnesota needs. This proposal would expand one of the largest dairies in Minnesota by 3,000 cows to a total of 4,628 cows. This expansion would generate 46 million gallons of manure per year and make Daley Farms the 43rd largest greenhouse gas (GHG) emitter in the state, according to court documents filed by the Minnesota Center for Environmental Advocacy.

This expansion hinders Minnesota’s ability to meet the goals of the Next Generation Energy Act, which requires the state to reduce GHG emissions by 80% by 2050. It also violates the Minnesota Environmental Protection Act (MEPA), which says:

> No state action significantly affecting the quality of the environment shall be allowed, nor shall any permit for natural resources management and development be granted, where such action or permit has caused or is likely to cause pollution, impairment, or destruction of the air, water, land or other natural resources located within the state, so long as there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety, and welfare and the state's paramount concern for the protection of its air, water, land and other natural resources from pollution, impairment, or destruction. Economic considerations alone shall not justify such conduct.

We are commenting to urge the MPCA’s Environmental Review division to use its power to conduct environmental review as intended by the authors of MEPA. The SEAW for the proposed expansion of

Daley Farms does not fully capture the operation’s environmental effects and underestimates its climate impacts. Furthermore, it does not consider the damaging impact of agricultural consolidation on the farm economy or adequately evaluate more climate-friendly methods of animal agriculture that also make farms more resilient to climate impacts. These oversights make it impossible for MPCA to fairly determine the significance of environmental effects from Daley Farms. We strongly urge MPCA to require an Environmental Impact Statement (EIS) for the Daley Farms expansion to fully measure its environmental impacts and outline alternatives.

The Daley Farms Expansion Violates MEPA

MEPA states that an EIS is triggered if a proposed project has the potential for significant environmental impact. In 2007, the U.S. Supreme Court found that GHGs are air pollutants covered by the Clean Air Act and that they threaten the public health and welfare of current and future generations.2 In 2019, Minnesota Governor Tim Walz called climate change an “existential threat” that “put[s] our communities and environment at risk.”3

According to the SEAW, the Daley Farms expansion would lead to a substantial increase in GHG emissions of at least 32,500 metric tons of carbon dioxide equivalent each year. This is a significant environmental impact and should trigger an EIS.

The Daley Farms Expansion Runs Counter to Minnesota’s Next Generation Energy Act

Minnesota’s Next Generation Energy Act requires the state to reduce GHGs by 80% between 2005 and 2050. According to a 2019 report by MPCA, agriculture accounts for approximately one-quarter of Minnesota’s GHG emissions. The report goes on to say that “strategies to reduce emissions from this sector are critical to reaching statewide goals.”5

__________________________

2 Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Section 202(a) of the Clean Air Act, (US Environmental Protection Agency, 2017).

3 Tim Walz, Establishing the Climate Change Subcabinet and the Governor’s Advisory Council on Climate Change to Promote Coordinated Climate Change Mitigation and Resilience Strategies in the State of Minnesota, (State of Minnesota, December 2019).


Minnesota missed the Next Generation Energy Act’s goal of a 15% reduction by 2015, signaling that strong and additional efforts are needed to reduce Minnesota’s GHG emissions. Minnesota’s overall emissions did decline 12% relative to 2005 levels by 2016, but emissions from crop agriculture increased by approximately 12% and methane emissions from animal agriculture increased by approximately 8% during that same time period. Since agriculture is an area where emissions are going up, it’s an obvious sector to target for emissions reduction efforts.

Minnesota’s climate goals are critical in the collective effort to combat climate change, yet the SEAW frames Daley Farms’ emissions in terms of global impact and ignores Minnesota’s goals. The SEAW says, “In other words, while agriculture contributes to climate change generally, existing scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts.” Global climate change impacts are a result of cumulative actions across the world. No single project can have a measurable global impact. Even constructing brand new coal-fired power plants throughout Minnesota wouldn’t register on a global scale. MPCA should measure progress against Minnesota’s climate goals, namely the Next Generation Energy Act, not against overall global GHG emissions.

This guidance has already been provided at the federal level when the Council on Environmental Quality (CEQ) advised on considering GHG emissions in environmental reviews. The CEQ’s guidance is for the National Environmental Policy Act (NEPA), but it is well established in Minnesota that interpretations of NEPA’s requirements can be used to understand how to implement MEPA. The CEQ said, “A statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA.” This should be applied to the Daley Farms SEAW as well; though the Daley Farms expansion will not significantly impact global GHG emissions, it will hinder Minnesota’s ability to meet its goal of GHG reductions across all sectors.

**Comments on Measurement**

In the Daley Farms SEAW, MPCA says, “The information MPCA would need to conduct a full GHG life-cycle analysis is not readily available.” It also says, “There is currently an absence of regulatory guidance for analyzing GHG emission impacts. If, in the future, climate models improve in their predictive capacity or more regulatory guidance is provided, MPCA will incorporate those tools into its environmental review process at that time.”

---


7 See *In re N.D. Pipeline Co. LLC*, 869 N.W.2d 693, 698 (Minn. App. 2015) (Minnesota courts may look to federal courts’ interpretation of NEPA when applying MEPA).

MPCA can and must find tools to conduct a life-cycle analysis for Daley Farms. An article in the *Journal of Dairy Science* lists many tools to estimate GHG emissions from dairy farms. These tools are described in the table below:9

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AgRE Calc</td>
<td>Emission factor-based carbon calculator that determines a carbon footprint of various types of farms, including dairy. (<a href="http://www.agreecalculator.com">http://www.agreecalculator.com</a>)</td>
</tr>
<tr>
<td>COMET-Farm</td>
<td>Emission factor and process model primarily for estimating carbon sequestration and emissions of various types of farms, including dairy. (<a href="http://cometfarm.nrel.colostate.edu/">http://cometfarm.nrel.colostate.edu/</a>)</td>
</tr>
<tr>
<td>Cool Farm Tool</td>
<td>Emission factor-based carbon accounting tool for a wide range of cropping systems and includes a dairy livestock component. (<a href="https://coolfarmtool.org/">https://coolfarmtool.org/</a>)</td>
</tr>
<tr>
<td>DairyGEM</td>
<td>Emission factor and process simulation tool that estimates GHG, NH3, and other gaseous emissions and the carbon footprint of dairy production systems. (<a href="https://www.ars.usda.gov/northeast-area/uppa/pswmru/docs/dairy-gas-emissions-model/">https://www.ars.usda.gov/northeast-area/uppa/pswmru/docs/dairy-gas-emissions-model/</a>)</td>
</tr>
<tr>
<td>DairyMod</td>
<td>Biophysical process simulation of pastoral dairy systems predicting GHG dynamics including direct and indirect emissions and soil carbon balance. (<a href="http://imj.com.au/dairymod/">http://imj.com.au/dairymod/</a>)</td>
</tr>
<tr>
<td>DairyWise</td>
<td>An empirical model that simulates the technical, environmental and financial processes on a dairy farm that includes nitrogen and phosphorus cycling and losses, GHG emissions and energy use.</td>
</tr>
<tr>
<td>FarmAC</td>
<td>Process-related emission factors represent carbon and nitrogen flows on arable and livestock farms quantifying GHG, soil C sequestration and N losses to the environment. (<a href="http://www.farmac.dk/">http://www.farmac.dk/</a>)</td>
</tr>
<tr>
<td>FASSET</td>
<td>Process simulation used to evaluate consequences of changes in regulations, management, prices and subsidies on farm production, profitability, nitrogen losses, energy consumption and GHG emissions. (<a href="http://www.fasset.dk/">http://www.fasset.dk/</a>)</td>
</tr>
<tr>
<td>Holos</td>
<td>Process-based emission factors estimate all important direct and indirect sources of GHG emissions of livestock operations. (<a href="http://www.agr.gc.ca/eng/science-and-innovation/results-of-agriculturalresearch/holos/?id=1349181297838">http://www.agr.gc.ca/eng/science-and-innovation/results-of-agriculturalresearch/holos/?id=1349181297838</a>)</td>
</tr>
</tbody>
</table>

---

Scientific literature outlines the necessity of using a life-cycle analysis to provide a valid comparison of different livestock production systems. In one evaluation of GHG emissions from the national supply chain of milk, 72% of the emissions occurred in processes prior to the milk leaving the farm. Without performing a life-cycle analysis of Daley Farms’ GHG emissions, the review will be incomplete and inherently flawed.

There is extensive guidance on what should be included in a life-cycle analysis of a livestock operation. According to a recent report, some of these factors include:

- Enteric fermentation
- Manure storage
- Embodied energy in fertilizers and pesticides for growing grain
- Energy use for heating, cooling and ventilation
- Soil organic carbon balance in pasture versus cropland for feed grains
- Nitrous oxide emissions from fertilized fields versus pasture
- GHG impacts of manure overapplication to surrounding acreages

MPCA chose to quantify emissions from only enteric fermentation, manure storage and manure land application because “these are the sources MPCA uses to estimate GHG emissions for the entire agricultural sector on a statewide basis, and the [EPA] provides emissions factors for these sources.”

---


12 National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge*, (Washington DC, 2019).
However, there are many tools available, such as those listed in the table above, to more fully estimate the impacts of this project.

Of the emissions that MPCA did choose to quantify, the SEAW’s estimate for nitrous oxide emissions from manure land application is likely far too low. In many livestock-producing regions of the U.S., the amount of waste produced exceeds the capacity of the surrounding land to absorb it for plant production.\textsuperscript{13} \textsuperscript{14} Analyses of GHG emissions from livestock systems often assume waste application rates consistent with Natural Resources Conservation Service nutrient management criteria, yet farmers often exceed these guidelines. According to the EPA, heavy manure applications can result in substantial nitrous oxide emissions.\textsuperscript{15} As a result, GHG emissions from larger confinement operations are often underestimated.

This is likely to be true for Daley Farms. The SEAW states that Daley Farms owns 2,381 acres of surrounding cropland but needs 4,083 acres to spread the additional manure at safe levels. Daley Farms has identified 42 manure application sites, but only owns 31 of those sites. They have written or verbal agreements with the owners of the other sites to accept manure from the project, but there’s absolutely no oversight of those acres. Without oversight, there’s no way to know whether manure is being over-applied at the additional manure application sites, which would cause the project to be responsible for significant and uncounted nitrous oxide emissions.

The SEAW admits that “GHG emissions are not calculated for electricity generation that is required to operate lighting, heating, milk pumping equipment, etc. Also not included are GHG emissions from fuel combustion required to deliver feed, animals, and milk, and to operate farm equipment used in growing feed, processing feed, and applying manure.” Constructing a 4,200-animal unit confinement barn and a rotary milking parlor will vastly increase Daley Farms’ electricity consumption, yet that’s left out of MPCA’s analysis. Emissions from these processes are a critical part of any life-cycle analysis and the omission of energy and fuel use gives the Daley Farms expansion the appearance of having a much smaller GHG footprint than it really does.

Other sources of emissions that the SEAW does not count are the impact of using cropland to grow feed grains and the production of fertilizers and pesticides needed to grow those feed grains. According to the Food and Agriculture Organization of the United Nations (FAO), feed production and processing is the main source of emissions from livestock production.\textsuperscript{16} Emissions associated with feed production could be mitigated through different systems of livestock production, namely pasture-based livestock production, which is explored in the mitigations section of this comment. Leaving feed-associated emissions out of the analysis obscures that fact and paints an incomplete picture of Daley Farms’ climate impact.


\textsuperscript{14} Peter Thorne, \textit{Environmental health impacts of concentrated animal feeding operations: anticipating hazards – searching for solutions}, (Environmental Health Perspectives, 2006).


Another weakness of the Daley Farms SEAW is that it counts methane emissions on a 100-year timeframe, which underestimates the operation’s climate impact. Methane has a shorter atmospheric lifetime than carbon dioxide, persisting in the atmosphere for only 12.4 years. By comparison, carbon dioxide persists in the atmosphere for hundreds of years. Given its shorter lifetime and the extreme urgency of climate change, methane should be compared to carbon dioxide over a 20-year timeframe, not a 100-year timeframe. When calculated on this shorter timeframe, methane has a global warming potential of 84, which is considerably higher than the SEAW’s estimated global warming potential for methane of 25. MPCA must use the most recent science in this analysis, and that means counting methane on a more appropriate 20-year timeframe.

Finally, the SEAW faultily estimates the potential air and odor emissions from Daley Farms. The SEAW says, “The Project will release air and odor emissions typically associated with a dairy farm.” However, the typical dairy farm in Minnesota has 200 to 500 cows — a far cry from the expansion’s proposed 4,628 cows. The measures to avoid or minimize these air and odor emissions are also questionable. The SEAW says that “Daley will evaluate weather conditions… before manure application to minimize impacts to neighbors and the public.” However, there will be no oversight to ensure this happens. The SEAW also says that “Daley may plant a fall cover crop on fields receiving manure” to reduce air and odor emissions. This statement is vague and does not guarantee a cover crop planting. When considering potentially significant environmental effects such as air and odor emissions, MPCA must be far more accurate and definitive in its measurements and mitigations.

Mitigations are Inadequately Evaluated

The animal feedlot EAW form requires a discussion of mitigations. It says the project must describe “any proposed feedlot design features or air or odor emission mitigation measures to be implemented to avoid or minimize potential adverse impacts and discuss their anticipated effectiveness.” It goes beyond this to also require a discussion of “any alternatives or mitigative measures that have been or may be considered.” In other words, Daley Farms must detail not only the mitigations that it plans on implementing, but also mitigations that exist and could be implemented.

The Daley Farms SEAW is extremely weak in its mitigations analysis and offers no definitive solutions. It only contains broad generalizations and potential ideas, including that Daley Farms “may plant a fall cover crop,” “may delay applying manure in the fall” or “may add a nitrogen inhibitor to manure when land applied.” This language is far too open-ended, doesn’t include oversight and doesn’t include any analysis of the effectiveness of those mitigations.

The SEAW does say that “The Project’s additional cattle would demand an average of 850 acres of alfalfa. The conversion of land currently managed as row crop agriculture to alfalfa would result in an

\[\text{USDA National Agricultural Statistics Service, Milk Cow Herd Size by Inventory and Sales, (USDA, 2017).}\]


19 USDA National Agricultural Statistics Service, Milk Cow Herd Size by Inventory and Sales, (USDA, 2017).
estimated 1,000 tons CO2-e avoided annually.” This is the only mitigation in the SEAW that is quantified. It goes on to say that “Additional CO2-e could be avoided by Daley’s and likely neighbor’s increased use of cover crops.”

It is absolutely true that best management practices including diversifying crop rotations and planting cover crops can sequester carbon. However, the SEAW uses language that Daley may plant a fall cover crop and that Daley’s neighbors will likely plant cover crops. This broad language is not the same as a requirement and does not confirm that any GHG reductions will take place.

In addition, there’s no guarantee that the carbon sequestered through the potential use of best management practices such as planting alfalfa and cover crops will be permanent. Any carbon sequestered in the soil can be released with a change in land management practices or through extreme weather events. With even one tillage pass, soil carbon can be volatilized and re-released into the atmosphere. The SEAW has absolutely no stipulations that growing alfalfa or cover crops will happen in perpetuity. Therefore, the carbon sequestered through these practices cannot be promised to offset any part of the operation’s GHG emissions in the long term.

Finally, the SEAW contains no discussion of a transition to pasture-based dairy production, which is arguably the most effective mitigation of all. Management intensive grazing that is adapted to region, climate and the condition of the pasture or rangeland has multiple benefits. These include:

- Distributing manure evenly on the land
- Encouraging populations of dung beetles and other beneficial soil organisms that enhance nutrient cycling
- Using little or no synthetic nitrogen or other agrichemical inputs
- Eliminating or minimizing the need for manure storage facilities
- Maximizing soil organic carbon sequestration
- Providing opportunities to integrate crop and livestock production for enhanced nutrient cycling and uptake efficiency

In addition to improving soil health, reducing the need for chemical inputs and eliminating many of the emissions associated with manure management, pasture-based systems can also reduce emissions from enteric fermentation. Some studies show that emissions per cow are about 15% less for grazing operations than for confinement operations. And because animals are primarily fed grass, grazing operations also minimize the need for purchased feed and the climate impacts of growing that feed.

This is a stark contrast to the CAFO model of production. According to the EPA’s GHG inventory, manure deposited on pasture or rangelands “decompose[s] aerobically and produce[s] little or no CH₄.”

---

20 National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge*, (Washington DC, 2019).

21 Ibid.

manure handled in liquid-based systems decomposes anaerobically and produces large amounts of CH₄. Methane emissions also increase when producers use long-term storage systems like lagoons, which can collect and hold liquefied manure for 10 to 15 years. This demonstrates that pasture-based operations avoid many of the GHG emissions from manure management.

Perhaps most importantly, grazing and pasture-based systems boost the ability of a farm to adapt to climate change. In Minnesota, record snowfall and flooding in 2019 led to the latest planting on record. In addition, there were over 1 million acres of corn in the state that were “prevented plantings,” or the failure to plant an insured crop. These real-life impacts of climate change are making it difficult for many farmers to stay in business.

Many of the practices used on pasture-based operations boost soil health and make farms more resilient to climate impacts. Boosting soil health increases the water-holding capacity of soil, thereby increasing resilience to floods and drought. For example, “A typical degraded Midwest soil with 1% organic matter may hold less than 1” of rain before becoming saturated, at which point additional rain runs off, carrying chemicals, sediment and manure into nearby streams. The same soil restored to 5% soil organic matter may hold 3.5” of rain before becoming saturated.” Healthy soils also have better structure, making a farm more immune to erosion.

In an extremely challenging farm economy, it is of the utmost importance that farms can withstand extreme precipitation, drought and storms. By using practices that build healthier soils, pasture-based dairies will fare much better in weather extremes. This is critical to keep Minnesota agriculture viable and help farmers stay in business.

Pasture-based agriculture can also help avoid water quality issues. Due to increasing rainfall and flooding from climate change, the risk of an overflowed or breached manure lagoon is high. In 2018, Hurricane Florence caused many manure lagoons to overflow in North Carolina, leading to contaminated water and severe public health impacts. Similar manure lagoon spills occurred in Iowa last year during extreme flooding.

The possibility of a breached or overflowing manure lagoon is especially scary for Daley Farms. The dairy is located in the sensitive karst region of Minnesota, where surface water pollution very easily inventory of U.S. Greenhouse Gas Emissions and Sinks, (US Environmental Protection Agency, 2020).

24 John Newton, Prevent Plantings Set Record in 2019 at 20 Million Acres, (Farm Bureau, 2019).


26 National Sustainable Agriculture Coalition, Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge, (Washington DC, 2019).

27 Shefali Sharma, Hogwash and its Aftermath: Climate Change and Corporate Accountability after Hurricane Florence, (Institute for Agriculture and Trade Policy, 2018).

becomes groundwater contamination. In 2018, former MPCA Commissioner John Linc Stine said, “The karst region is subject to rapid seepage of contaminants from the land and overlying soils, making the groundwater of this region very vulnerable.”

The MPCA has denied permits for CAFOs in the karst region of Minnesota before. Citing the need to address elevated levels of nitrate in drinking water in southeastern Minnesota, MPCA denied a general permit for the proposed Catalpa swine facility in 2018. Extreme storms and flooding are likely to cause an overflowed or breached manure lagoon on Daley Farms at some point. This should trigger an EIS to further explore the environmental risks of the proposed expansion.

**Agricultural Consolidation is Hurting Minnesota Farmers**

No conversation about agriculture in Minnesota can ignore the damaging impacts of consolidation on farmers. Farmers are facing the most difficult farm economy since the 1980s. Increases in farm debt, bankruptcies and land values have far outstripped farm assets and income, making it increasingly difficult for farmers to hold on to their land. Farm bankruptcies rose 24% between September 2018 and September 2019 and were at decade-high levels in some parts of the country. Farm debt is at a record high of $415 billion and has grown by nearly 40% since 2012, while asset values have climbed only 17%.

Like the rest of U.S. agriculture, dairy farms are consolidating into fewer farms with more milk production per farm. Minnesota lost 315 dairies in 2019, including 47 in December alone. According to the latest Census of Agriculture, the number of dairy farms fell by 20% between 2012 and 2017. Yet, milk sales went up 3.4% in the same time period.

The expansion of larger and more industrialized farms has contributed to financial stress on the dairy industry, most notably on small to mid-sized farms — the exact type of farm that is best for the climate and the environment. Industrial dairies have increased their production, which has driven down dairy prices paid to farmers, often below the cost of production. In doing so, industrial dairies have put increased financial pressure on smaller dairies with higher production costs or tighter margins. Across the country and in Minnesota, small and mid-sized dairies are struggling to operate with little to no farm income.

---

29 Cathy Rofshus, *MPCA Commissioner denies permit to proposed feedlot, recommends study of nitrate-contaminated waters in the sensitive karst region of southeast Minnesota*, (MPCA, 2018).

30 Cathy Rofshus, *MPCA Commissioner denies permit to proposed feedlot, recommends study of nitrate-contaminated waters in the sensitive karst region of southeast Minnesota*, (MPCA, 2018).

31 *Farm Bankruptcies Rise Again: Chapter 12 Filings Increase 24% Compared to Year-Ago Levels* (Farm Bureau, 2019).

32 *Dairy Farm Activity Report*, (MN Department of Agriculture, 2020).

income, often wiping out their savings and credit to stay in business.\textsuperscript{34, 35} In fact, many smaller farms have been forced to close, thereby continuing the process of structural change.

The low prices that are putting farms out of business are largely due to the overproduction of milk. For this reason, Minnesota should not continue to support mega-dairies that are harmful to the environment and climate and also contribute to the overproduction that is driving small and mid-sized pasture based operations out of business. We need those farmers on the land to combat climate change, steward our land and support our rural communities. In addition to environmental considerations, MPCA must consider the well-being of the state’s family farmers in its decisions.

IATP thanks MPCA for this opportunity to comment.

Sincerely,

Tara Ritter
Senior Program Associate, Climate Change and Rural Communities
Institute for Agriculture and Trade Policy

Ben Lillistom
Interim Executive Director and Director of Climate Change and Rural Strategies
Institute for Agriculture and Trade Policy

\textsuperscript{34} Justin Fox, \textit{A Productivity Revolution is Wiping Out (Most) Dairy Farms}, (Bloomberg, 2019).

\textsuperscript{35} James MacDonald and Doris Newton, \textit{Milk Production Continues to Shifting to Large-Scale Farms}, (USDA Economic Research Service, December 2014).
To whom it may concern,

I write to you today in regards to the Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions for the Daley Farm of Lewiston dairy expansion and modernization project. I support the Daley family’s efforts to pass on their family dairy farm to the next generation, which has been a part of our community for six generations. Unfortunately, it seems there are a lot of people not actively engaged in dairy farming who have a lot of opinions regarding how a family dairy farm should be allowed to grow and prosper. Neither the Minnesota Pollution Control Agency (MPCA) or any prior court decision had previously required an analysis of potential greenhouse gas emissions from a livestock facility in Minnesota. Environmental review of greenhouse gas emissions isn’t appropriate for a single feedlot project and the amount of cows Daley Farm is adding is less than the number of cows that Winona County has lost in the last five or six years. There is no easy measure for determining the environmental impact from a feedlot permit because of the substantial difficulty and uncertainty in estimating emissions from animal feedlots. Even the federal Environmental Protection Agency (EPA) has been unable to create accurate models for livestock facilities’ impact on air quality because there are too many variables in the process. The Minnesota Pollution Control Agency (MPCA), following a detailed analysis based on actual facts and science found the Daley Family’s project will not have any negative environmental impacts. It will actually provide environmental benefits. Supporting documents demonstrated that due to the family’s stewardship and utilization of best practices, nitrate percentages in area wells had improved by 2-3 percent since 1991. The MPCA publicly stated the project would not have any adverse effects on water quality. The project was carefully engineered and reviewed by the MPCA, ensuring that the manure generated would meet requirements of all applicable laws and regulations. Not only do the manure basins meet, but far exceed the required engineering standards. Additionally, according to a study of air emissions from the Daley Farm expanded facility, it would meet air quality standards and odor guidelines. The environmental advantages of the project are numerous. The project will use approximately 1,000 additional acres of land to raise alfalfa and will convert or retain numerous additional acres of land for use as pasture. Alfalfa and pasture of been scientifically demonstrated to sequester carbon in the soil and will thus reduce the amount of carbon in the atmosphere. In the absence of the project, this land may be converted to other uses, in which case the benefits of these carbon drops would not be realized. The land application of manure will replace nutrients that farmers would otherwise provide to their fields via application of chemical fertilizers, thereby avoiding GHG emissions associated with chemical fertilizer production (which are greater than the potential emissions from the land application of manure). The Daley Family has also agreed to implement a number of manure application practices, including, without limitation, the use of cover crops that will further mitigate GHG emissions and sequester greater carbon in the soil. These
practices will substantially mitigate much (if not all) of the potential additional GHG emissions from the project. Daley Farm is merely trying to preserve its family farm and to continue to act as good stewards of the land and support our rural economy. We strongly support the efforts of the Daley Family to pass their dairy farm to the next generation and believe their project has been held up for far too long.

Thank you,

Scott Ellinghuysen

This message may contain confidential material from Land O'Lakes, Inc. (or its subsidiary) for the sole use of the intended recipient(s) and may not be reviewed, disclosed, copied, distributed or used by anyone other than the intended recipient(s). If you are not the intended recipient, please contact the sender by reply email and delete all copies of this message.
To whom it may concern,

I write to you today in regards to the Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions for the Daley Farm of Lewiston dairy expansion and modernization project. I support the Daley family’s efforts to pass on their family dairy farm to the next generation, which has been a part of our community for six generations. Unfortunately, it seems there are a lot of people not actively engaged in dairy farming who have a lot of opinions regarding how a family dairy farm should be allowed to grow and prosper. Neither the Minnesota Pollution Control Agency (MPCA) or any prior court decision had previously required an analysis of potential greenhouse gas emissions from a livestock facility in Minnesota. Environmental review of greenhouse gas emissions isn’t appropriate for a single feedlot project and the amount of cows Daley Farm is adding is less than the number of cows that Winona County has lost in the last five or six years. There is no easy measure for determining the environmental impact from a feedlot permit because of the substantial difficulty and uncertainty in estimating emissions from animal feedlots. Even the federal Environmental Protection Agency (EPA) has been unable to create accurate models for livestock facilities’ impact on air quality because there are too many variables in the process. The Minnesota Pollution Control Agency (MPCA), following a detailed analysis based on actual facts and science found the Daley Family’s project will not have any negative environmental impacts. It will actually provide environmental benefits. Supporting documents demonstrated that due to the family’s stewardship and utilization of best practices, nitrate percentages in area wells had improved by 2-3 percent since 1991. The MPCA publicly stated the project would not have any adverse effects on water quality. The project was carefully engineered and reviewed by the MPCA, ensuring that the manure generated would meet requirements of all applicable laws and regulations. Not only do the manure basins meet, but far exceed the required engineering standards. Additionally, according to a study of air emissions from the Daley Farm expanded facility, it would meet air quality standards and odor guidelines. The environmental advantages of the project are numerous. The project will use approximately 1,000 additional acres of land to raise alfalfa and will convert or retain numerous additional acres of land for use as pasture. Alfalfa and pasture of been scientifically demonstrated to sequester carbon in the soil and will thus reduce the amount of carbon in the atmosphere. In the absence of the project, this land may be converted to other uses, in which case the benefits of these carbon drops would not be realized. The land application of manure will replace nutrients that farmers would otherwise provide to their fields via application of chemical fertilizers, thereby avoiding GHG emissions associated with chemical fertilizer production (which are greater than the potential emissions from the land application of manure). The Daley Family has also agreed to implement a number of manure application practices, including, without limitation, the use of cover crops that will further mitigate GHG emissions and sequester greater carbon in the soil. These
practices will substantially mitigate much (if not all) of the potential additional GHG emissions from the project. Daley Farm is merely trying to preserve its family farm and to continue to act as good stewards of the land and support our rural economy. We strongly support the efforts of the Daley Family to pass their dairy farm to the next generation and believe their project has been held up for far too long.

Thank you,

Scott Ellinghuysen

This message may contain confidential material from Land O'Lakes, Inc. (or its subsidiary) for the sole use of the intended recipient(s) and may not be reviewed, disclosed, copied, distributed or used by anyone other than the intended recipient(s). If you are not the intended recipient, please contact the sender by reply email and delete all copies of this message.
Hi Kim,

Please find the above referenced comments of Minnesota Center for Environmental Advocacy attached at the request of Amelia Vohs.

Regards,
Eric

Eric Lindberg
Legal Assistant
Minnesota Center for Environmental Advocacy
Direct: (651) 287-4868

Website: www.mncenter.org
Facebook: www.facebook.com/MCEA1974
Twitter: @MCEA1974

NOTICE: This email may contain information that is privileged, confidential or otherwise protected from disclosure. If you are not the intended recipient or otherwise received this email message in error, you are not authorized to read, print, retain, copy or disseminate this message or any information contained in it. If this reached you in error, please notify us immediately by email or phone and destroy any paper or electronic copies of this email message.
Minnesota Center for Environmental Advocacy’s
Comments on the Draft Supplemental Environmental Assessment Worksheet
for Daley Farms of Lewiston, LLP 2018 Dairy Expansion

March 6, 2020

Upon review of the draft Supplemental Environmental Assessment Worksheet (“SEAW”) for the proposed Daley Farms of Lewiston, LLP dairy expansion (“Daley Farms” or “the Project”), Minnesota Center for Environmental Advocacy (“MCEA”) asserts that the Minnesota Pollution Control Agency (“MPCA”) must postpone the decision on the need for an Environmental Impact Statement (“EIS”) to obtain missing information. The missing information is necessary for MPCA to make a reasoned decision about the potential for, or significance of, the Project’s environmental effects and MPCA must revise the SEAW accordingly. If MPCA does not revise the SEAW to include this information, MPCA must make a positive declaration on the need for an EIS and include the missing information in the EIS.

MCEA also requests that its comments on the original EAW, submitted on November 15, 2018, be incorporated into the current record in addition to the comments provided below.

I. THE DALEY FARMS SEAW LACKS THE INFORMATION NECESSARY TO DETERMINE THE POTENTIAL FOR AND SIGNIFICANCE OF THE PROJECT’S ENVIRONMENTAL EFFECTS

The SEAW prepared for Daley Farms lacks key information it must contain before MPCA assesses whether an EIS is needed for the Project. Pursuant to Minn. R. 4410.1700, subd. 2a, this means MPCA must either revise the SEAW to include this information or order an EIS. Rule 4410.1700, subd. 2a specifically provides:

When information necessary to a reasoned decision about the potential for, or significance of, one or more possible environmental impacts is lacking, but could be reasonably obtained, the RGU shall either:

(A) make a positive declaration and include within the scope of the EIS appropriate studies to obtain the lacking information; or
postpone the decision on the need for an EIS . . . in order to obtain the lacking information.

At present, the SEAW presents only a fractional picture of the Project’s greenhouse gas (“GHG”) emissions, thereby significantly underestimating the Project’s environmental impact. The SEAW also fails to include any discussion about the ways climate change will affect the Project, and the resulting environmental effects. The discussion of potential mitigation measures is also deficient, lacking both an identification of concrete mitigation measures that can be implemented as well as a meaningful analysis of the degree to which the identified mitigation measures will actually reduce emissions. Indeed, based on the existing analysis, it is impossible for MPCA to determine the significance of the Project’s emissions because the total net emissions (total emissions less mitigations) cannot even be determined from the information in the SEAW.

Finally, the SEAW lacks necessary information that must be contained in the record in order for MPCA to analyze the Project’s potential for cumulative effects. Without this information, MPCA cannot adequately determine the potential for, or significance of, environmental effects from Daley Farms.

Accordingly, MPCA must revise the SEAW to include the information discussed in this comment before making an EIS need determination. If MPCA declines to revise the SEAW, it must order an EIS pursuant to Rule 4410.1700, subd. 2a.

A. Missing Information Can Be Reasonably Obtained

At the outset, MCEA notes that the information missing from the SEAW already exists, and can be reasonably obtained. MPCA appears to assert that it was forced to do its best in preparing this SEAW because guidance from the Minnesota Environmental Quality Board
(“EQB”) on GHG emissions is currently under development and is not yet available.\(^1\) In fact, MPCA states, “there is currently an absence of regulatory guidance for analyzing GHG emissions impacts” and “[i]f, in the future . . . more regulatory guidance is provided, MPCA will incorporate those tools into its environmental review process at that time.”\(^2\)

MPCA is wrong on this point—there is already an abundance of regulatory guidance on this subject. An in-depth guidance has been issued by the Council of Environmental Quality (“CEQ”), the agency charged with overseeing the National Environmental Policy Act’s (“NEPA”) implementation (“CEQ Guidance”).\(^3\) The CEQ issued the CEQ Guidance nearly four years ago to address the very question MPCA is facing on this Project. The CEQ Guidance provides a structure for agencies to use when assessing a project’s climate impacts. Moreover, it explains common pitfalls and ways agencies should not perform a GHG analysis. It is well established in Minnesota that interpretations of NEPA’s requirements can be used to understand how to implement the Minnesota Environmental Policy Act (“MEPA”).\(^4\) Therefore, MPCA should look to guidance on how to conduct a GHG and climate change analysis from EQB’s national equivalent when it considers how to conduct such an analysis in Minnesota.

Furthermore, MPCA cannot point to any authority that suggests the absence of EQB-published guidance absolves it of its duty to thoroughly study the environmental effects of a

---

\(^1\) MPCA states, “[t]he MPCA had to apply its technical expertise and experience with GHG emissions inventories to determine which Project-related activities to quantify because Environmental Quality Board guidance is not currently available, and the information MPCA would need to conduct a full GHG life-cycle analysis is not readily available. MPCA, Supplemental Environmental Assessment Worksheet 6 (2020) [hereinafter, SEAW].

\(^2\) Id. at 8.


\(^4\) See In re N.D. Pipeline Co. LLC, 869 N.W.2d 693, 698 (Minn. App. 2015) (Minnesota courts may look to federal courts’ interpretation of NEPA when applying MEPA).
project. Indeed, the EQB has issued very little impact—or media—specific guidance. For example, there is no EQB guidance on how to study impacts to water quality, yet MPCA routinely includes in-depth analyses of potential impacts to water resources in its EAWs. In any case, MPCA can look to the many existing guidance documents, tools, and sample analyses that already exist on GHG emissions, many of which MPCA itself authored, and use those in its review of Daley Farms’ GHG emissions.

B. MPCA’s Estimates Of Daley Farms’ GHG Emissions Are Too Narrow In Scope And Underestimate The Project’s Total Emissions

The GHG emissions modeling for Daley Farms must be revised and improved. As written, MPCA’s modeling is selective, incomplete, fails to use the best available science and models, and underestimates the Project’s GHG emissions.

MPCA’s GHG emissions modeling approximates the GHG emissions from the Daley Farms expansion. The GHG emissions estimate includes the methane and nitrous oxide (“N₂O”) emissions from enteric fermentation,⁵ manure storage, and manure land application. But MPCA fails to account for other numerous sources of GHG emissions, resulting in a calculation that significantly underestimates Daley Farms’ total project emissions. Most notably, MPCA omits any calculations for fuel combustion from farm vehicles, electricity consumption and heating in buildings such as confinement barns, feed production and processing, and soil management. MPCA itself concedes these deficiencies, noting:

The potential GHG emissions . . . are only estimates and do not consider all GHG emissions that the Project could create or induce. For example, GHG emissions are not calculated for electricity generation . . . Also not included are GHG emissions

---

⁵ “Enteric fermentation” refers to the digestive process that occurs in ruminant animals. Methane is a by-product of the fermentation process. Most of this methane is exhaled or belched by the animal, and a small percentage is also produced in the large intestine and passed out as flatulence. 1 U.S. Envtl. Prot. Agency Office of Air Quality Planning and Standards, Compilation of Air Pollutant Emission Factors 14.4-1 (5th ed. 1995).
from fuel combustion required to deliver feed, animals, and milk, and to operate farm equipment.6

These sources, however, can generate a significant portion of an agricultural project’s environmental impact. The Food and Agricultural Organization of the United Nations estimates that feed production and processing alone account for 45% of GHG emissions from livestock production.7 Furthermore, ICF International estimates that carbon dioxide (“CO₂”) emissions from energy use accounts for 14% of all agricultural emissions across the United States.8 The sources analyzed in the SEAW—enteric fermentation and manure management—also account for significant emissions, but studies estimate that these sources account for less than 50% of total agricultural emissions.9

Table 1 below compares the emissions sources MPCA included in its analysis to those MPCA omitted.

<table>
<thead>
<tr>
<th>Sources Included in the SEAW</th>
<th>Sources Omitted from the SEAW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enteric fermentation</td>
<td>Fuel combustion in farm equipment and vehicles</td>
</tr>
<tr>
<td>Manure storage</td>
<td>Electricity consumption</td>
</tr>
<tr>
<td>Manure land application</td>
<td>Space heating</td>
</tr>
<tr>
<td></td>
<td>Soil management from synthetic fertilizer and liming (if applicable)</td>
</tr>
<tr>
<td></td>
<td>Feed production and processing</td>
</tr>
</tbody>
</table>

The proposed Daley Farms expansion will unquestionably have increased GHG emissions—including increases from those sources MPCA chose not to quantify. For instance, constructing and operating new buildings—such as a 4,200-animal unit confinement barn, a rotary

---

6 SEAW, supra note 1, at 5.
9 FAO, supra note 7, at 4; ICF Int’l, supra note 8, at 1.4.
milking parlor, and a sand processing building—will increase the operation’s electricity emissions. Tripling the number of cattle raised onsite will significantly increase emissions related to feed production. If farmers apply synthetic fertilizer and lime to soils in addition to spreading manure, this will also affect emissions.

Even more problematic, MPCA’s overly narrow scope duly skews the Project’s GHG estimates when mitigations are considered. Many available mitigation measures decrease emissions from agriculture using soil management practices such as reducing or timing fertilizer use, planting cover crops, and installing buffers. MPCA discussed the benefits from one soil management practice—planting alfalfa—which could offset a small portion of the Project’s total emissions. However, estimating the potential benefits of changing land use practices without first estimating the total emissions from existing land use practices creates an incomplete and flawed picture of the Project’s actual emissions.

MEPA requires MPCA to consider all environmental impacts “that may be reasonably expected to occur from the project.” Given that MPCA already conceded that Daley Farms will have GHG emissions from electricity generation and fuel combustion, GHG emissions from these sources are impacts “that may be reasonably expected to occur” and must be quantified and assessed when MPCA determines whether the Project has the potential for significant environmental effects. After all, the Project was remanded for MPCA to consider not just some or a select few, but all of the Project’s reasonably estimable GHG emissions.

---

10 SEAW, supra note 1, at 5
11 Minn. R. 4410.1700, subd. 6.
12 SEAW, supra note 1, at 5.
13 Minn. R. 4410.1700, subd. 6.
C. MPCA Can Easily Estimate The Proper Scope Of GHG Emissions Using Existing Tools

MPCA cannot avoid quantifying GHG emissions from all of the Project’s sources by asserting that they are too difficult to calculate. There are many simple, readily available tools to quantify these types of emissions that MPCA is capable of using, and should use. Many of these tools are simple “plug and play” models that function similarly to the tool MPCA used, but would better reflect the full array of GHG emissions from the Project. MPCA should select the tool that is useable and provides the best estimate of the total emissions from the Project, not simply the tool with which MPCA has the most familiarity.

MPCA asserts that it chose to quantify emissions from only enteric fermentation, manure storage, and manure land application because “these are the sources MPCA uses to estimate GHG emissions for the entire agricultural sector on a statewide basis, and the U.S. Environmental Protection Agency [(“EPA”)] provides emissions factors for these sources.”15 However, there are many tools available that would estimate the full array of impacts from the Project which would require minimal additional effort. These tools must be used. As discussed previously, the Court of Appeals remanded this case to MPCA for consideration of all the Project’s GHG emissions, not just those that MPCA has measured for other reports.

One tool that MPCA already has familiarity with is emissions factors. In addition to the emissions factors MPCA already used for enteric fermentation, manure storage, and manure land application, the EPA and other jurisdictions have produced simple calculations for other components of the agricultural sector. For instance, the EPA has produced emissions factors for electricity generation,16 which MPCA could use to estimate expected emissions from Daley Farms’

---

15 SEAW, supra note 1, at 6.
increased electricity consumption. The EPA has also created emissions factors for calculating CO₂ emissions per gallon of fuel— including diesel fuel, liquefied natural gas, motor gasoline, and others—as well as CH₄ and N₂O emissions per gallon of fuel used in agricultural equipment.

Since MPCA is already using emissions factors for some of Daley Farms’ emissions, MPCA can easily expand its analysis to include these other emissions factors. Given the ease and availability of this data, MPCA cannot assert that the emissions from Daley Farms’ electricity consumption or fuel-based emissions would be too difficult to calculate.

Beyond energy use, the California Air Resources Board (“CARB”) has utilized emissions factors based on guidance from the EPA and the Intergovernmental Panel on Climate Change (“IPCC”) to calculate direct and indirect N₂O emissions from managed soils. These calculations take into account synthetic and organic fertilizers applied to soils, manure spread on soils, and crop residues returned to soils. The CARB has similar equations for calculating CO₂ emissions from liming. MPCA already calculated N₂O emissions from spreading manure on the soil. Consequently, the implementation of additional soil management practices should also be included in the GHG analysis.

In addition to emissions factors, there are dozens of models and calculators available that can estimate emissions from agricultural projects. These tools range from “plug-and-play” web-based or spreadsheet calculators based on default emissions factors, to process-based models that

---

18 Id. at 22.
20 Id. at 113.
require more detailed data inputs, time, and expertise. Table 2 below provides a few examples of tools that could be used to estimate whole-farm emissions resulting from Daley Farms.

### Table 2: Tools to Estimate Whole-Farm Emissions

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Type of Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMET-FARM&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Web-based calculator</td>
<td>Generates a report comparing emissions and carbon changes between current management practices and alternative future scenarios.</td>
</tr>
<tr>
<td>Cool Farm Tool&lt;sup&gt;23&lt;/sup&gt;</td>
<td>Web-based calculator</td>
<td>Provides an estimate of on-farm GHG emissions in just 10-15 minutes, and illustrates potential for management decisions to reduce emissions and/or sequester carbon.</td>
</tr>
<tr>
<td>Integrated Farm System Model (IFSM)&lt;sup&gt;24&lt;/sup&gt;</td>
<td>Process simulation model</td>
<td>Comprehensive tool to understand the emissions impact of changes in farm management. Primarily used for systems research in dairy and beef production.</td>
</tr>
</tbody>
</table>

It is clear then that there are numerous, user-friendly tools that could provide a more inclusive, accurate GHG emission estimate for the Project. Consequently, MPCA must revise its analysis in the EAW to include GHG emissions estimates from the multiple emission sources that are wholly absent from its calculation. As it stands, MPCA’s narrow GHG emission analysis significantly underestimates the total GHG emissions from the Project. This skews the information and MPCA’s ability to determine whether the Daley Farms expansion has the potential for a significant environmental effect. The narrow scope also limits the potential mitigations that can be implemented; without estimating emissions across the farm operation, opportunities to reduce emissions from important sources may be missed.

---


D. MPCA Utilized An Overly Conservative Global Warming Potential In The SEAW

MPCA should also reconsider the global warming potential (“GWP”) it uses to calculate the environmental impact of methane in the SEAW. The current SEAW uses a GWP of 25—based on comparing methane’s and CO₂’s warming effects over a 100-year timeframe—to demonstrate the impact of methane on the climate. But the best available climate science suggests that calculating methane’s GWP on a 100-year timeframe results in an underestimation of methane’s climate warming potential. Given methane’s shorter 12.4-year atmospheric lifetime, methane should be compared to CO₂ over a 20-year timeframe. This calculation results in a much higher GWP for methane of 84.²⁵

While current scientific understanding suggests that GWP should be calculated over a 20-year timeframe, even if MPCA chooses to continue calculating GWP over a 100-year timeframe, it should update its calculations to be consistent with the most recent IPCC report, which adjusted the 100-year GWP for methane from 25 to 28.²⁶ Although the difference between these two factors may seem small, a GWP of 28 results in an additional 3,500 tons of CO₂ per year for Daley Farms. This would be comparable to the emissions from approximately 750 automobiles each year.²⁷ Table 3 below illustrates the resulting global warming potential for methane when calculated using the different GWP multipliers.

<table>
<thead>
<tr>
<th>GWP</th>
<th>Time Frame</th>
<th>Source of GWP Calculation</th>
<th>Daley Farms’ Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>100 years</td>
<td>IPCC 4th Assessment Report</td>
<td>32,426</td>
</tr>
<tr>
<td>28</td>
<td>100 years</td>
<td>IPCC 5th Assessment Report</td>
<td>36,000</td>
</tr>
<tr>
<td>84</td>
<td>20 years</td>
<td>IPCC 5th Assessment Report</td>
<td>105,711</td>
</tr>
</tbody>
</table>

²⁶ Id. at 87.
It is unquestionable that MPCA must use the most up-to-date data when it performs emissions calculations to ensure MPCA does not significantly underestimate the Project’s emissions as a result of old information. MPCA must update the SEAW to include a GHG emissions estimation that uses the current GWP for methane. Additionally, MPCA should include an assessment of the Project’s methane emissions under both GWPs, 28 and 84, to reflect the range of the Project’s potential effects.

E. MPCA Must Consider The Effect Of The Project On Climate Change And The Effect Of Climate Change On The Project

Also missing from the SEAW is any discussion of the effect climate change will have on the Project. The CEQ Guidance notes that when addressing climate change, agencies should consider not only the potential effects from a proposed project on climate change, but also the effects climate change will have on a proposed project.28 The SEAW contains no discussion about the ways that climate change will affect Daley Farms, for example, through increased rainfall or extreme weather events. MCEA requested exactly such an analysis in its comments on the original EAW prepared for Daley Farms.29 In response, MPCA cursorily dismissed this as “beyond the scope of the EAW” and noted that regardless, Daley Farms was required to report instances where increased precipitation caused their manure lagoons to become too full or overflow.30 However,

28 CEQ Guidance, supra note 3, at 4.
29 See Betsy Lawton, Minnesota Center for Environmental Advocacy Comments on the Environmental Assessment Worksheet and the Need for an Environmental Impact Statement for the Daley Farms of Lewiston, LLC Dairy Expansion in Winona County 13, 16 (2018) (stating the EAW failed to account for the impacts of climate change, including increased precipitation and extreme weather events) included as Exhibit 2.
30 MPCA, Responses to Comments on the EAW and Individual NPDES Feedlot Permit 36, 39 (2019).
this misses the point. The EAW must include a discussion of any potential environmental effects of a project, regardless of whether they are explicitly listed on the EAW form.31

And the potential for increased environmental effects as a result of climate change is well recognized. The Minnesota Board of Water and Soil Resources (“BWSR”) reports that “[m]ore frequent extreme weather events will impact Minnesota agriculture, resulting in increased runoff of fertilizers, pesticides, and sediment, particularly from agricultural fields that do not have best management practices in place such as buffers, grassed waterways, and crop residue left on the fields.”32 There is no indication in the SEAW that Daley Farms will use buffers, grassed waterways, or crop residue. This alone shows a potential environmental effect that is likely to occur as a result of climate change’s impact on the Project, which must be considered and discussed in the SEAW.

In light of the Minnesota Court of Appeals’ decision on Daley Farms, and MPCA’s own acknowledgement that climate change will have regional effects, including changes in the growing season, precipitation, and storms,33 MPCA must consider the effect that climate will have on the Project, and the resulting environmental consequences. Failing to do so results in a SEAW that only looks at one side of climate change, but completely ignores the other.

F. MPCA Failed To Identify Available Mitigations And Their Impacts

The SEAW’s most egregious shortcoming occurs in MPCA’s discussion of mitigation measures. MEPA, the Minnesota Rules, EQB guidance, the EAW form, guidance from the states attorneys general, and the CEQ Guidance all instruct MPCA to provide a robust discussion of

31 Minn. R. 4410.1200(E); see also In re Denial of a Contested Case Hearing Request, 2019 WL 5106666, at *7 (“We agree with the MCEA that MPCA’s analysis was not limited to the EAW form . . . Because the MCEA raised the issue of greenhouse-gas emissions during the comment period, MPCA should have considered this potentially significant environmental effect.”).
33 SEAW, supra note 1, at 7.
mitigation measures when analyzing a project’s climate change impacts. Despite this, the SEAW only contains broad generalizations and fails to identify specific practices that could mitigate GHG emissions from the Project. MPCA must revise the SEAW to provide the required robust analysis.

First, to fulfill environmental review’s purpose, MPCA must provide a robust mitigation discussion sufficient for public review. MEPA’s purpose includes “understanding the impact which a proposed project will have on the environment . . . through the preparation and public review of environmental documents . . . This information shall be available to governmental units and citizens early in the decision making process . . .”34 In the EAW context specifically, the Minnesota Supreme Court favorably cited the U.S. Supreme Court’s analysis with regard to mitigation in Robertson v. Methow Valley Citizens Council35 that environmental review “‘serves a larger informational role. It gives the public the assurance that the agency has indeed considered environmental concerns in its decisionmaking process . . . and, perhaps more significantly, provides a springboard for public comment.’”36 Here, the public is entitled to information about mitigation measures Daley Farms could implement to reduce the Project’s environmental effect early enough to allow meaningful comments on how the Project should be modified or improved. This information must also be included for the benefit of other permitting agencies and units of government who rely on the EAW as the best available information about a project’s environmental effects. By identifying practices Daley Farms can use to avoid, minimize, or compensate for its emissions in the SEAW, governmental units that will issue permits and approvals can require improvements that make Daley Farms a better, more resilient project.

34 Minn. R. 4410.0300, subd. 3 (emphasis added).
Second, Minn. R. 4410.1200 details the basic information an EAW must contain. Rule 4410.1200 operates as the floor—not the ceiling—for the information MPCA must include in the SEAW. The Rule requires that all EAWs discuss “resource protection measures that have been incorporated into the project design.” In other words, mitigation measures. This makes sense—the RGU cannot truly determine a project’s potential for significant environmental effects if the EAW only identifies a project’s effects, but is silent on the degree that the Project plans to mitigate those effects. Here, MPCA’s perfunctory analysis of mitigation measures does not comply with the basic requirement in Rule 4410.1200. The SEAW must identify in detail the specific mitigations incorporated into the project design and how those mitigations will protect resources affected by the Project. If there are none, this must also be explicitly stated. Consequently, the SEAW must be revised to comply with the Minnesota Rules.

Third, the EAW Form and EQB guidance require a robust mitigation discussion, including both those practices Daley Farms plans to implement and those practices Daley Farms could implement. The animal feedlot Alternative EAW Form requires that an RGU describe “any proposed feedlot design features or air or odor emission mitigation measures to be implemented to avoid or minimize potential adverse impacts and discuss their anticipated effectiveness” and also requires that the RGU describe “any alternatives or mitigative measures that have been or may be considered.”37 This language makes clear that the EAW must detail not only mitigation measures a facility plans to implement, but also the efficacy of those practices as well as mitigative measures that could be implemented to reduce effects.

37 EQB, Alternative EAW Form for Animal Feedlots 5-6 (2000) (emphasis added) included as Exhibit 4.
The EQB guidance confirms the EAW must include a discussion of mitigation practices that *could be* implemented. According to EQB guidance:

Information that reduces uncertainties about impacts and their significance belongs in an EAW. Any information that helps clarify the likelihood or level of significance of a potential impact is useful in an EAW because it helps the RGU make a better determination about the need for an EIS. It could be . . . information about how the impact *could be mitigated* and how that mitigation will be imposed."38

Here, the SEAW fails to analyze the efficacy of all measures the Project will use and has no discussion of mitigations that *could be* implemented for the Project. As such, the SEAW must be modified to comply with the requirements of EQB forms and guidance.

Finally, the Minnesota Attorney General has also noted that when a proposed project has climate change impacts, a robust analysis of mitigation measures from GHG emissions is required.39 Similarly, the CEQ Guidance advises that agencies performing a climate analysis should consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects.40 Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane.41

It is clear then, that a full discussion of mitigation measures should be included in the SEAW, especially for the Project’s impact on climate change. The analysis must include not only

---

40 CEQ Guidance, *supra* note 3, at 19.
41 *Id.* at 19.
a detailed description of the mitigations the Project plans to implement and the efficacy of these practices, but also mitigations that could be implemented to further reduce environmental effects. The Daley Farms SEAW does not fulfill this call for a robust mitigation analysis. Instead, as discussed in more detail in the following section, the SEAW contains broad generalizations hinting that there are some practices that could work. The SEAW only quantifies the efficacy of one practice Daley Farms will implement. Beyond this, it is unclear what other measures will actually be used to mitigate GHG emissions, if any. With regard to mitigations that could be implemented, the SEAW fails to identify what those practices are. In order to comply with MEPA, EQB guidance, the EAW form, and guidance from the Attorney General and CEQ, MPCA must revise the SEAW to include a significantly improved discussion of available GHG emission mitigation measures.

G. The SEAW Lacks Information Necessary For A Cumulative Effects Analysis

Just as important as a robust mitigations analysis is MPCA’s obligation to perform a cumulative effects analysis. Nevertheless, the SEAW lacks relevant information that must be included in order for MPCA to perform a competent cumulative effects analysis.

Because climate change results from the incremental addition of GHG emissions from millions of individual sources that collectively have a large impact, the CEQ has advised that the analysis of a project’s climate impacts must be done through a cumulative impacts analysis.42 This methodology is consistent with how other states, like California, consider GHG emissions in environmental review—identifying that it is inherently a cumulative impact problem.43

42 Id. at 17.
Under NEPA, a “cumulative impact” is defined as the “impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.” The MEPA equivalent to the federal standard is “cumulative potential effects,” defined as:

the effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects . . . regardless of . . . what jurisdictions have authority over the projects. Significant cumulative potential effects can result from individually minor projects taking place over a period of time.”

The Minnesota Attorney General’s Office (“OAG”) illustrated how a cumulative potential effects analysis for climate change should be performed. In a comment to the CEQ, OAG identified that when conducting a cumulative effects analysis, it is insufficient to simply quantify a project’s GHG emissions, compare it to local, regional, national, or sector-wide emissions estimates, and then provide a qualitative discussion of the effects of GHG emissions generally. Instead, in order to take the requisite “hard look,” an agency must conduct a thorough analysis of cumulative GHG emissions. Then, it must consider a project’s consistency with plans and policies to reduce GHG emissions as well as mitigation measures for cumulative impacts from GHG emissions.

While MPCA does not analyze whether a cumulative potential effect is significant until the EIS need decision, EQB guidance provides that the EAW must contain the facts and information

44 40 C.F.R. § 1508.7.
45 Minn. R. 4410.0200, subd. 11a.
46 AGs Comments, supra note 39, at 18.
47 Id.
48 Id.; see also Sierra Club v. Clinton, 689 F. Supp. 2d 1123, 1127, 1138-39 (D. Minn. 2010) (upholding cumulative impact analysis for GHG emissions from new 326-mile pipeline to transport crude oil, in part, because it discussed mitigation measures to offset emissions).
that MPCA will draw upon in determining “significance.” \(^{49}\) According to Minn. R. 4410.1700, subd. 7 and EQB guidance, MPCA must be able to answer four key questions when considering the significance of the Project’s cumulative effects: \(^{50}\) (1) whether the cumulative effect is significant; (2) whether the contribution from the Project is significant when viewed in connection with other contributions to the cumulative potential effect; (3) the degree to which the Project complies with approved mitigation measures specifically designed to address the cumulative potential effect; and (4) the efforts of the proposer to minimize contributions from the Project. \(^{51}\)

At this juncture, the SEAW contains confusing and incomplete information, preventing MPCA from performing a competent analysis when it considers the significance of the cumulative potential effects of the Project pursuant to these four factors. The information missing for each step of the analysis is discussed in turn below.

1. *Is the cumulative potential effect significant?*

In determining whether the Project’s cumulative potential effect is a potential significant environmental effect (“significance analysis”) MPCA must begin by determining whether the sum total of contributions from all GHG sources is significant. \(^{52}\) While it may seem obvious that the sum total of contributions from global GHG emissions (i.e. climate change) is significant, this cannot be inferred, and facts supporting this conclusion must be stated explicitly in the SEAW. This is necessary for two reasons. First, the existence of climate change and its significance has been debated for decades. It is only in recent years that Minnesota’s Governor and state agencies have identified climate change as the greatest environmental challenge facing our state and

\(^{49}\) EAW Guidelines, *supra* note 38, at 44 (“In order to give proper consideration to the role of CPE [cumulative potential effects] in making the EIS need decision, the RGU must have obtained the proper information in EAW preparation.”).

\(^{50}\) *Id.* at 44.

\(^{51}\) Minn. R. 4410.1700, subd. 7; EAW Guidelines, *supra* note 38, at 44-45.

\(^{52}\) *Id.* at 44.
prioritized policies to address it. It is even more recent that this has become an issue with bipartisan recognition and support. Consequently, a factual basis explaining the significance of climate change as a key environmental threat should be included in the SEAW. Second, the remaining steps of a significance analysis depend on this context. It is impossible for MPCA to evaluate whether the GHG contributions from Daley Farms are significant if it has not first provided context for why climate change is generally significant.

2. Is the contribution from the Project significant?

The second step in the significance analysis requires MPCA to consider whether the GHG emissions from Daley Farms are significant when viewed in connection with other contributions to climate change. This step requires MPCA to quantify the GHG emissions attributable to Daley Farms in the SEAW and to consider them in context. MPCA has attempted to quantify the emissions from Daley Farms, but as discussed previously, MPCA’s analysis is too narrow in scope and uses out-of-date information and must be revised. Indeed, MPCA admits its GHG calculations for Daley Farms “do not consider all GHG emissions that the Project could create or induce.”53 This must be remedied before MPCA attempts to perform the significance analysis because it is impossible to determine whether the emissions from a project are significant until an accurate estimation of those emissions has been identified.

Additionally, the second step of the significance analysis requires MPCA to consider Daley Farms’ emissions in the context of other GHG emissions and the cumulative effect of climate change. In order to do this, MPCA must include sufficient facts in the SEAW to provide the relevant context about cumulative GHG emissions. This analysis requires more than simply comparing the emissions from Daley Farms to the quantity of global emissions or the effects of

53 SEAW, supra note 1, at 8.
global climate change. Indeed, the CEQ, many state agencies, and courts have made clear that when analyzing climate impacts, agencies must avoid analyses that minimize a project’s emissions in light of global climate change. The CEQ Guidance admonishes agencies for this type of analysis, stating:

CEQ recognizes that the totality of climate change impacts [are] not attributable to any single action, but are exacerbated by a series of actions . . . . Therefore, a statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact. When considering GHG emissions and their significance, agencies should use appropriate tools and methodologies for quantifying GHG emissions and comparing GHG quantities across alternative scenarios. Agencies should not limit themselves to calculating a proposed action’s emissions as a percentage of sector, nationwide, or global emissions in deciding whether or to what extent to consider climate change impacts under NEPA.54

It is clear why the CEQ cautions against this type of analysis. An analysis that determines GHG emissions are not significant simply because they are a small fraction compared to global or regional emissions ensures that no project will ever have emissions that reach the significance threshold. Indeed, even the construction and operation of a new coal plant in Minnesota with a projected forty-year operating life would not meet the significance threshold because its emissions, although substantial, would be fractional when compared to global emissions. If MPCA performs this kind of climate impact review, Minnesota will undoubtedly fail to avoid the most serious impacts of climate change.

54 CEQ Guidance, supra note 3 (emphasis added).
The IPCC has also recognized the need to avoid this type of faulty analysis. The IPCC found effective climate change mitigation will not be achieved if individual agents advance their own interests independently, because climate change is a collective action problem. Most GHGs accumulate over time and mix globally, and any agent’s emissions (e.g., individual, community, company, country) affect other agents.

Despite numerous cautions against this type of analysis, MPCA appears to signal that it will adopt this approach when determining the significance of Daley Farms’ GHG emissions. In the SEAW, MPCA states:

- “The Project’s incremental contribution to global GHGs cannot be translated into effects on climate change globally or regionally.”
- “Currently it is not possible to model the physical impacts of global or regional climate change, such as storm frequency/intensity or temperature increases, caused by incremental GHG emissions, such as those from the Project.”
- “While agriculture contributes to climate change generally, existing scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts.”

This is the exact analysis CEQ advised agencies not to apply. The fact that Daley Farms has an incremental contribution to climate change or that a causal connection cannot be drawn from Daley Farms alone to a global temperature increase is simply a statement about the nature of climate change itself, not an assessment of the significance of Daley Farms’ emissions. Indeed, MEPA has

---

56 Id.
57 Id.
58 SEAW, supra note 1, at 7.
59 Id.
60 Id.
long recognized that a project may still reach the significance threshold, although individually minor, when it is part of a cumulative effect.61

Rather than apply this faulty analysis, MPCA should develop the SEAW to allow for a meaningful significance analysis. To do so, the SEAW should contain information regarding: (1) the Project’s significance when considered in connection with contributions from other sources; (2) Minnesota’s plan to reduce GHG emissions in the Next Generation Energy Act (“NGEA”);62 (3) Minnesota’s progress in meeting the NGEA goals; (4) agriculture’s role in meeting the NGEA goals; and (5) the Project’s effect on Minnesota’s ability to meet the NGEA goals. All of this information is readily available to MPCA, who published numerous reports about climate impacts and Minnesota’s progress in reducing GHG emissions, including *Greenhouse Gas Emissions in Minnesota: 1990-2016*63 and *Greenhouse Gas Reduction Potential of Agricultural Best Management Practices*64 in 2019 (“2019 Reports”). These reports contain information about climate change in Minnesota and agriculture’s contribution to our state GHG emissions. Some examples of relevant information include:

- “To reduce the impacts of climate change, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, but we are behind schedule.”65

- “Without continued support and additional effort, we are not likely to achieve the goals of the Next Generation Energy Act.”66

---

61 Minn. R. 4410.1700, subd. 7.
62 Minn. Stat. § 216H.02.
65 Id.
• “Agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions, so strategies to reduce emissions from this sector are critical to reaching statewide goals.”67

• “Agricultural nutrient management is the largest source of nitrous oxide (N₂O) emissions, but many best management practices that protect water quality from nutrients and sediment also can help reduce GHG emissions.”68

• “Animal agriculture is the largest source of methane emissions, specifically from manure management and cattle digestion.”69

This information demonstrates the unique role that agriculture plays in Minnesota’s emissions. It clarifies that Minnesota cannot achieve its GHG reduction goals without reductions from the agricultural sector when agriculture is the state’s largest source of methane and N₂O emissions. Perhaps more importantly, MPCA’s 2019 Reports also show that the portions of the agricultural sector relevant to Daley Farms have not achieved emissions reductions. In fact, emissions from key agricultural sectors have actually increased during a period in which they should have decreased. For example, while emissions across the board should have decreased 15% from 2005 to 2015,70 during that same period N₂O emissions from crop agriculture increased about 12%71 and methane emissions from animal agriculture increased about 8%.72

This critical information and context is not included anywhere in the SEAW. The SEAW fails to mention that Minnesota is behind on the NGEA’s GHG reduction goals. It also does not mention that Minnesota needs to take even more aggressive action than we have in the past in order to achieve the NGEA’s goals. Instead, the SEAW minimizes the urgency to reduce emissions

67 Cibrowski, supra note 64, at Executive Summary (emphasis added).
68 Claflin & Steinwand, supra note 63, at 2.
69 Id. at 8.
70 Minn. Stat. § 216H.02 (“It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015”).
71 Claflin & Steinwand, supra note 62, at 8.
72 Id.
and makes it appear as though Minnesota is making sufficient progress on its emissions reductions by stating, “[a]nnual GHG emissions fluctuate, but fortunately, the State has been on a general downward trend since 2005.”\footnote{SEAW, \textit{supra} note 1, at 7.} Moreover, in contrast to the data showing emissions from crop and animal agriculture have increased, the SEAW reports that GHG emissions from Minnesota’s agriculture and forestry sector have decreased about 12\%.\footnote{\textit{Id.}}

This figure paints a skewed picture of the sector’s emissions reductions progress, as the 12\% decrease is attributable to an increase in carbon stored in Minnesota’s forests between 2005 and 2016. This, in turn, offset GHG emissions from other agricultural activities which, as discussed above, have actually increased their emissions.\footnote{Claflin & Steinwand, \textit{supra} note 62, at 8.} Finally, the SEAW fails to note that while Minnesota has a state policy to reduce emissions dramatically across all emitting sectors including agriculture, the Project would increase emissions from our current baseline by at least 32,500 metric tons of CO\textsubscript{2} equivalent each year.\footnote{SEAW, \textit{supra} note 1, at 5.}

The SEAW must explain this context, revealing that but for the growth in forestry, agriculture broadly has failed to meet its GHG reduction goals, and in fact, has gone backwards. The aforementioned information, contained in recent MPCA reports, must be included in the SEAW before MPCA can actually analyze the significance of Daley Farms’ emissions in the context of other contributions to climate change.

\textit{3. To what degree does the Project comply with approved mitigation measures designed to address the cumulative potential effect?}

The third step in the significance analysis requires MPCA to consider the degree to which the Project complies with approved mitigation measures specifically designed to address the cumulative effect. This factor only applies if some governmental unit has previously developed

\begin{footnotesize}
\footnote{SEAW, \textit{supra} note 1, at 7.}
\footnote{\textit{Id.}}
\footnote{Claflin & Steinwand, \textit{supra} note 62, at 8.}
\footnote{SEAW, \textit{supra} note 1, at 5.}
\end{footnotesize}
and put into effect a plan or program whose purpose is to specifically mitigate the type of cumulative effect under consideration.\textsuperscript{77} Examples of such plans include comprehensive land use plans or TMDLs.\textsuperscript{78} Usually, there is no plan and MPCA must acknowledge the absence of such a plan in the EAW.\textsuperscript{79} There is currently no mitigation plan for GHG emissions that has been formally approved by a relevant governmental unit. Because there are no “approved mitigation measures [for GHGs] specifically designed to address the cumulative effect,” the degree to which the Project complies with these mitigation measures is zero. The SEAW currently contains no mention of whether approved mitigation measures exist, and this must be included.

4. \textit{Has the proposer minimized contributions from the Project?}

The final step in the significance analysis requires MPCA to consider Daley Farms’ efforts to minimize the Project’s GHG emissions. This analysis considers questions such as whether the project proposer has made only a token effort to reduce GHG emissions or has incorporated state-of-the-art measures, and whether the proposer has been responsive to suggestions for mitigations from the agency and public comments.\textsuperscript{80} In order for MPCA to perform this analysis, the SEAW must contain: (1) details about the proposed mitigations the Project will implement; (2) a quantification of the degree to which those mitigations will “minimize contributions from the project”; (3) information about other available mitigations and the extent they would be considered “state-of-the-art”; and (4) information about mitigations that MPCA staff have suggested and whether such mitigation measures have been adopted.

\textsuperscript{77} EAW Guidelines, \textit{supra} note 38, at 44.
\textsuperscript{78} Id.
\textsuperscript{79} Id.
\textsuperscript{80} Id.
As discussed previously, the SEAW contains scant information about mitigation measures Daley Farms will actually implement. The only concrete mitigation practice mentioned in the SEAW concerns the planting of alfalfa:

Daley will implement manure application practices—including without limitation the use of cover crops—that may further mitigate GHG emissions and sequester greater carbon in the soil. The Project’s additional cattle would demand an average of 850 acres of alfalfa. The conversion of land currently managed as row crop agriculture to alfalfa would result in an estimated 1,000 tons CO₂-e avoided annually.81

The above-mentioned conversion of row crop acreage into alfalfa is also the only place in the SEAW where MPCA actually identified the degree to which the Project’s GHG contributions will be minimized.

Furthermore, the SEAW is completely lacking a discussion of available mitigation measures that could be implemented. Instead, the SEAW merely provides the following generalizations:

- “Some agricultural practices can offset estimated greenhouse gas emissions.”82
- “The land application of manure replaces nutrients that farmers would otherwise provide to their fields via application of chemical fertilizers, thereby avoiding GHG emissions associated with chemical fertilizer production.”83
- “Additional CO₂-e could be avoided by Daley’s and likely neighbor’s use of cover crops . . . .”84

These broad, generalized statements fail to meet the standard to identify other available mitigations the Project could implement. The first statement is too broad to be useful and does not identify any actual mitigation practices. The second statement is irrelevant unless MPCA confirms that the Project will displace the use of chemical fertilizer. All three statements suffer from the

81 SEAW, supra note 1, at 5.
82 Id.
83 Id.
84 Id. at 5-6.
fatal flaw of failing to identify to what degree they could minimize GHG contributions from the Project. A discussion of mitigation measures is only useful when the agency quantifies the extent of projected mitigations from such practices, allowing MPCA, other governmental agencies, and the public to see opportunities for the greatest reduction in environmental effects.

MPCA has no excuse for failing to include information about available mitigation practices in the SEAW. Information about mitigation practices and their resulting emissions reductions is readily available. In fact, within the last six months, MPCA has completed a report detailing twenty-one best management practices that can be used to reduce GHG emissions from agriculture specifically.85 MPCA could have easily looked to its own existing data to describe available mitigation practices and their effects in the SEAW.

For example, the SEAW should have analyzed the mitigative effect of converting some currently tilled land to shelterbelts and hedgerows. For each acre of land planted as a shelterbelt or hedgerow, 2.69 short tons of CO₂ equivalent emissions are avoided, assuming a 20-year timeframe for carbon storage.86 Similarly, the SEAW should have analyzed the mitigative effect of removing land from crop production and planting trees. For each acre of cropland dedicated to forest, 2.63 short tons of CO₂ equivalent emissions are avoided, assuming a 20-year timeframe for carbon storage.87 This afforestation could occur either on the project proponent’s farmland or other farmland. Further, MPCA should have considered and analyzed the use of biochar as a soil amendment. Preliminary data from MPCA indicates that biochar application has the potential for avoided emissions of more than one ton of CO₂ equivalent per acre per year.88 The SEAW should

---

85 Cibrowski, supra note 64.
86 Id. at 5.
87 Id.
88 Id.
also look at the effect of using best management practices on the land currently dedicated to row crops (e.g., no chemicals, cover cropping, minimal or no tillage, elimination of synthetic fertilizers). Use of these practices has the potential to sequester GHGs at a rate of approximately one to two tons of CO₂ equivalent per acre per year. Finally, the SEAW should also have discussed mitigation methods to reduce methane. Altering cattle feed rations can significantly reduce methane produced. Studies show that a seaweed supplement can reduce methane by up to 80%.

The SEAW also lacks any mention of mitigation measures MPCA agency staff suggested and whether or not Daley Farms adopted such measures. Without this, and the other aforementioned information about mitigations, MPCA does not have a sufficient factual record before it to determine whether Daley Farms has made only a “token effort” to minimize the GHG emissions from the Project, or has incorporated “state-of-the-art” measures.

Given the significant amount of missing information in the SEAW, MPCA lacks the necessary factual record required to determine the actual environmental effect of the project and to perform a competent cumulative effects analysis. The SEAW must be revised to address the deficiencies in modeling, MPCA’s failure to use the most up-to-date information, the lacking discussion of mitigations, and the missing information that is necessary for MPCA to answer each of the four questions that make up the cumulative effects analysis. As written, the SEAW and the

---

91 EAW Guidelines, supra note 38, at 44.
MPCA’s factual record is deficient. In light of this missing information and pursuant to Minn. R. 4410.1700, subd. 2a, MPCA must revise the SEAW to include all of this information or make a positive declaration on an EIS and gather the missing information through that tool.

II. EMISSIONS FROM DALEY FARMS ARE A POTENTIAL SIGNIFICANT ENVIRONMENTAL EFFECT

Absent significant revisions, the current information in the SEAW describing the Project reveals that the Project will have a potential significant environmental effect. In order to determine whether a project has a potential significant environmental effect, MPCA must consider the following factors: (1) type, extent, and reversibility of environmental effects; (2) cumulative potential effects; (3) the extent to which the environmental effects are subject to mitigation by ongoing public regulatory authority; and (4) the extent to which environmental effects can be anticipated and controlled as a result of other available environmental studies.92

As discussed previously, the Project’s GHG emissions trigger a cumulative potential effects analysis. In determining whether the Project has the potential for significant environmental effects based on a cumulative effect, MPCA must consider additional factors, including: (1) whether the cumulative potential effect is significant; (2) whether the contribution from the Project is significant when viewed in connection with other contributions to the cumulative potential effect; (3) the degree to which the Project complies with approved mitigation measures specifically designed to address the cumulative potential effect; and (4) Daley Farms’ efforts to minimize the GHG contributions from the Project.93

Based on the SEAW as it exists currently, the Project will have a cumulative potential effect that is significant for the reasons discussed below.

92 Minn. R. 4410.1700, subd. 7.
93 Id., subd. 7(B).
A. The Cumulative Potential Effect Is Significant

Climate change is a cumulatively significant environmental effect. In 2009, the EPA issued a finding that the changes in the climate caused by elevated GHG concentrations in the atmosphere are reasonably anticipated to endanger the public health and public welfare for current and future generations.94 Climate change effects observed to-date and projected to occur in the future include more frequent and intense downpours and flooding, increased drought, greater sea-level rise, higher-intensity storm events, harm to water resources and agriculture, ocean acidification, and damage to wildlife and ecosystems.95

In Minnesota, we have already experienced substantial warming during winter and at night and increased precipitation throughout the year, often from larger and more frequent heavy rainfall events.96 These changes alone have damaged buildings and infrastructure, altered our growing seasons, and impacted natural resources.97 According to BWSR, “an overwhelming base of scientific evidence projects that Minnesota’s climate will see additional significant changes through the end of the 21st century.”98

An incredible amount of work must be done to reduce GHG emissions. Global GHG emissions reached an all-time high in 2018, underscoring the need for more immediate and stronger action to address climate change.99 In October 2018, the IPCC issued a report finding that, absent substantial GHG reductions by 2030 and net zero emissions by 2050, warming above 1.5°C (2.7°F) from pre-industrial levels is likely, resulting in wide-ranging and devastating

94 CEQ Guidelines, supra note 3, at 8.
95 Id. at 9.
96 BWSR supra note 32, at 6.
97 Id.
98 Id.
99 AGs Comments, supra note 39, at 2.
contraries. Additionally, the U.S. Global Change Research Program reported to Congress in 2018 that humanity’s current efforts to avoid substantial environmental damage and human health impacts are inadequate:

Earth’s climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. The impacts of global climate change are already being felt in the United States and are projected to intensify in the future—but the severity of future impacts will depend largely on actions taken to reduce greenhouse gas emissions and to adapt to the changes that will occur.

Climate-related risks will continue to grow without additional action. Decisions made today determine risk exposure for current and future generations and will either broaden or limit options to reduce the negative consequences of climate change.

While Americans are responding in ways that can bolster resilience and improve livelihoods, neither global efforts to mitigate the causes of climate change nor regional efforts to adapt to the impacts currently approach the scales needed to avoid substantial damages to the U.S. economy, environment, and human health and well-being over the coming decades.

Climate change is the greatest environmental challenge facing the planet and the science clearly indicates the cumulative potential effect of continuing to increase GHG emissions is significant.

B. The Contribution From The Project Is Significant

GHG emissions from the Project are significant when viewed in connection with other contributions. While tempting to argue that the Project’s emissions are insignificant in light of global climate change, this analysis is wholly inadequate for the reasons discussed previously. Instead, MPCA must look at more relevant contextual information, which shows the Project’s emissions are significant in light of Minnesota’s goals and lack of progress toward those goals.

---


For example, Minnesota aims to dramatically reduce its emissions statewide across all sectors, but the state is not on track to meet these reduction goals. While Minnesota seeks to reduce its emissions from the 2005 baseline, the Project, even using conservative estimates, adds 32,500 metric tons per year of emissions. Other states that perform similar analyses have set numerical significance thresholds at 10,000 metric tons per year. And when CEQ proposed using 25,000 metric tons annually as the significance threshold, it received pushback that the threshold was too high because it allowed for a “very large quantity of emissions.” The conservative estimate of Daley Farms’ GHG emissions well exceeds both of these significance thresholds.

Additionally, agriculture accounts for approximately one-quarter of Minnesota’s GHG emissions and MPCA has identified that strategies to reduce emissions from this sector are critical to reaching statewide goals. Furthermore, Minnesota cannot achieve its reduction goals without reducing emissions from the agricultural sector given that it is Minnesota’s largest source of methane and N₂O emissions. And, thus far, crop and animal agriculture have wholly failed to reach their reductions targets; in fact, emissions have increased. This important context reveals that the addition of 32,500 metric tons annually is significant, by federal and other state’s standards, in light of Minnesota’s goals, and in light of agriculture’s contribution to the state’s overall emissions.

102 Minn. Stat. § 116H.02.
103 California Letter, supra note 43, at 5-6.
104 Id.
105 Cibrowski, supra note 64, at Executive Summary.
106 Claflin & Steinwand, supra note 62, at 8
C. There Are No Approved Mitigation Measures That Could Allow The Project To Avoid An EIS

This factor does not apply to Daley Farms because there are currently no governmentally-created plans to mitigate the cumulative effect of GHGs that are applicable to the Project. As a result, this factor does not allow Daley Farms to avoid an EIS.

D. Daley Farms Has Made Only A Token Effort To Minimize GHG Contributions From The Project

Despite the absence of “approved mitigation measures” available for the Project, Daley Farms could avoid an EIS if it implemented its own mitigation measures to minimize the GHG contributions from the Project. However, the factual record before MPCA shows only that the Project will reduce its emissions 1,000 metric tons annually as a result of converting row crops to alfalfa. A 3% emission reduction per year as a result of mitigations is not enough to allow MPCA to find that the potential significant environmental effect from the Project’s emissions has been successfully mitigated. Without further information about the Project’s efforts to minimize emissions using practices such as those outlined in MPCA’s own reports, the SEAW shows Daley Farms has made only a token effort to reduce its emissions.

Because the cumulative potential effect of climate change is unquestionably significant, the Project’s GHG contributions are significant, the Project cannot comply with approved mitigation measures, and Daley Farms has made only a token effort to minimize its contributions to climate change, the Project has a cumulative potential effect on the basis of its GHG emissions.

Moreover, consideration of the other factors in Minn. R. 4410.1700, subd. 7 further demonstrates that this Project will have significant environmental effects. The extent of the Project’s GHG emissions are not insignificant, and the impact from these emissions and climate

107 SEAW, supra note 1, at 5.
change generally is not easily reversed. This is evidenced in Minnesota’s failure to meet our first GHG emissions reduction benchmark in 2015. The Project’s emissions are also not subject to any mitigation by an ongoing public regulatory authority, so MPCA cannot avoid a positive declaration on the EIS by finding the effects will be mitigated under 4410.1700, subd. 7. There are also no other identified environmental studies that can anticipate and control the effects from the Project’s GHG emissions. In light of this, and the fact that the Project has a cumulative effect, MPCA must order an EIS for Daley Farms.

III.  CONCLUSION

Minnesota law provides that when the information necessary to a reasoned decision about the potential for or significance of a project’s environmental effects is lacking, the RGU must either order an EIS or postpone the EIS decision and obtain the information that is lacking. For the reasons discussed above, the SEAW is deficient in numerous respects. To address this, MPCA must postpone the decision on the need for an EIS and revise the SEAW to include the vital information that is lacking. As part of this revision, MPCA must broaden the scope of its GHG emissions estimate for the Project to include a full picture of the facility’s emissions, including those from electricity consumption and fuel combustion. MCEA identified multiple tools MPCA can use to perform this analysis that are readily available and easy to use. MPCA must also revise its emissions calculation to use the most up-to-date GWP for methane consistent with the current IPCC report to reflect the true emissions from the Project. In addition, a robust discussion of available mitigation practices and their efficacy must be added to the SEAW along with critical contextual information about climate change in Minnesota that is necessary to perform a cumulative effects analysis.

108 Minn. R. 4410.1700, subd. 2a.
Should MPCA elect to proceed without obtaining the information that is lacking in the SEAW, under Rule 4410.1700, subdivision 2a MPCA must order an EIS to obtain the lacking information. In the alternative, if MPCA believes the SEAW is complete, it must order an EIS on the basis of the potential significant environmental effect resulting from the Project’s contribution to the cumulative effect of climate change.

Respectfully submitted,

/s/ Amelia Vohs
Amelia Vohs
Staff Attorney
Minnesota Center for Environmental Advocacy
1919 University Avenue West, Ste. 515
Saint Paul, MN  55104
avohs@mncenter.org
Exhibit 1
August 1, 2016

MEMORANDUM FOR HEADS OF FEDERAL DEPARTMENTS AND AGENCIES

FROM: CHRISTINA GOLDFUSS
COUNCIL ON ENVIRONMENTAL QUALITY

SUBJECT: Final Guidance for Federal Departments and Agencies on
Consideration of Greenhouse Gas Emissions and the Effects of
Climate Change in National Environmental Policy Act Reviews

I. INTRODUCTION

The Council on Environmental Quality (CEQ) issues this guidance to assist
Federal agencies in their consideration of the effects of greenhouse gas (GHG) emissions\(^1\)
and climate change when evaluating proposed Federal actions in accordance with the
National Environmental Policy Act (NEPA) and the CEQ Regulations Implementing the
Procedural Provisions of NEPA (CEQ Regulations).\(^2\) This guidance will facilitate
compliance with existing NEPA requirements, thereby improving the efficiency and
consistency of reviews of proposed Federal actions for agencies, decision makers, project
proponents, and the public.\(^3\) The guidance provides Federal agencies a common

---

\(^1\) For purposes of this guidance, CEQ defines GHGs in accordance with Section 19(m) of Exec. Order No. 13693, Planning for Federal Sustainability in the Next Decade, 80 Fed. Reg. 15869, 15882 (Mar. 25, 2015) (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride). Also for purposes of this guidance, "emissions" includes release of stored GHGs as a result of land management activities affecting terrestrial GHG pools such as, but not limited to, carbon stocks in forests and soils, as well as actions that affect the future changes in carbon stocks. The common unit of measurement for GHGs is metric tons of CO\(_2\) equivalent (mt CO\(_2\)-e).


\(^3\) This guidance is not a rule or regulation, and the recommendations it contains may not apply to a particular situation based upon the individual facts and circumstances. This guidance does not change or substitute for any law, regulation, or other legally binding
approach for assessing their proposed actions, while recognizing each agency’s unique circumstances and authorities.\(^4\)

Climate change is a fundamental environmental issue, and its effects fall squarely within NEPA’s purview.\(^5\) Climate change is a particularly complex challenge given its global nature and the inherent interrelationships among its sources, causation, mechanisms of action, and impacts. Analyzing a proposed action’s GHG emissions and the effects of climate change relevant to a proposed action—particularly how climate change may change an action’s environmental effects—can provide useful information to decision makers and the public.

CEQ is issuing the guidance to provide for greater clarity and more consistency in how agencies address climate change in the environmental impact assessment process. This guidance uses longstanding NEPA principles because such an analysis should be similar to the analysis of other environmental impacts under NEPA. The guidance is intended to assist agencies in disclosing and considering the reasonably foreseeable effects of proposed actions that are relevant to their decision-making processes. It confirms that agencies should provide the public and decision makers with explanations of the basis for agency determinations.

---


\(^5\) NEPA recognizes “the profound impact of man’s activity on the interrelations of all components of the natural environment.” (42 U.S.C. 4331(a)). It was enacted to, \textit{inter alia}, “promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man.” (42 U.S.C. 4321).
Focused and effective consideration of climate change in NEPA reviews\(^6\) will allow agencies to improve the quality of their decisions. Identifying important interactions between a changing climate and the environmental impacts from a proposed action can help Federal agencies and other decision makers identify practicable opportunities to reduce GHG emissions, improve environmental outcomes, and contribute to safeguarding communities and their infrastructure against the effects of extreme weather events and other climate-related impacts.

Agencies implement NEPA through one of three levels of NEPA analysis: a Categorical Exclusion (CE); an Environmental Assessment (EA); or an Environmental Impact Statement (EIS). This guidance is intended to help Federal agencies ensure their analysis of potential GHG emissions and effects of climate change in an EA or EIS is commensurate with the extent of the effects of the proposed action.\(^7\) Agencies have discretion in how they tailor their individual NEPA reviews to accommodate the approach outlined in this guidance, consistent with the CEQ Regulations and their respective implementing procedures and policies.\(^8\) CEQ does not expect that implementation of this guidance will require agencies to develop new NEPA implementing procedures. However, CEQ recommends that agencies review their NEPA procedures and propose any updates they deem necessary or appropriate to facilitate their consideration of GHG emissions and climate change.\(^9\) CEQ will review agency

\(^6\) The term “NEPA review” is used to include the analysis, process, and documentation required under NEPA. While this document focuses on NEPA reviews, agencies are encouraged to analyze GHG emissions and climate-resilient design issues early in the planning and development of proposed actions and projects under their substantive authorities.

\(^7\) See 40 CFR 1502.2(b) (Impacts shall be discussed in proportion to their significance); 40 CFR 1502.15 (Data and analyses in a statement shall be commensurate with the importance of the impact…).

\(^8\) See 40 CFR 1502.24 (Methodology and scientific accuracy).

\(^9\) See 40 CFR 1507.3. Agency NEPA implementing procedures can be, but are not required to be, in the form of regulation. Section 1507.3 encourages agencies to publish explanatory guidance, and agencies also should consider whether any updates to explanatory guidance are necessary. Agencies should review their policies and implementing procedures and revise them as necessary to ensure full compliance with NEPA.
proposals for revising their NEPA procedures, including any revision of CEs, in light of this guidance.

As discussed in this guidance, when addressing climate change agencies should consider: (1) The potential effects of a proposed action on climate change as indicated by assessing GHG emissions (e.g., to include, where applicable, carbon sequestration);\textsuperscript{10} and, (2) The effects of climate change on a proposed action and its environmental impacts.

This guidance explains the application of NEPA principles and practices to the analysis of GHG emissions and climate change, and

- Recommends that agencies quantify a proposed agency action’s projected direct and indirect GHG emissions, taking into account available data and GHG quantification tools that are suitable for the proposed agency action;

- Recommends that agencies use projected GHG emissions (to include, where applicable, carbon sequestration implications associated with the proposed agency action) as a proxy for assessing potential climate change effects when preparing a NEPA analysis for a proposed agency action;

- Recommends that where agencies do not quantify a proposed agency action’s projected GHG emissions because tools, methodologies, or data inputs are not reasonably available to support calculations for a quantitative analysis, agencies include a qualitative analysis in the NEPA document and explain the basis for determining that quantification is not reasonably available;

\textsuperscript{10} Carbon sequestration is the long-term carbon storage in plants, soils, geologic formations, and oceans.
• Discusses methods to appropriately analyze reasonably foreseeable direct, indirect, and cumulative GHG emissions and climate effects;

• Guides the consideration of reasonable alternatives and recommends agencies consider the short- and long-term effects and benefits in the alternatives and mitigation analysis;

• Advises agencies to use available information when assessing the potential future state of the affected environment in a NEPA analysis, instead of undertaking new research, and provides examples of existing sources of scientific information;

• Counsels agencies to use the information developed during the NEPA review to consider alternatives that would make the actions and affected communities more resilient to the effects of a changing climate;

• Outlines special considerations for agencies analyzing biogenic carbon dioxide sources and carbon stocks associated with land and resource management actions under NEPA;

• Recommends that agencies select the appropriate level of NEPA review to assess the broad-scale effects of GHG emissions and climate change, either to inform programmatic (e.g., landscape-scale) decisions, or at both the programmatic and tiered project- or site-specific level, and to set forth a reasoned explanation for the agency’s approach; and

• Counsels agencies that the “rule of reason” inherent in NEPA and the CEQ Regulations allows agencies to determine, based on their expertise and
experience, how to consider an environmental effect and prepare an analysis based on the available information.

II. BACKGROUND

A. NEPA

NEPA is designed to promote consideration of potential effects on the human environment\textsuperscript{11} that would result from proposed Federal agency actions, and to provide the public and decision makers with useful information regarding reasonable alternatives\textsuperscript{12} and mitigation measures to improve the environmental outcomes of Federal agency actions. NEPA ensures that the environmental effects of proposed actions are taken into account before decisions are made and informs the public of significant environmental effects of proposed Federal agency actions, promoting transparency and accountability concerning Federal actions that may significantly affect the quality of the human environment. NEPA reviews should identify measures to avoid, minimize, or mitigate adverse effects of Federal agency actions. Better analysis and decisions are the ultimate goal of the NEPA process\textsuperscript{13}.

Inherent in NEPA and the CEQ Regulations is a “rule of reason” that allows agencies to determine, based on their expertise and experience, how to consider an environmental effect and prepare an analysis based on the available information. The usefulness of that information to the decision-making process and the public, and the

\textsuperscript{11} 40 CFR 1508.14 (“‘Human environment’ shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment.”).

\textsuperscript{12} 40 CFR 1508.25(b) (“Alternatives, which include: (1) No action alternative. (2) Other reasonable courses of actions. (3) Mitigation measures (not in the proposed action).”).

\textsuperscript{13} 40 CFR 1500.1(c) (“Ultimately, of course, it is not better documents but better decisions that count. NEPA’s purpose is not to generate paperwork—even excellent paperwork—but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment.”).
extent of the anticipated environmental consequences are important factors to consider when applying that “rule of reason.”

B. Climate Change

Climate change science continues to expand and refine our understanding of the impacts of anthropogenic GHG emissions. CEQ’s first Annual Report in 1970 referenced climate change, indicating that “[m]an may be changing his weather.”\textsuperscript{14} At that time, the mean level of atmospheric carbon dioxide (CO\textsubscript{2}) had been measured as increasing to 325 parts per million (ppm) from an average of 280 ppm pre-Industrial levels.\textsuperscript{15} Since 1970, the concentration of atmospheric carbon dioxide has increased to approximately 400 ppm (2015 globally averaged value).\textsuperscript{16} Since the publication of CEQ’s first Annual Report, it has been determined that human activities have caused the carbon dioxide content of the atmosphere of our planet to increase to its highest level in at least 800,000 years.\textsuperscript{17}

It is now well established that rising global atmospheric GHG emission concentrations are significantly affecting the Earth’s climate. These conclusions are built upon a scientific record that has been created with substantial contributions from the


\textsuperscript{17} See http://earthobservatory.nasa.gov/Features/CarbonCycle; University of California Riverside, National Aeronautics and Space Administration (NASA), and Riverside Unified School District, Down to Earth Climate Change, http://globalclimate.ucr.edu/resources.html; USGCRP, Third National Climate Assessment, Appendix 3 Climate Science Supplement, p. 736 (“Although climate changes in the past have been caused by natural factors, human activities are now the dominant agents of change. Human activities are affecting climate through increasing atmospheric levels of heat-trapping gases and other substances, including particles.”).
United States Global Change Research Program (USGCRP), which informs the United States’ response to global climate change through coordinated Federal programs of research, education, communication, and decision support.\(^\text{18}\) Studies have projected the effects of increasing GHGs on many resources normally discussed in the NEPA process, including water availability, ocean acidity, sea-level rise, ecosystem functions, energy production, agriculture and food security, air quality and human health.\(^\text{19}\)

Based primarily on the scientific assessments of the USGCRP, the National Research Council, and the Intergovernmental Panel on Climate Change, in 2009 the Environmental Protection Agency (EPA) issued a finding that the changes in our climate caused by elevated concentrations of greenhouse gases in the atmosphere are reasonably anticipated to endanger the public health and public welfare of current and future generations.\(^\text{20}\) In 2015, EPA acknowledged more recent scientific assessments that “highlight the urgency of addressing the rising concentration of CO\(_2\) in the atmosphere,” finding that certain groups are especially vulnerable to climate-related effects.\(^\text{21}\) Broadly


\(^{20}\) See generally Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496 (Dec. 15, 2009). (For example, at 66497-98: “[t]he evidence concerning how human-induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. Additionally, public health is expected to be adversely affected by an increase in the severity of coastal storm events due to rising sea levels”).

\(^{21}\) See EPA, Final Rule for Carbon Pollution Emission Guidelines for Existing Stationary Sources Electric Utility Generating Units, 80 Fed. Reg. 64661, 64677 (Oct. 23, 2015) (“Certain groups, including children, the elderly, and the poor, are most vulnerable to climate-related effects. Recent studies also find that certain communities, including low-income communities and some communities of color . . . are disproportionately affected by certain climate change related impacts—including heat waves, degraded air quality, and
stated, the effects of climate change observed to date and projected to occur in the future include more frequent and intense heat waves, longer fire seasons and more severe wildfires, degraded air quality, more heavy downpours and flooding, increased drought, greater sea-level rise, more intense storms, harm to water resources, harm to agriculture, ocean acidification, and harm to wildlife and ecosystems.22

III. CONSIDERING THE EFFECTS OF GHG EMISSIONS AND CLIMATE CHANGE

This guidance is applicable to all Federal actions subject to NEPA, including site-specific actions, certain funding of site-specific projects, rulemaking actions, permitting decisions, and land and resource management decisions.23 This guidance does not – and cannot – expand the range of Federal agency actions that are subject to NEPA. Consistent with NEPA, Federal agencies should consider the extent to which a proposed action and its reasonable alternatives would contribute to climate change, through GHG emissions, and take into account the ways in which a changing climate may impact the proposed action and any alternative actions, change the action’s environmental effects over the lifetime of those effects, and alter the overall environmental implications of such actions.

This guidance is intended to assist agencies in disclosing and considering the effects of GHG emissions and climate change along with the other reasonably foreseeable environmental effects of their proposed actions. This guidance does not establish any


23 See 40 CFR 1508.18.
particular quantity of GHG emissions as “significantly” affecting the quality of the human environment or give greater consideration to the effects of GHG emissions and climate change over other effects on the human environment.

A. GHG Emissions as a Proxy for the Climate Change Impacts of a Proposed Action

In light of the global scope of the impacts of GHG emissions, and the incremental contribution of each single action to global concentrations, CEQ recommends agencies use the projected GHG emissions associated with proposed actions as a proxy for assessing proposed actions’ potential effects on climate change in NEPA analysis. 24 This approach, together with providing a qualitative summary discussion of the impacts of GHG emissions based on authoritative reports such as the USGCRP’s National Climate Assessments and the Impacts of Climate Change on Human Health in the United States, a Scientific Assessment of the USGCRP, allows an agency to present the environmental and public health impacts of a proposed action in clear terms and with sufficient information to make a reasoned choice between no action and other alternatives and appropriate mitigation measures, and to ensure the professional and scientific integrity of the NEPA review. 25

Climate change results from the incremental addition of GHG emissions from millions of individual sources, 26 which collectively have a large impact on a global scale.

---

24 See 40 CFR 1502.16, 1508.9.
25 See 40 CFR 1500.1, 1502.24 (requiring agencies to use high quality information and ensure the professional and scientific integrity of the discussions and analyses in environmental impact statements).
26 Some sources emit GHGs in quantities that are orders of magnitude greater than others. See EPA, Greenhouse Gas Reporting Program 2014 Reported Data, Figure 2: Direct GHG Emissions Reported by Sector (2014), available at https://www.epa.gov/ghgreporting/ghgrp-2014-reported-data (amounts of GHG emissions by sector); Final Rule for Carbon Pollution Emission Guidelines for Existing Stationary Sources Electric Utility Generating Units, 80 Fed. Reg. 64661, 64663, 64689 (Oct. 23, 2015) (regulation of GHG emissions from fossil fuel-fired electricity generating power plants); Oil and Natural Gas Sector Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 34824, 35830 (June 3, 2016 (regulation of GHG emissions from oil and gas sector).
CEQ recognizes that the totality of climate change impacts is not attributable to any single action, but are exacerbated by a series of actions including actions taken pursuant to decisions of the Federal Government. Therefore, a statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA. Moreover, these comparisons are also not an appropriate method for characterizing the potential impacts associated with a proposed action and its alternatives and mitigations because this approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make a relatively small addition to global atmospheric GHG concentrations that collectively have a large impact. When considering GHG emissions and their significance, agencies should use appropriate tools and methodologies for quantifying GHG emissions and comparing GHG quantities across alternative scenarios. Agencies should not limit themselves to calculating a proposed action’s emissions as a percentage of sector, nationwide, or global emissions in deciding whether or to what extent to consider climate change impacts under NEPA.

1. GHG Emissions Quantification and Relevant Tools

This guidance recommends that agencies quantify a proposed agency action’s projected direct and indirect GHG emissions. Agencies should be guided by the principle that the extent of the analysis should be commensurate with the quantity of projected GHG emissions and take into account available data and GHG quantification tools that
are suitable for and commensurate with the proposed agency action. The rule of reason and the concept of proportionality caution against providing an in-depth analysis of emissions regardless of the insignificance of the quantity of GHG emissions that would be caused by the proposed agency action.

Quantification tools are widely available, and are already in broad use in the Federal and private sectors, by state and local governments, and globally. Such quantification tools and methodologies have been developed to assist institutions, organizations, agencies, and companies with different levels of technical sophistication, data availability, and GHG source profiles. When data inputs are reasonably available to support calculations, agencies should conduct GHG analysis and disclose quantitative estimates of GHG emissions in their NEPA reviews. These tools can provide estimates of GHG emissions, including emissions from fossil fuel combustion and estimates of GHG emissions and carbon sequestration for many of the sources and sinks potentially affected by proposed resource management actions. When considering which tool(s) to employ, it is important to consider the proposed action’s temporal scale, and the availability of input data. Examples of the kinds of methodologies agencies might consider using are presented in CEQ’s 2012 Guidance for Accounting and Reporting GHG Emissions for a wide variety of activities associated with Federal agency operations. When an agency determines that quantifying GHG emissions would not be

---

27 See 40 CFR 1500.1(b) (“Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.”); 40 CFR 1502.2(b) (Impacts shall be discussed in proportion to their significance); 40 CFR 1502.15 (Data and analyses in a statement shall be commensurate with the importance of the impact…).
29 For example, USDA’s COMET-Farm tool can be used to assess the carbon sequestration of existing agricultural activities along with the reduction in carbon sequestration (emissions) of project-level activities, http://cometfarm.nrel.colostate.edu/. Examples of other tools are available at https://ceq.doc.gov/current_developments/GHG-accounting-tools.html.
30 See 40 CFR 1502.22.
31 See https://www.whitehouse.gov/sites/default/files/microsites/ceq/revised_federal_greenhouse_gas_accounting_and_reporting_guidance_
warranted because tools, methodologies, or data inputs are not reasonably available, the agency should provide a qualitative analysis and its rationale for determining that the quantitative analysis is not warranted. A qualitative analysis can rely on sector-specific descriptions of the GHG emissions of the category of Federal agency action that is the subject of the NEPA analysis.

When updating their NEPA procedures and guidance, agencies should coordinate with CEQ to identify 1) the actions that normally warrant quantification of their GHG emissions, and consideration of the relative GHG emissions associated with alternative actions and 2) agency actions that normally do not warrant such quantification because tools, methodologies, or data inputs are not reasonably available. The determination of the potential significance of a proposed action remains subject to agency practice for the consideration of context and intensity, as set forth in the CEQ Regulations.

2. The Scope of the Proposed Action

In order to assess effects, agencies should take account of the proposed action – including “connected” actions – subject to reasonable limits based on feasibility and practicality. Activities that have a reasonably close causal relationship to the Federal action, such as those that may occur as a predicate for a proposed agency action or as a consequence of a proposed agency action, should be accounted for in the NEPA analysis.
For example, NEPA reviews for proposed resource extraction and development projects typically include the reasonably foreseeable effects of various phases in the process, such as clearing land for the project, building access roads, extraction, transport, refining, processing, using the resource, disassembly, disposal, and reclamation. Depending on the relationship between any of the phases, as well as the authority under which they may be carried out, agencies should use the analytical scope that best informs their decision making.

The agency should focus on significant potential effects and conduct an analysis that is proportionate to the environmental consequences of the proposed action.\(^{35}\) Agencies can rely on basic NEPA principles to determine and explain the reasonable parameters of their analyses in order to disclose the reasonably foreseeable effects that may result from their proposed actions.\(^{36}\)

3. Alternatives

Considering alternatives, including alternatives that mitigate GHG emissions, is fundamental to the NEPA process and accords with NEPA Sections 102(2)(C) and 102(2)(E).\(^{37}\) The CEQ regulations emphasize that the alternatives analysis is the heart of the EIS under NEPA Section 102(2)(C).\(^{38}\) NEPA Section 102(2)(E) provides an independent requirement for the consideration of alternatives in environmental documents.\(^{39}\) NEPA calls upon agencies to use the NEPA process to “identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment.”\(^{40}\) The requirement to

\(^{35}\) See 40 CFR 1501.7(a)(3), 1502.2(b), and 1502.15.
\(^{36}\) See 40 CFR 1502.16.
\(^{37}\) 42 U.S.C. 4332(2)(C), 4332(2)(E); 40 CFR 1502.14, 1508.9(b).
\(^{39}\) See 40 CFR 1500.2, 1508.9(b).
\(^{40}\) 40 CFR 1500.2(c).
consider alternatives ensures that agencies account for approaches with no, or less, adverse environmental effects for a particular resource.

Consideration of alternatives also provides each agency decision maker the information needed to examine other possible approaches to a particular proposed action (including the no action alternative) that could alter the environmental impact or the balance of factors considered in making the decision. Agency decisions are aided when there are reasonable alternatives that allow for comparing GHG emissions and carbon sequestration potential, trade-offs with other environmental values, and the risk from – and resilience to – climate change inherent in a proposed action and its design.

Agencies must consider a range of reasonable alternatives consistent with the level of NEPA review (e.g., EA or EIS) and the purpose and need for the proposed action, as well as reasonable mitigation measures if not already included in the proposed action or alternatives. Accordingly, a comparison of these alternatives based on GHG emissions and any potential mitigation measures can be useful to advance a reasoned choice among alternatives and mitigation actions. When conducting the analysis, an agency should compare the anticipated levels of GHG emissions from each alternative – including the no-action alternative – and mitigation actions to provide information to the public and enable the decision maker to make an informed choice.

Agencies should consider reasonable alternatives and mitigation measures to reduce action-related GHG emissions or increase carbon sequestration in the same fashion as they consider alternatives and mitigation measures for any other environmental effects. NEPA, the CEQ Regulations, and this guidance do not require the decision

41 See 42 U.S.C. 4332(2)(C), 4332(2)(E), and 40 CFR 1502.14(f), 1508.9(b). The purpose and need for action usually reflects both the extent of the agency’s statutory authority and its policies.
maker to select the alternative with the lowest net level of emissions. Rather, they allow for the careful consideration of emissions and mitigation measures along with all the other factors considered in making a final decision.

4. Direct and Indirect Effects

If the direct and indirect GHG emissions can be quantified based on available information, including reasonable projections and assumptions, agencies should consider and disclose the reasonably foreseeable direct and indirect emissions when analyzing the direct and indirect effects of the proposed action.\(^4\) Agencies should disclose the information and any assumptions used in the analysis and explain any uncertainties.

To compare a project’s estimated direct and indirect emissions with GHG emissions from the no-action alternative, agencies should draw on existing, timely, objective, and authoritative analyses, such as those by the Energy Information Administration, the Federal Energy Management Program, or Office of Fossil Energy of the Department of Energy.\(^5\) In the absence of such analyses, agencies should use other available information. When such analyses or information for quantification is unavailable, or the complexity of comparing emissions from various sources would make quantification overly speculative, then the agency should quantify emissions to the extent that this information is available and explain the extent to which quantified emissions information is unavailable while providing a qualitative analysis of those emissions.

\(^4\) For example, where the proposed action involves fossil fuel extraction, direct emissions typically include GHGs emitted during the process of exploring for or extracting the fossil fuel. The indirect effects of such an action that are reasonably foreseeable at the time would vary with the circumstances of the proposed action. For actions such as a Federal lease sale of coal for energy production, the impacts associated with the end-use of the fossil fuel being extracted would be the reasonably foreseeable combustion of that coal.

with any NEPA analysis, the level of effort should be proportionate to the scale of the emissions relevant to the NEPA review.

5. Cumulative Effects

“Cumulative impact” is defined in the CEQ Regulations as the “impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.”  All GHG emissions contribute to cumulative climate change impacts. However, for most Federal agency actions CEQ does not expect that an EIS would be required based solely on the global significance of cumulative impacts of GHG emissions, as it would not be consistent with the rule of reason to require the preparation of an EIS for every Federal action that may cause GHG emissions regardless of the magnitude of those emissions.

Based on the agency identification and analysis of the direct and indirect effects of its proposed action, NEPA requires an agency to consider the cumulative impacts of its proposed action and reasonable alternatives. As noted above, for the purposes of NEPA, the analysis of the effects of GHG emissions is essentially a cumulative effects analysis that is subsumed within the general analysis and discussion of climate change impacts. Therefore, direct and indirect effects analysis for GHG emissions will adequately address the cumulative impacts for climate change from the proposed action and its alternatives and a separate cumulative effects analysis for GHG emissions is not needed.

6. Short- and Long-Term Effects

44 40 CFR 1508.7.
When considering effects, agencies should take into account both the short- and long-term adverse and beneficial effects using a temporal scope that is grounded in the concept of reasonable foreseeability. Some proposed actions will have to consider effects at different stages to ensure the direct effects and reasonably foreseeable indirect effects are appropriately assessed; for example, the effects of construction are different from the effects of the operations and maintenance of a facility.

Biogenic GHG emissions and carbon stocks from some land or resource management activities, such as a prescribed burn of a forest or grassland conducted to limit loss of ecosystem function through wildfires or insect infestations, may result in short-term GHG emissions and loss of stored carbon, while in the longer term a restored, healthy ecosystem may provide long-term carbon sequestration. Therefore, the short- and long-term effects should be described in comparison to the no action alternative in the NEPA review.

7. Mitigation

Mitigation is an important component of the NEPA process that Federal agencies can use to avoid, minimize, and compensate for the adverse environmental effects associated with their actions. Mitigation, by definition, includes avoiding impacts, minimizing impacts by limiting them, rectifying the impact, reducing or eliminating the impacts over time, or compensating for them.\textsuperscript{46} Consequently, agencies should consider reasonable mitigation measures and alternatives as provided for under existing CEQ Regulations and take into account relevant agency statutory authorities and policies. The NEPA process is also intended to provide useful advice and information to State, local

\textsuperscript{46} See 40 CFR 1508.20, 1508.25 (Alternatives include mitigation measures not included in the proposed action).
and tribal governments and private parties so that the agencies can better coordinate with other agencies and organizations regarding the means to mitigate effects of their actions.\textsuperscript{47} The NEPA process considers the effects of mitigation commitments made by project proponents or others and mitigation required under other relevant permitting and environmental review regimes.\textsuperscript{48}

As Federal agencies evaluate potential mitigation of GHG emissions and the interaction of a proposed action with climate change, the agencies should also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented.\textsuperscript{49} Agencies should consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane.

Finally, the CEQ Regulations and guidance recognize the value of monitoring to ensure that mitigation is carried out as provided in a record of decision or finding of no significant impact.\textsuperscript{50} The agency’s final decision on the proposed action should identify those mitigation measures that the agency commits to take, recommends, or requires

\textsuperscript{47} NEPA directs Federal agencies to make “advice and information useful in restoring, maintaining, and enhancing the quality of the environment” available to States, Tribes, counties, cities, institutions and individuals. NEPA Sec. 102(2)(G).


others to take. Monitoring is particularly appropriate to confirm the effectiveness of mitigation when that mitigation is adopted to reduce the impacts of a proposed action on affected resources already increasingly vulnerable due to climate change.

**B. CONSIDERING THE EFFECTS OF CLIMATE CHANGE ON A PROPOSED ACTION AND ITS ENVIRONMENTAL IMPACTS**

According to the USGCRP and others, GHGs already in the atmosphere will continue altering the climate system into the future, even with current or future emissions control efforts. Therefore, a NEPA review should consider an action in the context of the future state of the environment. In addition, climate change adaptation and resilience — defined as adjustments to natural or human systems in response to actual or expected climate changes — are important considerations for agencies contemplating and planning actions with effects that will occur both at the time of implementation and into the future.

1. **Affected Environment**

An agency should identify the affected environment to provide a basis for comparing the current and the future state of the environment as affected by the proposed action or its reasonable alternatives. The current and projected future state of the environment without the proposed action (i.e., the no action alternative) represents the reasonably foreseeable affected environment, and this should be described based on

---


53 See 40 CFR 1502.15 (providing that environmental impact statements shall succinctly describe the environmental impacts on the area(s) to be affected or created by the alternatives under consideration).
authoritative climate change reports, which often project at least two possible future scenarios. The temporal bounds for the state of the environment are determined by the projected initiation of implementation and the expected life of the proposed action and its effects. Agencies should remain aware of the evolving body of scientific information as more refined estimates of the impacts of climate change, both globally and at a localized level, become available.

2. Impacts

The analysis of climate change impacts should focus on those aspects of the human environment that are impacted by both the proposed action and climate change. Climate change can make a resource, ecosystem, human community, or structure more susceptible to many types of impacts and lessen its resilience to other environmental impacts apart from climate change. This increase in vulnerability can exacerbate the effects of the proposed action. For example, a proposed action may require water from a stream that has diminishing quantities of available water because of decreased snow pack in the mountains, or add heat to a water body that is already warming due to increasing atmospheric temperatures. Such considerations are squarely within the scope of NEPA and can inform decisions on whether to proceed with, and how to design, the proposed action to eliminate or mitigate impacts exacerbated by climate change. They can also

---

54 See, e.g., Third National Climate Assessment (Regional impacts chapters) available at http://www.globalchange.gov/nca3-downloads-materials.
55 See, e.g., Third National Climate Assessment (Regional impacts chapters, considering a low future global emissions scenario, and a high emissions scenario) available at http://www.globalchange.gov/nca3-downloads-materials.
inform possible adaptation measures to address the impacts of climate change, ultimately enabling the selection of smarter, more resilient actions.

3. Available Assessments and Scenarios

In accordance with NEPA’s rule of reason and standards for obtaining information regarding reasonably foreseeable effects on the human environment, agencies need not undertake new research or analysis of potential climate change impacts in the proposed action area, but may instead summarize and incorporate by reference the relevant scientific literature. For example, agencies may summarize and incorporate by reference the relevant chapters of the most recent national climate assessments or reports from the USGCRP. Particularly relevant to some proposed actions are the most current reports on climate change impacts on water resources, ecosystems, agriculture and forestry, health, coastlines, and ocean and arctic regions in the United States. Agencies may recognize that scenarios or climate modeling information (including seasonal, inter-annual, long-term, and regional-scale projections) are widely used, but when relying on a single study or projection, agencies should consider their limitations and discuss them.

4. Opportunities for Resilience and Adaptation

As called for under NEPA, the CEQ Regulations, and CEQ guidance, the NEPA review process should be integrated with agency planning at the earliest possible time that would allow for a meaningful analysis. Information developed during early

---

58 See 40 CFR 1502.21 (material may be incorporated by reference if it is reasonably available for inspection by potentially interested persons during public review and comment).
59 See http://www.globalchange.gov/browse/reports.
60 See Third National Climate Assessment, Our Changing Climate, available at http://nca2014.globalchange.gov/report. Agencies should consider the latest final assessments and reports when they are updated.
62 See 42 U.S.C. 4332 (“agencies of the Federal Government shall … utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decision-making”); 40 CFR 1501.2 (“Agencies shall integrate the NEPA process with other planning at the earliest possible time…”); See also CEQ Memorandum
planning processes that precede a NEPA review may be incorporated into the NEPA review. Decades of NEPA practice have shown that integrating environmental considerations with the planning process provides useful information that program and project planners can consider in the design of the proposed action, alternatives, and potential mitigation measures. For instance, agencies should take into account increased risks associated with development in floodplains, avoiding such development wherever there is a practicable alternative, as required by Executive Order 11988 and Executive Order 13690. In addition, agencies should take into account their ongoing efforts to incorporate environmental justice principles into their programs, policies, and activities, including the environmental justice strategies required by Executive Order 12898, as amended, and consider whether the effects of climate change in association with the effects of the proposed action may result in a disproportionate effect on minority and low income communities. Agencies also may consider co-benefits of the proposed action, alternatives, and potential mitigation measures for human health, economic and social stability, ecosystem services, or other benefit that increases climate change preparedness or resilience. Individual agency adaptation plans and interagency adaptation strategies, such as agency Climate Adaptation Plans, the National Fish, Wildlife and Plants Climate Adaptation Strategy, and the National Action Plan: Priorities for Managing Freshwater
Resources in a Changing Climate, provide other good examples of the type of relevant and useful information that can be considered.65

Climate change effects on the environment and on the proposed project should be considered in the analysis of a project considered vulnerable to the effects of climate change such as increasing sea level, drought, high intensity precipitation events, increased fire risk, or ecological change. In such cases, a NEPA review will provide relevant information that agencies can use to consider in the initial project design, as well as alternatives with preferable overall environmental outcomes and improved resilience to climate impacts. For example, an agency considering a proposed long-term development of transportation infrastructure on a coastal barrier island should take into account climate change effects on the environment and, as applicable, consequences of rebuilding where sea level rise and more intense storms will shorten the projected life of the project and change its effects on the environment.66 Given the length of time involved in present sea level projections, such considerations typically will not be relevant to short-term actions with short-term effects.

In addition, the particular impacts of climate change on vulnerable communities may be considered in the design of the action or the selection among alternatives to

assess the impact, and potential for disproportionate impacts, on those communities.\textsuperscript{67} For example, chemical facilities located near the coastline could have increased risk of spills or leakages due to sea level rise or increased storm surges, putting local communities and environmental resources at greater risk. Increased resilience could minimize such potential future effects. Finally, considering climate change preparedness and resilience can help ensure that agencies evaluate the potential for generating additional GHGs if a project has to be replaced, repaired, or modified, and minimize the risk of expending additional time and funds in the future.

C. Special Considerations for Biogenic Sources of Carbon

With regard to biogenic GHG emissions from land management actions – such as prescribed burning, timber stand improvements, fuel load reductions, scheduled harvesting, and livestock grazing – it is important to recognize that these land management actions involve GHG emissions and carbon sequestration that operate within the global carbon and nitrogen cycle, which may be affected by those actions. Similarly, some water management practices have GHG emission consequences (e.g., reservoir management practices can reduce methane releases, wetlands management practices can enhance carbon sequestration, and water conservation can improve energy efficiency).

Notably, it is possible that the net effect of ecosystem restoration actions resulting in short-term biogenic emissions may lead to long-term reductions of atmospheric GHG concentrations through increases in carbon stocks or reduced risks of future emissions. In the land and resource management context, how a proposed action affects a net carbon sink or source will depend on multiple factors such as the climatic region, the distribution

of carbon across carbon pools in the project area, and the ongoing activities and trends. In addressing biogenic GHG emissions, resource management agencies should include a comparison of estimated net GHG emissions and carbon stock changes that are projected to occur with and without implementation of proposed land or resource management actions. This analysis should take into account the GHG emissions, carbon sequestration potential, and the changes in carbon stocks that are relevant to decision making in light of the proposed actions and timeframes under consideration.

One example of agencies dealing with biogenic emissions and carbon sequestration arises when agencies consider proposed vegetation management practices that affect the risk of wildfire, insect and disease outbreak, or other disturbance. The public and the decision maker may benefit from consideration of the influence of a vegetation management action that affects the risk of wildfire on net GHG emissions and carbon stock changes. NEPA reviews should consider whether to include a comparison of net GHG emissions and carbon stock changes that are anticipated to occur, with and without implementation of the proposed vegetation management practice, to provide information that is useful to the decision maker and the public to distinguish between alternatives. The analysis would take into account the estimated GHG emissions (biogenic and fossil), carbon sequestration potential, and the net change in carbon stocks relevant in light of the proposed actions and timeframes under consideration. In such cases the agency should describe the basis for estimates used to project the probability or likelihood of occurrence or changes in the effects or severity of wildfire. Where such

---

68 One example of a tool for such calculations is the Carbon On Line Estimator (COLE), which uses data based on USDA Forest Service Forest Inventory & Analysis and Resource Planning Assessment data and other ecological data. COLE began as a collaboration between the National Council for Air and Stream Improvement, Inc. (NCASI) and USDA Forest Service, Northern Research Station. It currently is maintained by NCASI. It is available at http://www.fs.usda.gov/cerc/tools/cole.
tools, methodologies, or data are not yet available, the agency should provide a qualitative analysis and its rationale for determining that the quantitative analysis is not warranted. As with any other analysis, the rule of reason and proportionality should be applied to determine the extent of the analysis.

CEQ acknowledges that Federal land and resource management agencies are developing agency-specific principles and guidance for considering biological carbon in management and planning decisions.\(^6^9\) Such guidance is expected to address the importance of considering biogenic carbon fluxes and storage within the context of other management objectives and ecosystem service goals, and integrating carbon considerations as part of a balanced and comprehensive program of sustainable management, climate change mitigation, and climate change adaptation.

IV. TRADITIONAL NEPA TOOLS AND PRACTICES

A. Scoping and Framing the NEPA Review

To effectuate integrated decision making, avoid duplication, and focus the NEPA review, the CEQ Regulations provide for scoping.\(^7^0\) In scoping, the agency determines the issues that the NEPA review will address and identifies the impacts related to the proposed action that the analyses will consider.\(^7^1\) An agency can use the scoping process to help it determine whether analysis is relevant and, if so, the extent of analysis.


\(^{70}\) See 40 CFR 1501.7 (“There shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process shall be termed scoping.”); see also CEQ Memorandum for Heads of Federal Departments and Agencies, Improving the Process for Preparing Efficient and Timely Environmental Reviews under the National Environmental Policy Act, March 6, 2012, available at https://ceq.doe.gov/current_developments/docs/Improving_NEPAs_Efficiencies_06Mar2012.pdf (the CEQ Regulations explicitly require scoping for preparing an EIS, however, agencies can also take advantage of scoping whenever preparing an EA).

\(^{71}\) See 40 CFR 1500.4(b), 1500.4(g), 1501.7.
appropriate for a proposed action.\textsuperscript{72} When scoping for the climate change issues associated with the proposed agency action, the nature, location, timeframe, and type of the proposed action and the extent of its effects will help determine the degree to which to consider climate projections, including whether climate change considerations warrant emphasis, detailed analysis, and disclosure.

Consistent with this guidance, agencies may develop their own agency-specific practices and guidance for framing the NEPA review. Grounded on the principles of proportionality and the rule of reason, such aids can help an agency determine the extent to which an analysis of GHG emissions and climate change impacts should be explored in the decision-making process and will assist in the analysis of the no action and proposed alternatives and mitigation.\textsuperscript{73} The agency should explain such a framing process and its application to the proposed action to the decision makers and the public during the NEPA review and in the EA or EIS document.

B. Frame of Reference

When discussing GHG emissions, as for all environmental impacts, it can be helpful to provide the decision maker and the public with a recognizable frame of reference for comparing alternatives and mitigation measures. Agencies should discuss relevant approved federal, regional, state, tribal, or local plans, policies, or laws for GHG emission reductions or climate adaptation to make clear whether a proposed project’s

\textsuperscript{72} See 40 CFR 1501.7 (The agency preparing the NEPA analysis must use the scoping process to, among other things, determine the scope and identify the significant issues to be analyzed in depth) and CEQ, Memorandum for General Counsels, NEPA Liaisons, and Participants in Scoping, April 30, 1981, available at https://ceq.doe.gov/nepa/regs/scoping/scoping.htm.

GHG emissions are consistent with such plans or laws.\textsuperscript{74} For example, the Bureau of Land Management has discussed how agency actions in California, especially joint projects with the State, may or may not facilitate California reaching its emission reduction goals under the State’s Assembly Bill 32 (Global Warming Solutions Act).\textsuperscript{75} This approach helps frame the policy context for the agency decision based on its NEPA review.

C. Incorporation by Reference

Incorporation by reference is of great value in considering GHG emissions or where an agency is considering the implications of climate change for the proposed action and its environmental effects. Agencies should identify situations where prior studies or NEPA analyses are likely to cover emissions or adaptation issues, in whole or in part. When larger scale analyses have considered climate change impacts and GHG emissions, calculating GHG emissions and carbon stocks for a specific action may provide only limited information beyond the information already collected and considered in the larger scale analyses. The NEPA reviews for a specific action can incorporate by reference earlier programmatic studies or information such as management plans, inventories, assessments, and research that consider potential changes in carbon stocks, as well as any relevant programmatic NEPA reviews.\textsuperscript{76}

Accordingly, agencies should use the scoping process to consider whether they should incorporate by reference GHG analyses from other programmatic studies, action

\textsuperscript{74} See 40 CFR 1502.16(c), 1506.2(d) (where an inconsistency exists, agencies should describe the extent to which the agency will reconcile its proposed action with the plan or law). See also Exec. Order No. 13693, 80 Fed. Reg. 15869 (Mar. 25, 2015) (establishing GHG emission and related goals for agency facilities and operations. Scope 1, 2, and 3 emissions are typically separate and distinct from analyses and information used in an EA or EIS).


\textsuperscript{76} See 40 CFR 1502.5, 1502.21.
specific NEPA reviews, or programmatic NEPA reviews to avoid duplication of effort. Furthermore, agencies should engage other agencies and stakeholders with expertise or an interest in related actions to participate in the scoping process to identify relevant GHG and adaptation analyses from other actions or programmatic NEPA documents.

D. Using Available Information

Agencies should make decisions using current scientific information and methodologies. CEQ does not expect agencies to fund and conduct original climate change research to support their NEPA analyses or for agencies to require project proponents to do so. Agencies should exercise their discretion to select and use the tools, methodologies, and scientific and research information that are of high quality and available to assess the impacts.77

Agencies should be aware of the ongoing efforts to address the impacts of climate change on human health and vulnerable communities.78 Certain groups, including children, the elderly, and the poor, are more vulnerable to climate-related health effects, and may face barriers to engaging on issues that disproportionately affect them. CEQ recommends that agencies periodically engage their environmental justice experts, and the Federal Interagency Working Group on Environmental Justice,79 to identify approaches to avoid or minimize impacts that may have disproportionately high and

---

77 See 40 CFR 1502.24 (requiring agencies to ensure the professional and scientific integrity of the discussions and analyses in environmental impact statements).
79 For more information on the Federal Interagency Working Group on Environmental Justice co-chaired by EPA and CEQ, see http://www.epa.gov/environmentaljustice/interagency/index.html.
adverse human health or environmental effects on minority and low-income populations. 80

E. Programmatic or Broad-Based Studies and NEPA Reviews

Agency decisions can address different geographic scales that can range from the programmatic or landscape level to the site- or project-specific level. Agencies sometimes conduct analyses or studies that are not NEPA reviews at the national level or other broad scale level (e.g., landscape, regional, or watershed) to assess the status of one or more resources or to determine trends in changing environmental conditions. 81 In the context of long-range energy, transportation, and resource management strategies an agency may decide that it would be useful and efficient to provide an aggregate analysis of GHG emissions or climate change effects in a programmatic analysis and then incorporate by reference that analysis into future NEPA reviews.

A tiered, analytical decision-making approach using a programmatic NEPA review is used for many types of Federal actions 82 and can be particularly relevant to addressing proposed land, aquatic, and other resource management plans. Under such an approach, an agency conducts a broad-scale programmatic NEPA analysis for decisions such as establishing or revising USDA Forest Service land management plans, Bureau of Land Management resource management plans, or Natural Resources Conservation Service conservation programs. Subsequent NEPA analyses for proposed site-specific

81 Such a programmatic study is distinct from a programmatic NEPA review which is appropriate when the action under consideration is itself subject to NEPA requirements. See CEQ, Memorandum for Heads of Federal Departments and Agencies, Effective Use of Programmatic NEPA Reviews, Dec. 18, 2014, § I(A), p. 9, available at https://www.whitehouse.gov/sites/default/files/docs/effective_use_of_programmatic_nepa_reviews_final_dec2014_searchable.pdf (discussing non-NEPA types of programmatic analyses such as data collection, assessments, and research, which previous NEPA guidance described as joint inventories or planning studies).
82 See 40 CFR 1502.20, 1508.28. A programmatic NEPA review may be appropriate when a decision is being made that is subject to NEPA, such as establishing formal plans, programs, and policies, and when considering a suite of similar projects.
decisions – such as proposed actions that implement land, aquatic, and other resource
management plans – may be tiered from the broader programmatic analysis, drawing
upon its basic framework analysis to avoid repeating analytical efforts for each tiered
decision. Examples of project- or site-specific actions that may benefit from being able
to tier to a programmatic NEPA review include: constructing transmission lines;
conducting prescribed burns; approving grazing leases; granting rights-of-way; issuing
leases for oil and gas drilling; authorizing construction of wind, solar or geothermal
projects; and approving hard rock mineral extraction.

A programmatic NEPA review may also serve as an efficient mechanism in which
to assess Federal agency efforts to adopt broad-scale sustainable practices for energy
efficiency, GHG emissions avoidance and emissions reduction measures, petroleum
product use reduction, and renewable energy use, as well as other sustainability
practices.\textsuperscript{83} While broad department- or agency-wide goals may be of a far larger scale
than a particular program, policy, or proposed action, an analysis that informs how a
particular action affects that broader goal can be of value.

\textbf{F. Monetizing Costs and Benefits}

NEPA does not require monetizing costs and benefits. Furthermore, the weighing
of the merits and drawbacks of the various alternatives need not be displayed using a
monetary cost-benefit analysis and should not be when there are important qualitative
considerations.\textsuperscript{84} When an agency determines that a monetized assessment of the impacts
of greenhouse gas emissions or a monetary cost-benefit analysis is appropriate and

\textsuperscript{84} See 40 CFR 1502.23.
relevant to the choice among different alternatives being considered, such analysis may be incorporated by reference or appended to the NEPA document as an aid in evaluating the environmental consequences. For example, a rulemaking could have useful information for the NEPA review in an associated regulatory impact analysis which could be incorporated by reference. When using a monetary cost-benefit analysis, just as with tools to quantify emissions, the agency should disclose the assumptions, alternative inputs, and levels of uncertainty associated with such analysis. Finally, if an agency chooses to monetize some but not all impacts of an action, the agency providing this additional information should explain its rationale for doing so.

V. CONCLUSION AND EFFECTIVE DATE

Agencies should apply this guidance to all new proposed agency actions when a NEPA review is initiated. Agencies should exercise judgment when considering whether to apply this guidance to the extent practicable to an on-going NEPA process. CEQ does not expect agencies to apply this guidance to concluded NEPA reviews and actions for

---

85 See 40 CFR 1502.21 (material may be cited if it is reasonably available for inspection by potentially interested persons within the time allowed for public review and comment).

86 When conducting a cost-benefit analysis, determining an appropriate method for preparing a cost-benefit analysis is a decision left to the agency’s discretion, taking into account established practices for cost-benefit analysis with strong theoretical underpinnings (for example, see OMB Circular A-4 and references therein). For example, the Federal social cost of carbon (SCC) estimates the marginal damages associated with an increase in carbon dioxide emissions in a given year. Developed through an interagency process committed to ensuring that the SCC estimates reflect the best available science and methodologies and used to assess the social benefits of reducing carbon dioxide emissions across alternatives in rulemakings, it provides a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review. For current Federal estimates, see Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 (revised July 2015), available at https://www.whitehouse.gov/omb/oirasocial-cost-of-carbon.

87 For example, the regulatory impact analysis was used as a source of information and aligned with the NEPA review for Corporate Average Fuel Economy (CAFE) standards, see National Highway Traffic Safety Administration, Corporate Average Fuel Economy Standards, Passenger Cars and Light Trucks, Model Years 2017-2025, Final Environmental Impact Statement, Docket No. NHTSA-2011-0056 (July 2012), § 5.3.2, available at http://www.nhtsa.gov/Laws&Regulations/CAFE+-+Fuel+Economy/Environmental+Impact+Statement+for+CAFE+Standards,+2017-2025.

88 For example, the information may be responsive to public comments or useful to the decision maker in further distinguishing between alternatives and mitigation measures. In all cases, the agency should ensure that its consideration of the information and other factors relevant to its decision is consistent with applicable statutory or other authorities, including requirements for the use of cost-benefit analysis.
which a final EIS or EA has been issued. Agencies should consider applying this
guidance to projects in the EIS or EA preparation stage if this would inform the
consideration of differences between alternatives or address comments raised through the
public comment process with sufficient scientific basis that suggest the environmental
analysis would be incomplete without application of the guidance, and the additional time
and resources needed would be proportionate to the value of the information included.

# # #
Exhibit 2
Minnesota Center for Environmental Advocacy ("MCEA")
Comments on the Environmental Assessment Worksheet and the
Need for an Environmental Impact Statement
for the Daley Farms of Lewiston, LLC dairy expansion in Winona County

November 15, 2018
The Minnesota Center for Environmental Advocacy ("MCEA" or "Petitioner") requests that the Minnesota Pollution Control Agency ("MPCA") prepare an Environmental Impact Statement ("EIS") for Daley Farms of Lewiston, LLC dairy expansion ("Daley Expansion" or "the project") in Winona County. Petitioner also requests that MPCA deny Daley Farm’s request for a National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Permit ("Permit"). If MPCA issues a negative declaration on the EIS, Petitioner requests that MPCA grant a contested case hearing pursuant to Minn. R. 7000.1800-1900 due to material issues of fact with regard to whether the Daley Expansion can be operated in compliance with Minnesota Rules chapter 7020 and other applicable laws, as discussed in the Permit comment (concurrently filed).

I. TIMELINESS

These requests are timely. MPCA published the Public Notice of the Environmental Assessment Worksheet ("EAW") and intent to issue an NPDES permit for the Daley Expansion on October 1, 2018, and extended the comment period until November 15, 2018 at the request of Petitioner and others, due to the fact that this comment period coincided with harvesting, and because of the complexity of the project. Similarly, the petition for a contested case is timely pursuant to Minn. R. 7000.1800, which provides that a petition for a contested case hearing “must be submitted during the public comment period established under parts 7001.0100.”

II. SUMMARY OF REASONS

Minn. R. 4410.1700, subp. 1 provides that “[a]n EIS shall be ordered for projects that have the potential for significant environmental effects.” For the Daley Expansion, ample evidence exists that, due to location of the project, existing levels of pollutants in surface and
groundwater, and the volume of manure that will need to be managed, the project poses the potential for significant environmental effects.¹

Simply put, the project does not have enough acres of land to accommodate the volumes of manure produced by the facility, and the land that has been identified for application is pocked with karst features that will convey manure directly to ground and surface waters. For the same reasons, Petitioner asserts that the project as proposed cannot comply with the requirements of the Clean Water Act and state law and would endanger public health in an area that is already experiencing the health impacts of contaminated drinking water. Because evidence establishes that the proposal cannot comply with federal and state law and the effluent limitations in the draft permit, Petitioner requests that the MPCA deny the NPDES permit for the Daley Expansion. If the agency does not deny coverage, Petitioners request that the agency refer the disputed issues of material fact to the Office of Administrative Hearings for resolution in a contested case hearing.

III. STATEMENTS OF INTEREST

MCEA is a Minnesota nonprofit public interest organization with over 3,000 members including many in Winona County, and its mission is to use law, science, and research to protect and enhance Minnesota’s natural resources, wildlife, and the health of its people. MCEA has advocated for sustainable agriculture for many years, and was integrally involved in the feedlot rule amendments implemented in the early 2000s.

IV. AN EIS IS REQUIRED

Under applicable rules, the MPCA must decide whether a project has the potential for significant environmental effects by applying the following factors:

¹E. Calvin Alexander Jr., Comment on Daley Farms of Lewiston, LLP: 2018 Dairy Expansion – EAW (p-ear2-143i), attached as Exhibit 1.
A. type, extent, and reversibility of environmental effects;  
B. cumulative potential effects. The RGU shall consider the following factors: whether the cumulative potential effect is significant; whether the contribution from the project is significant when viewed in connection with other contributions to the cumulative potential effect; the degree to which the project complies with approved mitigation measures specifically designed to address the cumulative potential effect; and the efforts of the proposer to minimize the contributions from the project;  
C. the extent to which the environmental effects are subject to mitigation by ongoing public regulatory authority. The RGU may rely only on mitigation measures that are specific and that can be reasonably expected to effectively mitigate the identified environmental impacts of the project; and  
D. the extent to which environmental effects can be anticipated and controlled as a result of other available environmental studies undertaken by public agencies or the project proposer, including other EISs.2

The EAW for the Daley Expansion lacks sufficient information to support a finding that the project does not have the potential to cause significant environmental impacts. Therefore, an EIS must be ordered.3 While this alone compels a decision to require an EIS, at the very least the lack of complete information supports the need to either “make a positive declaration and include within the scope of the EIS appropriate studies to obtain the lacking information” or “postpone the decision on the need for an EIS, for not more than 30 days or such other period of time as agreed upon by the RGU and proposer, in order to obtain the lacking information.”4

A. The Daley Expansion Has The Potential For Significant Environmental Impacts As A Result Of Cumulative Impacts Because Existing Water Quality Is Already Impacted By Similar Pollutants.

Winona County is a highly sensitive karst region. As the result of existing agricultural uses, water quality is suffering in Winona County. A significant proportion of the ground and surface water is already contaminated by nitrate and bacteria, and safe drinking water sources are increasingly difficult to find. The problem is created when fertilizers, both manure and

---

2 Minn. R. 4410.1700, subp. 7  
3 Minn. R. 4410.2000, subp. 3, 4410.1700, subp. 1.  
4 Minn. R. 4410.1700, subp. 2a.
nitrogen fertilizer, are land applied, and seep, leach, or are otherwise discharged to groundwater and rivers and streams through the porous geology. Despite this existing problem, Daley Farms is proposing to significantly increase the amount of manure that will be landspread in a highly susceptible karst region.

The contribution from the project to existing pollution must be viewed as significant in connection with other contributions. If the expansion is granted, Daley Farms will need to dispose of 46.2 million gallons of liquid manure per year on nearby cropland. But nearly every stream or river nearby the Daley Expansion is already contaminated by agricultural pollutants including nitrate and bacteria, such as *E. coli* and fecal coliform. Similarly, a significant percentage of private wells are contaminated, and public water supplies are also at risk.

In the townships where Daley proposes to spread its manure, about 40% of private wells that have been tested already register above the health risk limit (HRL) for nitrate, with some wells testing at over 4 times the safe levels of nitrates.

<table>
<thead>
<tr>
<th>Township</th>
<th>% Private Wells &gt; HRL</th>
<th>Max Nitrate Level Recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utica</td>
<td>46.5%</td>
<td>27.9 mg/L</td>
</tr>
<tr>
<td>Fremont</td>
<td>54.8%</td>
<td>43.8 mg/L</td>
</tr>
<tr>
<td>Saint Charles</td>
<td>34.1%</td>
<td>34.8 mg/L</td>
</tr>
</tbody>
</table>

*the results are based on data collected by the Minnesota Department of Agriculture’s Township Testing Program.*

Six of the Dales Farms’ proposed manure application sites are within the Utica Drinking Water Supply Management Area (DWSMA), which is rated “Highly Vulnerable.” The public

---

6 See Map of Manure Application Acres Proposed at Daley Farms & Drinking Water Supply Management Area Vulnerability, attached as Exhibit 2.
water supply for Utica is at serious risk and has registered over the nitrate HRL in recent years.\textsuperscript{7} Other manure-spreading locations are also already impacted. Between 2011 and 2016, coliform was registered as present in the non-community water supplies of Trout Valley Trail in Lewiston.\textsuperscript{8} Coliform was also present in 3 locations in nearby St. Charles: Discount Grocery, Berea Moravian Church, and SEMA equipment.\textsuperscript{9} Coliform was also detected in the Whitewater State Park and Wildlife Management Area in Altura.\textsuperscript{10,11}

In this sad reality, any additional pollution has the potential to create significant environmental effects as a result of cumulative impacts.

**B. The EAW Relies On Disproved “Mitigations” To Conclude That No Impacts Will Occur**

Of key concern is the fact that the EAW heavily relies on entirely unproven assumptions to conclude that the proposed expansion will not significantly impact the environment. The MPCA must consider “the extent to which the environmental effects are subject to mitigation by ongoing public regulatory authority.”\textsuperscript{12} In considering these effects, “the RGU may rely only on mitigation measures that are specific and that can be reasonably expected to effectively mitigate the identified environmental impacts of the project.”\textsuperscript{13} It may not rely on “mitigations” that are disproved by the available evidence.

\textsuperscript{7} See Minnesota Department of Health public water supply test results for PSWID 1850011 from 2016-2018, available by request from Minnesota Department of Health.
\textsuperscript{9} Id.
\textsuperscript{11} Despite a request to Winona County, MCEA was unable to obtain data on bacteria levels in private wells in this area during the comment period.
\textsuperscript{12} Minn. R. 4410.1700, subp. 7.
\textsuperscript{13} Id.
Although the EAW acknowledges that “feedlots may impact these impairments (for nitrate, TSS, *E. coli* and impaired biota) by contributing nutrients and fecal bacteria through overland runoff or drain tile intakes from the application of manure,” the EAW contains no further analysis on this question. Instead, the EAW simply presumes this impact away:  

- “Manure application at this field must be done according to its MMP\(^{15}\) and cannot exceed agronomical rates; therefore, the PCA does not expect cumulative impacts.”
- “The applied manure from the Project will not add additional nutrients, but will replace the use of commercial fertilizer at the manure application sites.”
- “Manure application provides enhanced soil tilth, a beneficial property of soil that helps retain moisture and reduce runoff from fields.”
- “The nutrients in manure from the Project will replace the use of commercial fertilizers for the manure application sites. All manure application is required to take place at agronomical rates and in accordance with Minn. R. 7020 and the Feedlot Permit.”
- “Daley expects the stormwater runoff characteristics from the Project manure application sites to remain the same, and under certain circumstances, improve because of the land application activities regulated under the Feedlot Permit. The improvements occur through developing better soil tilth from organic fertilizer and the uniform practices of incorporating manure over the acres identified in the MMP.”
- “Daley expects no change in stormwater runoff characteristics (physically and chemically) from the Project manure application sites.”

No analysis is undertaken to determine the veracity of these assumptions, and indeed, they cannot be supported. Under state law, the EAW has not considered the environmental impacts that are “reasonably expected to occur.”\(^{16}\) Instead of analyzing these reasonably foreseeable impacts, the EAW concludes they will not occur on the basis of two disproven assumptions, neither of which can reasonably be construed as “mitigations” that would justify a finding of no significant impact.

---

\(^{15}\) Manure Management Plan (“MMP”)  
\(^{16}\) Minn. R. 4410.1700, subp. 6.
1. Manure does not replace commercial fertilizer.

In the EAW, MPCA maintains that the groundwater and surface waters at the site and its surrounding area are already contaminated with nitrates, total suspended solids, and *E. coli*, but argues that the proposal “will not add additional nutrients, but will replace the use of commercial fertilizer at the manure application sites.”\(^{17}\) This replacement assumption is a critical component of the conclusion that the project will not add to the already heavy nutrient and pathogen load to area waters, but the EAW provides no evidence or even reasoning to support this assumption. In fact, the available evidence suggests that the exact opposite is true, rendering the EAW’s conclusions fundamentally baseless and therefore legally inadequate.

According to survey data collected by the Department of Agriculture, 74% of farmers in Southeastern Minnesota apply commercial fertilizers to their manured fields, and 83% did not know how much nitrogen was in the manure they applied to their fields.\(^{18}\) Proper application of commercial fertilizers requires the applicator to take into account the nitrogen applied to the field from manure, but the vast majority of producers in Southeastern Minnesota are entirely unable to make this adjustment. As a result, nearly half of the corn fields in Minnesota that are applied with both manure and commercial fertilizer received over 200 pounds of nitrogen per acre, well over the recommended limit.\(^{19}\) The *average* amount of nitrogen from manure and commercial fertilizer per acre is 191 pounds; again well over the recommended limit.\(^{20}\) The vast majority of

\(^{17}\) EAW at 22; see also *id.* at 24 (“The nutrients in manure from the Project will replace the use of commercial fertilizers for the manure application sites.”).


\(^{19}\) *Id.* at 161.

\(^{20}\) *Id.* at 254.
producers do not use variable rate manure applications, and a majority are unaware of manure application rates at all.\textsuperscript{21}

In the face of this data, it is unreasonable and capricious for the agency to assert that the application of 46.5 million gallons of liquid manure to area croplands will not add nutrients and bacteria to the already impaired surface and groundwaters. The data very clearly show that manure applicators apply manure \textit{in addition to} their applications of commercial fertilizer, and that fertilizer rates are not reduced by the application of manure.

2. \textit{Manure management plans do not prevent overapplication.}

MPCA also presumes that manure management plans will prevent the type of significant ground and water pollution that is already proven to occur in the area where Daley Farms is located. The EAW for Daley Farms repeatedly concludes that compliance with MMPs will prevent any impacts to groundwater or surfacewater. But Petitioner has evidence that the use of manure management plans fails to prevent overapplication and cumulative impacts. For example, as the EAW observes, Daley Farms proposes to apply manure on a field that also receives manure from a nearby swine facility operated by Holden Farms.\textsuperscript{22} In addition, MDA’s data shows that manure applicators are almost entirely unaware of the nitrogen content of the manure they are applying to fields, but the EAW for Daley Farms concludes, without any evidence or support of any kind: “[m]anure application at this field must be done according to its MMP and cannot exceed agronomical rates; therefore, the PCA does not expect cumulative impacts.”\textsuperscript{23}

Based on the information presented by Petitioner above, it is clear that the use of MMPs will not, and do not, prevent pollutants from reaching surface waters, nor do MMPs prevent

\textsuperscript{21} \textit{Id.} at 250.
\textsuperscript{22} EAW at 21. The manure application site numbered 41 for the Daley project is the same site numbered 36 for the Holden Farms Inc., Sites 1 and 2 swine facility in Winona County.
\textsuperscript{23} \textit{Id.}
overapplication of transferred manure or the cumulative impacts of oversaturation of liquid manure applied in a relatively small area by multiple sources.

MPCA’s own documentation shows the impact of feedlot manure on the watershed. The Watershed Restoration and Protection Strategy (WRAPS) for the Mississippi River – Winona Watershed identifies ongoing bacterial contamination as a main issue that needs to be addressed.24 The Lower Mississippi River Fecal Coliform TMDL identifies “Livestock Facilities with NPDES Permits” and “Livestock Manure” as “major source categor[ies]” for bacterial contamination.25 The report concludes that “runoff from livestock feedlots, pastures, and land application areas has the potential to be a significant source of fecal coliform bacteria and other pollutants.” The study also implicitly acknowledges that producer adoption of MMPs is a largely aspirational goal, contrary to the oft-stated assumption that applicators follow the manure application rates in their MMPs.26 The more recent Mississippi River – Winona Watershed Pollutant Reduction Project (Total Maximum Daily Load Study) for Nutrients, Sediment and Bacteria concludes that:

Livestock manure is often either surface applied or incorporated into farm fields as fertilizer and soil amendment. This land application of manure has the potential to be a substantial source of fecal contamination, entering waterways from overland runoff and drain tile intakes. Research being conducted in southern Minnesota shows high concentrations of fecal bacteria leaving fields with incorporated manure and open tile intakes. Minn. R. ch. 7020 contains manure application setback requirements based on research related to phosphorus transport, and not bacterial transport, and the effectiveness of these current setbacks on bacterial transport to surface waters is not known.27

25 Lower Mississippi River TMDL for Fecal Coliform at 23.
26 Id. at 118 (“Funding to support technical assistance and to provide producer incentives will be sought to maximize producer adoption of manure management plans.”).
27 Mississippi River – Winona Watershed Pollutant Reduction Project (Total Maximum Daily Load Study) for Nutrients, Sediment and Bacteria at 51-52.
Despite all this, every feedlot EAW continues to assert that land applied manure never reaches surface or ground waters, and in fact improves water quality. To continue to do so without evidence (and where the evidence that is available suggests otherwise) while the state of the watershed continues to deteriorate is unreasonable and demands an EIS under Minnesota Rule 4410.1700.

This pattern has unfortunately continued for every feedlot EAW in the state. Expansion and consolidation in the industry has led to more animals and more manure being concentrated in highly localized areas, and water quality continues to suffer not just from nutrients but from pathogens like \textit{E. coli}, which is not derived from commercial fertilizers but from animal manure. And yet in each instance, the MPCA repeats the same conclusions: agronomic rates of manure application ensure no environmental impact. Every feedlot EAW in fact contains the same conclusion: that new or expanded feedlots improve water quality in the surrounding area. Under state law, however, rote repetition cannot substitute for actual evidence, inquiry, and analysis.

This EAW is devoid of any actual evidence showing that the additional production of incredible amounts of manure will not affect surrounding waters in any way. At some point, the landscape is physically unable to absorb additional manure applications. However, MPCA’s regulatory scheme entirely fails to account for any sort of physical limits of the land. As far as state-level regulation of feedlots is concerned, facilities could continue to expand \textit{ad infinitum}, and the agency would bless that expansion with the same refrain: application cannot exceed agronomic rates, and therefore there are no impacts to the expansions. Minnesota Rule 4410.1700 requires the RGU to make a determination on the need for an EIS by considering the

\footnote{\textit{See, e.g.} Mississippi River – Winona Watershed Pollutant Reduction Project (Total Maximum Daily Load Study) for Nutrients, Sediment and Bacteria at section 3.5.2.1.}
“cumulative potential effects” of the proposal,\textsuperscript{29} which is defined as the “effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid.”\textsuperscript{30} In making this determination, the RGU may not rely on “bare assertions” alone, and a negative determination on the need for an EIS that is based on bare assertions alone is a violation of the Minnesota Administrative Procedure Act (MAPA).\textsuperscript{31} Here, the EAW’s conclusions on the potential for significant environmental effects is based on multiple critical assumptions – that manure applicators actually apply at agronomic rates and that manure applications substitute for applications of commercial fertilizers - that are unsupported by any evidence at all, and are in fact contrary to evidence. The MPCA cites no “independent scientific data, agency opinions, or studies” supporting these key assertions,\textsuperscript{32} thereby violating both MEPA and MAPA.

C. The EAW Fails To Address Cumulative Impacts Due To Manure Releases.

Despite the MPCA’s optimistic assumptions that feedlots improve water quality, outside of the EAW context the agency is clear that this is not the case. The available evidence tells us something different. The Mississippi River – Winona Watershed Restoration and Protection Strategy states that liquid storage manure areas are sources of bacterial contamination from leakage and structural failures.\textsuperscript{33} Elsewhere MPCA regularly reports on the overtopping of manure storage facilities from precipitation, noting recently that “heavy rains in southern

\textsuperscript{29} Minn. R. 4410.1700, supb. 7.
\textsuperscript{30} Minn. R. 4410.0200, subp. 11a.
\textsuperscript{31} See \textit{CARD v. Kandiyohi County Bd. Of Comm’rs}, 713 N.W.2d 817, 837 (Minn. 2006).
\textsuperscript{32} \textit{Id}.
\textsuperscript{33} MRWW WRAPS at 41
Minnesota find some livestock producers scrambling to stem the overflow from livestock manure storage basins.” The MPCA regularly publishes newsletters advising livestock producers to take steps to account for increased precipitation in order to avoid overtopping manure storage basins. Those recommendations state:

It’s been cold and wet so far this October, delaying crop harvest. This makes it challenging to get manure applied in a timely fashion and for liquid manures there is a risk of overflow from storage basins.

These high precipitation events will only get more frequent and more intense with climate change, but the EAW ignores this entirely.

V. THE EAW FAILS TO ACCOUNT FOR THE IMPACTS OF, AND CONTRIBUTIONS TO, CLIMATE CHANGE

A. The Proposed Expansion Will Significantly Contribute To The State’s Greenhouse Gas Emissions

The proposed expansion would house 4,628 cows, of which 3,983 are dairy cows and 645 are heifers or calves. Recently calculated emission factors estimate that the average dairy cow in the United States produces 158.7 kg methane per animal per year via enteric fermentation, and 137 kg methane per animal per year via manure management. Meat and other cattle (e.g. heifers and calves) produce 58.8 kg and 2.4 kg methane per animal per year via enteric

---


37 MRWW WRAPS at 43, and Section V.

38 EAW at 4.

fermentation and manure management, respectively.\textsuperscript{40} In total the Daley Farms expansion would produce 1,217,247.1 kg of methane per year.\textsuperscript{41} Methane is many times as potent a greenhouse gas as CO\textsubscript{2}, and over the next twenty years a kg of methane will warm the planet as much as 84-86 kg of CO\textsubscript{2}.\textsuperscript{42} The 1.2 million kg of methane emitted by this proposal will therefore warm the planet by the equivalent of 102,248,748 kg of CO\textsubscript{2}, or 102,248 metric tons. This is the same GHG emissions as driving 21,895 cars for a year, or burning 558 rail cars full of coal.\textsuperscript{43} This would make the expanded Daley Farms the 43rd largest GHG emitter in the state, larger than power plants in Red Wing, Blue Earth County, Mower County, and Minneapolis.\textsuperscript{44}

If the concentrated dairy industry is viewed as whole, it would be one of the state’s largest greenhouse gas emitters. Even just looking at large dairies with over 1,000 AU, there are 95 such facilities in the state, housing a total of 269,770 AU of dairy cattle.\textsuperscript{45} Together these large dairies produce roughly 4,601,160 metric tons of CO\textsubscript{2} equivalent GHGs a year,\textsuperscript{46} which

\begin{itemize}
\item \textsuperscript{40} Id.
\item \textsuperscript{41} 3,983 dairy cows at 158.7 kg methane = 632,102.1 kg methane via enteric fermentation. 3,983 dairy cows at 137 kg methane = 545,671 kg methane via manure management practices. 645 meat or other cattle at 58.8 kg methane = 37,926 kg methane via enteric fermentation. 645 meat or other cattle at 2.4 kg methane = 1,548 kg methane via manure management practices. \textit{See} Wolf et al., supra.
\item \textsuperscript{44} U.S. EPA, \textit{GHG Reporting Program Data Sets}, available at .https://www.epa.gov/ghgreporting/ghg-reporting-program-data-sets.
\item \textsuperscript{45} Data derived from state GIS information.
\item \textsuperscript{46} This estimate assumes that the Daley Farms profile of dairy cows, heifers, and calves is representative of these large dairies. 269,770 AU of dairy cattle is equivalent to about 45 operations similar to Daley Farms’ 6,000 AU proposal.
\end{itemize}
would make these dairy farms the #3 emitter of GHGs in the state, just below the Sherco and Boswell coal fired power plants.

Despite being a significant emitter by itself, and despite being part of an industry that cumulatively contributes more greenhouse gases than any other industry besides coal-fired electricity, the EAW contains no analysis of greenhouse gas emissions whatsoever. Question 6 of the EAW summarizes many other air emissions, including odors, hydrogen sulfide, ammonia, and dust, but no estimates of CO2, methane or nitrous oxide emissions. This omission is notable, for in Minnesota, agriculture is the third largest source of greenhouse gases. The failure to account for these impacts, both for the individual project and for the cumulative emissions of comparable projects, violates MAPA.

B. The EAW relies on out-of-date rainfall data

Animal feedlots or manure containment areas are required to meet the effluent limits for five-day biochemical oxygen demand of 25 mg/L unless it falls under the conditions for phosphorus effluent limits from existing facilities as specified in Minn. Rule 7053.0255. These effluent limits apply to stormwater leaving the facility as well as other treated and untreated effluent. These effluent limits do not apply, though, should the animal feedlot or manure storage areas overflow due to rainfall if the facilities are designed, constructed, and operated:

- to meet effluent limits for rainfall events less than or equal to a 25-year, 24-hour rainfall event for that location; or
- to collect and contain the runoff from a 25-year, 24-hour rainfall event for that location.

---

48 See Pope Cty. Mothers v. Minnesota Pollution Control Agency, 594 N.W.2d 233 (Minn. Ct. App. 1999); CARD, 713 N.W.2d at 829.
49 Minn. R. 7053.0305 subp. 2(A).
50 Minn. R. 7053.0305, subp. 2(B).
The rainfall depth used in designing an animal feedlot for a 25-year, 24-hour rainfall event is the amount of rainfall over 24-hours that on average will be exceeded only every 25-years. Similarly, it is a depth over 24-hours that has a 1/25 chance of being exceeded in any given year.

The EAW for the Daley Farms expansion states that the proposed facility will be designed to withstand a rainfall event of 5.4 inches. This is lower than the median 25-Year, 24-hour rainfall event of 5.57 inches from the NOAA Atlas-14\textsuperscript{51} for the Daley Farms.\textsuperscript{52}

Unfortunately, the NOAA Atlas-14 is an outdated and insufficient resource to use for designs to prevent the overflow and discharge of raw manure into nearby waterways. Atlas-14 provides precipitation frequency estimates for durations of 5-minutes through 60-days at average recurrence intervals of 1-year through 1,000-year for eleven Midwestern states. It uses data from stations across Minnesota, yet the estimates for Southeast Minnesota do not incorporate data newer than 2011.\textsuperscript{53}

The increased precipitation from anthropogenic climate change has begun to accelerate in recent years, but the rainfall data relied on by the EAW does not take this acceleration into account. As an illustration that the rainfall patterns in the region around the Daley Farm are shifting, annual rainfall measured at the Winona Dam 5A weather station shows increasing annual rainfall due to climate change. \textit{See Figure 1.} This trend is accelerating for extreme weather events as well. Increased storm intensity can appear as increased depth of a given type of rainfall event or as a greater frequency of heavy rainfall events. These events can have highly


\textsuperscript{52} Attached printout from the Precipitation Frequency Data Server at \url{http://hdsc.nws.noaa.gov/hdsc/pfds}. Accessed on 11/12/2018 for 18774 Highway 14, Lewiston, MN 55952.

\textsuperscript{53} \textit{Id}. 

16
localized effects, and Southeast Minnesota in particular has likely experienced the wettest six years on record since 2011. These events are not included in the Atlas-14 modeling. Designs for the Daley Farms derived from Atlas-14 will therefore be undersized for their stated purpose.

**Figure 1: Total annual precipitation as measured at the Winona Dam 5A Weather Station since 1941**

![Graph showing total annual precipitation](image)

Knowing that even the most up-to-date resources like Atlas-14 are already out-of-date due to the quickly changing climate, many engineers compensate by using rainfall depths at or near the upper 90% confidence interval. That means that using the given dataset, there is only a 5% chance that real life rainfall depth, at the specified frequency, will exceed the modeled upper 90% confidence level. Compare this to a greater than 50% likelihood that rainfall depths will exceed the estimated depth currently used in Daley Farm designs. Since it is known that real life rainfall depths will be higher than those modeled in Atlas-14 and given the potential impacts of the uncontrolled release of manure, it is warranted to use the upper 90% confidence interval for

---

54 Personal communication with Kenneth Blummenfeld, Senior Climatologist, Minnesota State Climate Office.
55 Years with missing data are not shown. The trend line is a linear fit of the data showing a long-term increase in the annual rainfall near the Daley Farm.
designs at the Daley Farms. The Atlas-14 upper 90% confidence interval at the Daley Farms is 7.31 inches.56

This increased precipitation has a direct role on the environmental impacts that can be reasonably expected to occur from the project.57 Overall, the precipitation an area receives in wetter years will roughly double the nitrate leaching losses to groundwater.58 Climate, therefore, “has a significant effect on nonpoint source N loadings to Minnesota groundwater,” and yet the EAW concludes no analysis whatsoever of this effect.59

C. The EAW Fails To Consider The Significant Impacts To The Environment And Current Wells Posed By Daley’s Proposed New Irrigation Wells.

The Daley Farms proposes to expand its current water use by over three times. The current wells used for livestock watering will continue to be used, and two additional wells will be constructed and permitted.

The current wells used by the Daley Farms are permitted for a combined 60 million gallons per year (“MGY”) and have a combined reported usage of 23.4 MGY to 35 MGY since they were installed in 2010.60 Both current wells draw from the Wonewoc Aquifer.61 Permission from the MN DNR will be required if modifications are to be made to the current wells to

56 See Atlas-14 output for Daley Farms, attached as Exhibit 3.
57 Minn. R. 4410.1700, subp. 6.
58 D.J. Mulla & J. Galzki, Nutrient Sources and Pathways to Groundwater in Minnesota at slide 14, available at www.gwpc.org/sites/default/files/event-sessions/Mulla_DavidFINAL.pdf.
59 Mulla & Galzki, supra at 29.
60 Based upon publicly available information in the Minnesota DNR Permitting and Reporting System (MPARS).
61 MN DNR water appropriations Permit Number 2010-0352 for the Daley Farms includes Well Number 591916 and Well Number 678949. Well Number 591916 has a Permit Total Volume of 30 MGY and is 715 feet deep. Well Number 678949 also has a Permit Total Volume of 30 MGY and is 720 feet deep. Both are permitted for Livestock Watering and draw from the Wonewoc Aquifer.
increase the pumping capacity. The two proposed new wells will be located near the current wells and at similar depths. The expected aquifers they will use are the Jordan, St. Laurence, and Tunnel City Aquifers.

Water use of greater than 1 MGY or 10,000 gallons per day requires a water use permit from the MN DNR in addition to a permit for drilling the well from the MDH. The water use permit is not granted at the same time as the well permit but later after well testing and other conditions of the permit are met that require the well to have already been constructed. Instead, the MN DNR issues a preliminary evaluation of the water use permit at the time the well permit is issued by the MDH. The preliminary evaluation gives the well owner an early indication of the likelihood that the well will cause harm to ecosystems, degrade water quality, or significantly reduce the public water supply. The Daley Farms received a preliminary approval letter from the MN DNR on October 30, 2017. As noted above, this approval only allows drilling of a well; it does not authorize the well owner to appropriate water.

Among the criteria MN DNR must consider in evaluating a water use permit is interference with other wells. Well interference is determined from analysis, modeling, and, primarily, by an aquifer test. In an aquifer test, the water is drawn down at the maximum requested pumping rate over time to determine if there will be impacts to other wells or surface waters. Testing and analysis necessarily occur after the well is drilled because many factors that may contribute to interference with surrounding wells are unknown beforehand. These factors

---

63 The Tunnel City and Wonewoc Aquifers are related and synonymous in this context.
64 Minn. R. 6115.0620.
65 Minn. Stat. § 103I.205.
66 Minn. Stat. § 103G.287, subd. 1(c).
67 EAW Attachment R.
69 Test pumping does not require a water appropriations permit Minn. R. 6115.0620.
include the local rate of movement of groundwater, which aquifers the well will draw from once drilled, and the local interconnectedness of different aquifers between each other and with surface water. The results of an aquifer test are not included in the EAW.

The EAW lists three wells of potential concern for interference; however, there are additional wells that could also be impacted. The MDH report “Southeast Minnesota Domestic Well Network 2016 Data Report” issued in 2016 surveyed 206 domestic wells across Southeast Minnesota. The report indicates that in the Lewiston/Utica area surrounding the Daley Farm, the aquifers commonly used by domestic wells are the St. Peter-Prairie du Chien-Jordan aquifers and the Tunnel City – Wonewoc aquifers. The report also finds that, in general, the St. Peter-Prairie du Chien-Jordan aquifers in the Lewiston/Utica area have high vertical recharge rates while the Tunnel City-Wonewoc aquifers have low vertical recharge rates. Low vertical recharge rates indicate that there is likely little interaction between the two aquifer layers. It does not, however, mean that there aren’t localized interactions between the aquifers (e.g., cracks or fissures in the rock layers separating the aquifers) that would contribute to interference with wells drawing from a different aquifer than the proposed wells.

The Minnesota Well Index lists three wells within the same Township Section as the proposed well. See Table 1. These wells are the most likely to be impacted by the addition of a new high volume well as proposed by Daley Farms. Two of the existing wells are listed as using the Prairie Du Chien-Jordan or Prairie Du Chien aquifers. The aquifer used by the third is unknown, but it is likely, based upon the depth of the well, also drawing from the Prairie Du Chien aquifer.

---

70 Minnesota Dep’t of Health, Minnesota Well Index, available at https://mnwellindex.web.health.state.mn.us/.
### Table 1: Wells listed in the Minnesota Well Index located in the same Township Section as the Daley Farm.

<table>
<thead>
<tr>
<th>Well Number</th>
<th>Well Name</th>
<th>Type/Use</th>
<th>Status</th>
<th>Year</th>
<th>Depth</th>
<th>Aquifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>100014074</td>
<td>Biever, Wayne – Reiner</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>300</td>
<td>Prairie Du Chien – Jordan</td>
</tr>
<tr>
<td>100014062</td>
<td>Rohrer, Roslyn</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>270</td>
<td>Unknown</td>
</tr>
<tr>
<td>100021848</td>
<td>Rupprecht</td>
<td>Unknown</td>
<td>Active</td>
<td>2018</td>
<td>120</td>
<td>Prairie Du Chien Group</td>
</tr>
</tbody>
</table>

The likelihood of well interference decreases the further an existing well is from the proposed well, however, the extent of the potential inference is unknown until an aquifer test is conducted. There are 32 wells in the Minnesota Well Index located in adjacent Township Sections to the Daley Farm.\(^{71}\) Of the 32 wells listed, 18 are domestic wells used for drinking water, and other household uses, and 12 are of unknown use. Most wells in the adjacent Sections to the Daley farm draw from the Prairie Du Chien – Jordan aquifer with most of the newer wells going deeper into the Tunnel City-Wonewoc aquifer (formerly known as the Franconia-Ironton-Galesville sandstone).\(^{72}\) It is quite possible that domestic wells will increasingly draw from the Tunnel City-Wonewoc aquifer as contamination of shallower groundwater becomes more pervasive. The EAW does not contain information necessary to evaluate the potential impacts on these wells.

The five high capacity wells in the vicinity of the Daley Farms also must be considered both because they may be interfered with by the proposed new wells and because they may have impacts on surrounding wells, aquifers, and surface waters that will be compounded by any new high capacity wells.\(^{73}\) Many of the existing water use permits rely on the same aquifers the new wells at the Daley Farm are expected to draw from which increases the likelihood of both well

---

\(^{71}\) See Table 3, *Wells Listed in the Minnesota Well Index Located in Adjacent Township Sections to the Daley Farm*, attached as Exhibit 4.

\(^{72}\) This is consistent with the regional findings in “Southeast Minnesota Domestic Well Network 2016 Data Report” previously referenced.

\(^{73}\) See Table 4, *Groundwater Appropriations from the MPARS System Within Five Miles of the Daley Farm*, attached as Exhibit 5.
interference and cumulative adverse impacts. The EAW does not present information sufficient
to determine the extent of the impact on surrounding public drinking water wells or to determine
the cumulative impacts.

The MN DNR can issue water use permits only if “the proposed use will not harm
ecosystems.”74 The preliminary well assessment75 states that the proposed wells present concerns
that it will impact:

- An unnamed trout stream tributary to the Whitewater River,
- Rush Creek, a DNR designated trout stream, and
- Several non-DNR Protected Streams near the proposed well.

DNR also noted that Wilsons’ Phalarope, a State Species of Concern, was documented 1.9 miles
from the site of the proposed wells. The EAW, however, does not present information sufficient
to determine the extent of the impact on these surface waters.

The MN DNR is also required to consider the long-term impacts of water use permits.
Minn. Statute § 103G.287, subd. 5 states:

The commissioner may issue water-use permits for appropriation from groundwater only
if the commissioner determines that the groundwater use is sustainable to supply the
needs of future generations.

A determination of the sustainability of the water supply necessitates consideration of
current uses and the proposed use relative to the rate the affected aquifers will recharge or refill.
The EAW does not provide the information needed to determine the impact of current uses on
groundwater in the region or project the impact of the proposed use.

74 Minn. Stat § 103G.287, subd. 5.
75 DNR Well Construction Preliminary Assessment; Tracking No. 2017-4001; T106N-R9W-S16
SENW; Winona County.
MN DNR maintains a network of observation wells across the state to track groundwater levels in key aquifers. No observation wells are located near the Daley Farm, and those located closest to the Daley Farm do not provide sufficient information to determine the current sustainability trends or the potential impact the Daley wells may have on water availability in the area. See Table 2. The Observation wells shown on Table 2 are located closest to the Daley Farm. Few of the Observation Wells are currently monitoring the same aquifers the proposed wells are likely to impact, and those that do are too new to indicate the long-term trends in water availability in the aquifer.

The MN DNR can require new water use applicants to install observation wells or other monitoring equipment to monitor the impacts of those appropriations. Without such observation wells or modern technology that allows for automatically measuring and reporting the static water level of active wells, there is not enough information to determine the impact that the Daley Farms is having on groundwater sustainability in a region with a currently insufficient network.

Table 2: Observation wells located nearest to the Daley Farm.

<table>
<thead>
<tr>
<th>Obs. Well Number</th>
<th>Name</th>
<th>Period of Record</th>
<th>Depth</th>
<th>Status</th>
<th>Aquifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>85000</td>
<td>MTPL at Saint Charles ST. CHARLES 1</td>
<td>1973-10-26 to 1982-9-24</td>
<td>175 (drilled to 60 in 1892 then backfilled)</td>
<td>Sealed</td>
<td>multiple</td>
</tr>
<tr>
<td>85003</td>
<td>CJDN in Utica; Whitewater WMA</td>
<td>2016-10-25 to 2018-9-25</td>
<td>605</td>
<td>Active</td>
<td>Jordan</td>
</tr>
<tr>
<td>85002</td>
<td>CMPS at Winona, Winona #7</td>
<td>2010-1-19 to 2011-8-31</td>
<td>51</td>
<td>Sealed</td>
<td>Mt. Simon</td>
</tr>
<tr>
<td>23002</td>
<td>CMPS at Rushford Village, Peterson Fish Hatchery</td>
<td>2001-10-25 to 2015-2-28</td>
<td>643</td>
<td>Not Actively Read</td>
<td>Mt. Simon</td>
</tr>
<tr>
<td>55010</td>
<td>OGL in Marion; Marion Rest Area</td>
<td>2016-10-25 to 2018-8-23</td>
<td>50</td>
<td>Active</td>
<td>Prosser</td>
</tr>
<tr>
<td>23004</td>
<td>OPDC at Chatfield, Mill Park Pdc</td>
<td>2012-12-6 to 2018-10-18</td>
<td>483</td>
<td>Active</td>
<td>Prairie du Chien</td>
</tr>
<tr>
<td>23001</td>
<td>OPCJ at Chatfield, FILMORE COUNTY SHOP</td>
<td>1989-11-29 to 2012-11-29</td>
<td>84</td>
<td>Not Actively Read</td>
<td>Prairie du Chien</td>
</tr>
</tbody>
</table>

76 Minn. Stat. § 103G.282.
The Daley Farms EAW states that the proposed project will include drainage tile around the manure lagoons. However, the EAW does not include a plan to apply for a water use permit or state why such a permit is not required. Minn. Rule 6115.0620 allows for an exception for agricultural field tile but does not allow for an exception in the case of dewatering. The project proposal and EAW need to state explicitly why a permit is not required under Minn. Rule 6115.0620 (e.g., the withdrawal is less than 10,000 gallons per day and less than 1 MGY) or include the permit application in the project proposal. If a permit(s) is required for dewatering the additional requirements of Minn. Rule 6115.0710 must also be met, including showing that the “excess water can be discharged without adversely affecting the public interest.” This assurance includes that the capacity of the manure lagoons will not be exceeded by the of the discharged water or that the stormwater holding basins will not discharge untreated manure to waterways due to the dewatering discharge.

Based on this information, the lack of information in the EAW, and on the information that MCEA has gathered that suggests that additional wells and resources may be interfered with if this proposed water appropriation is allowed to proceed, MPCA has insufficient information to make a “reasoned decision about the potential for, or significance of” impacts from this proposed project on groundwater.77 MPCA must therefore delay its decision or order an EIS.

VI. THE EAW DOES NOT CONTAIN ANY MEANINGFUL ASSESSMENT OF THE PROJECT’S COMPATIBILITY WITH APPROVED PLANS OF LOCAL UNITS OF GOVERNMENT

Minnesota Rule 4410.1200 requires each EAW to include an “assessment of the compatibility of the project with approved plans of local units of government.”78 The Daley Farms EAW notes that the project as proposed is not consistent with local ordinances, which

77 Minn. R. 4410.1700, subp. 2a.
78 Minn. R. 4410.1200 (H).
prohibit feedlots in excess of 1,500 AU. In addressing this inconsistency, the EAW perfunctorily observes that “because the Project will increase Daley’s operations from 2,275.2 AU to 5,967.7 AU, Daley must apply for and receive a zoning variance from Winona County for the Project.” No other analysis or explanation is given, despite the regulatory directive to provide an assessment.

This omission is critical, for the local ordinances were specifically crafted to address and prohibit the situation present here, where a large feedlot that was “grandfathered in” proposes to expand even further. The Winona County feedlot ordinance was adopted to balance the County’s competing interests in “maintain[ing] a healthy agricultural community within the County while ensuring that farmers properly manage animal feedlots and animal wastes to protect the health of the public and the natural resources of Winona County.” To this end, the Zoning Ordinance allows nonconforming, pre-existing animal feedlots such as Daley Farms to continue to operate, but only as long as the number of animal units does not increase. The Ordinance’s provisions on non-conforming uses supplement this express intent, noting that “it is the intent of this section that all non-conformities shall be gradually eliminated and eventually brought into conformity.” Even more specifically, the Ordinance expressly forbids non-conforming uses of land from enlarging or increasing.

---

79 EAW at 7.
80 Id.
81 Winona County, Minnesota, Zoning Ordinance § 8.1.1.
82 Id. § 8.2.1 (“A feedlot that is non-conforming because of excessive animal-unit numbers, which exists at the time of adoption of this Ordinance, may continue, if the number of animal units does not increase.”).
83 Id. § 3.2.1.
84 Id. § 3.2.3 (“A lawful, non-conforming use shall not be enlarged, but may be continued at the same size and in the same manner of operation as it existed on the date it became legally non-conforming except as hereinafter specified.”).
The express intent of the Zoning Ordinance to restrict feedlots to a maximum size and to eventually eliminate pre-existing nonconformities with this ceiling is the direct implementation of express policies in the 2014 Comprehensive Plan. The proposed expansion would be built in an area known for its karst topography, and the EAW confirms that many manure application sites contain karst features such as sinkholes, caves, and disappearing springs. The County Comprehensive Plan specifically addresses these circumstances, observing that “[b]ecause water moves very quickly in limestone formations and sinkholes with little or no purification by filtration, care must be used in preventing pollution in these areas. As a result, intense agricultural operations such as feedlot or solid waste disposal sites should be carefully regulated or prohibited in karst areas.” To address these concerns, the Plan states that the policy of the County is to “[c]arefully control the location and size of feedlots and other animal confinement areas in the County to minimize pollution and nuisance problems using acreage for manure spreading to determine carrying capacity and develop a fair and equitable permit system.”

The specific language of this policy referencing “carrying capacity” is especially worthy of notice. Feedlot manure is expensive to transport, and virtually all of a feedlot’s manure is applied to fields within 3-5 miles of the facility itself. In areas of high concentration of feedlot animals, then, the local fields can become effectively saturated with manure. In Utica Township, where the expansion would be built and the manure applied, almost half of private wells already test over the health limit of 10 mg/L nitrate. The public water supply for Utica was already

85 EAW at 10.
87 Comp. Plan at 18.
contaminated with nitrate at levels “far exceeding the drinking water limit,” forcing the Township to drill a deeper well that also consistently shows elevated concentrations of nitrate, but at levels below the limit.89 The primary source of this contamination is from the application of commercial fertilizers and manure to croplands.90

Winona County's Comprehensive Plan is clear that the policy of the County is to “maintain groundwater nitrate level at a point which is equal to or less than the drinking water standard of 10 parts per million or in accordance with State Standards.”91 An “assessment of the compatibility of the project” with the comprehensive plan must therefore contain some assessment of how the project as proposed would possibly be consistent with these clearly stated policies.

Likewise, Winona County the may not issue a Conditional Use Permit (CUP) for the Daley Expansion if it does not comply with the County’s Comprehensive Plan.92 Winona County had denied conditional use permits for smaller farms (800 AU) in the same area and the Court of Appeals has upheld this denial based on the comprehensive plan, in particular the requirement that “intense agricultural uses such as feedlots . . . should be carefully regulated or prohibited entirely” in areas consisting of Karst geology where the groundwater is very susceptible to pollution.93 The Court of Appeals further found that Winona County had appropriately denied the 800 AU farm discussed above due to the significant risk to water quality due the number of

89 EAW at 18.
90 MRWW WRAPS at 36.
91 Comp. Plan at 34.
92 Id. at § 5.5.4.3. Winona County also must provide a conditional use permit (CUP). EAW at 20. When deciding whether to grant a CUP, the board should consider the effect of the Daley Expansion on the health, safety and general welfare of occupants of surrounding lands. Comp. Plan at § 5.5.4.3.
93 Anderson v. Winona County board of Commissioners, Unpublished Opinion Minnesota Court of Appeals Case No. C2-00-537, December 5, 2000.
sinkholes in the area; location in the “High Probability” sinkhole area; concern for the City of Utica wells. Daley Farms is similarly close to the City of Utica and located in an area with “high” sinkhole probability.

VII. **THE EAW LACKS INFORMATION ABOUT DALEY’S COMPLIANCE HISTORY AND ASSESSMENT OF WHETHER ONGOING NONCOMPLIANCE WITH NPDES PERMIT REQUIREMENTS AND REMEDIATION OF POLLUTION HAZARDS SHOWS A RISK SIGNIFICANT ENVIRONMENTAL RISKS NOT BEING ADDRESSED.**

The Daley Farms poses significant and ongoing risks to the environment by failing to timely remedy pollution hazards at its facilities and failing to meet the requirements of its NPDES permit and MMP.

In 2004, MPCA issued a notice of violation and compliance schedule to persuade Daley Farms to correct pollution hazards posed by bubbles and liner issues in its four manure lagoons. Since 1999, Daley had been aware of these large bubbles and knew that the bubbles indicated something was wrong with its basins. And by 2000 or 2001 Daley Farms believed that the basin liners had been “compromised.” In 2002, MPCA investigated an anonymous tip regarding a large bubble in the basin that reached nearly 30 feet in diameter, and Daley farms “admitted that it was more likely than not that the MPCA would require it to reline all four basins.” Yet it appears that as of October 2009, not all the work had been done yet to remedy this pollution hazard in at least one of the basins.

---

94 *Id.*
96 Letter to Ben Daley dated November 19, 2004 and Schedule of Compliance between Daley Farms of Lewiston, LLP and MPCA, attached as Exhibit 7.
98 *Id.*
99 Inspection Form, October 6, 2009, attached as Exhibit 8.
In October 2009, MPCA notified Daley Farms that it was illegally operating two open feedlots and that there was a potential for contaminated leachate and feed pad runoff to reach surface waters. But as of the time the current Draft permit was proposed, Daley had not yet remedied those issues, despite a Compliance Schedule in Daley Farm’s 2010 NPDES permit requiring feed storage runoff controls and open lot runoff controls by January 1, 2014. Instead of requiring compliance with that deadline, it appears that MPCA extended the timeline for compliance when it issued Daley Farm’s a new NPDES permit in 2016. The 2016 Compliance Schedule required the feed pad runoff leachate collection system to be complete by October 1, 2017, open lot runoff controls constructed at Site 1 by October 1, 2019, and open lot runoff control completed at Site 7 by October 1, 2020. And rather than requiring Daley Farms to actually meet these compliance dates for open lot runoff controls MPCA now proposes to allow Daley Farms to continue to operate these pollution hazards for yet another year. The current draft permit does not require Daley to construct the open lot runoff controls, until October 1, 2021. MPCA has provided no justification for this extended compliance schedule in its permitting documents.

Finally, Daley Farms has not kept up with its permit commitments pertaining to land-spreading of liquid manure. In 2013, MPCA notified Daley Farms that its land application records showed Daley had applied liquid manure at rates 20% higher than allowed by rule. In 2015, Winona County became aware that Daley Farms had not completed a manure nutrient analysis, which is essential to determining proper application rates, for more than four years, as

100 Id.
102 2016 Daley Farms NPDES permit, at 3.1.1.3.
103 Id.
104 Draft Permit, at 3.2.1.4 and 3.2.1.5.
required by Minnesota Rule 7020.2225, subp. 2. And more recently, MPCA has noted that Daley Farms had not supplied appropriate records of the dates and amount of manure applied by the facility.

VIII. CONCLUSION

For the reasons given above, MPCA must order an EIS. The EAW for the Daley Expansion simply lacks sufficient information to support a finding that the project does not have the potential to cause significant environmental impacts. Therefore an EIS must be ordered.

While this alone compels a decision to require an EIS, at the very least the lack of complete information supports the need to either “make a positive declaration and include within the scope of the EIS appropriate studies to obtain the lacking information” or “postpone the decision on the need for an EIS, for not more than 30 days or such other period of time as agreed upon by the RGU and proposer, in order to obtain the lacking information.” For all of the foregoing reasons, an EIS is needed to prevent this facility from causing significant environmental impacts that threaten water quality and public health.

Respectfully submitted,

/s/ Betsy Lawton
Betsy Lawton
Kevin P. Lee
Minnesota Center for Environmental Advocacy
1919 University Ave. W., Ste. 515
St. Paul, MN 55104
blawton@mncenter.org
klee@mncenter.org

Attorneys for Minnesota Center for Environmental Advocacy

---

106 Letter from Winona County to Ben Daley dated September 18, 2015, attached as Exhibit 10.
107 MPCA Feedlot NPDES/SDS Permitted Facility Inspection Checklist re Daley Farms of Lewiston LLP 1 dated September 6, 2016, attached as Exhibit 11.
108 Minn. R. 4410.2000, subp. 3, 4410.1700, subp. 1.
109 Minn. R. 4410.1700, subp. 2a.
EXHIBIT 1
Comment on
Daley Farms of Lewiston, LLP: 2018 Dairy Expansion - EAW (p-ear2-143i)
By
E. Calvin Alexander Jr.
Morse Alumni Professor Emeritus
Earth Sciences Department
University of Minnesota
116 Church Street SE
Minneapolis, MN 55455

Introduction:
The proposed Daley Farms expansion, if approved and constructed, will create a significant environmental risk to the Lewiston area. The site is surrounded by many sinkholes. Many of the wells in the first two aquifers under the area are already at or above the nitrate-nitrogen drinking water standard. The Lewiston Waste Water Treatment Lagoon catastrophically collapsed (Jannik et al., 1992). The failed lagoon is about 1.8 miles southeast of the Daley Farms site -- at approximately the same elevation and in the same hydrogeologic stratigraphic environment.

Mapped Sinkhole:
There is a mapped sinkhole, MN85:D00422 (hereafter D422), in the Minnesota Karst Features Data base that is about 450 feet from the existing manure storage lagoons at the Daley Farm operations. The feature is readily visible on historic air photos and is shown as a pond on the USGS topo sheet of the area. “The Daley Family describes the feature as a landfill that was miss-classified as a sinkhole in the 1980s and they do not recall any subsidence during the years they have lived on the farm.” (Dogwiler, 2015, p. 6) That feature was later filled as part of a grassed water way construction. Two Electrical Resistivity Imaging lines (ERI) were conducted at the site by Professor Toby Dogwiler (then at Winona State University -- currently at Missouri State University, Springfield, MO) in April 2015. Professor Dogwiler’s ERI specifically ran two ERI lines across the mapped location of D422. Those two lines are reproduced below as Professor Dogwiler’s Figures 12 and Figure 11.

Figure 12, the ERI line down the axis of the grassed waterway, shows an approximately 30 m deep pit in the bedrock surface at D422’s location (shown by the added dashed rectangle in Figure 12). Professor Dogwiler interpreted this apparent bedrock pit as an artifact of the disturbed and compacted materials used to fill the depression before and during the construction of the grassed waterway. Last week at the 2018 Geological Society of America’s annual meeting in Indianapolis, IN, I discussed the Daley Farms ERI study with Professor Dogwiler. He quickly reviewed his interpretation and said that he was comfortable with his interpretation of the line -- but would check with a couple of his ERI mentors to see what they felt about his interpretation.
Professor Dogwiler, however, was not aware of the EAW for an expansion to almost 5000 dairy cows. In view of that proposal, given that development he recommended that the ERI results from his lines 5 and 6 below should be ground truthed with deep drilling and/or deep backhoe excavations. I share that recommendation and it was supported by two karst hydrogeologists who routinely use ERI to characterize sites in karst who looked at the Daley Report at my request.

ERI Images of D422
Reproduced below are the two ERI lines crossing mapped sinkhole D422 from Dogwiler’s (2015) Daley Farms study. The area of the mapped sinkhole is outlined in the black dashed rectangle. Dogwiler’s Fig. 12 (line 6) ran down the axis of the grassed waterway through D422. This figure shows the prominent, roughly 30 m deep, apparent pit in the surface of the red bedrock. This is the feature Professor Dogwiller interpreted as an artifact of the compacted fill near the surface.

![ERI Image of D422](image_url)

Figure 12. A profile of ERI Line 6 (see Figures 1 and 2 for the location of the line and Figure 7 for an overview of interpreting ERI profiles and the characteristics of different types of ERI arrays).

Professor Dogwiller’s Figure 11 (line 5) below was run across the location of D422 perpendicular to line 6. The near surface, red, compacted fill in not evident in this ERI line but there is still a clear, roughly 10 m deep depression in the surface of the bedrock -- consistent with D422 being a filled sinkhole.
Recommendation:

Given the prominent karst features all around the Daley Farms site, the nearby catastrophic collapse of the Lewiston Waste Water Treatment Lagoon on similar karst stratigraphy, the documented growing nitrate pollution of Lewiston’s wells and many local wells, and the enormous size of this proposed CAFO this facility should not be permitted at this site without a full scale EIS.

If this EAW is approved it should be contingent on a deep excavation of the D422 feature to check Professor Dogwiller’s interpretation. Simple soil borings to “refusal” will not be sufficient. Given that the Daley’s used the site as a landfill before it was converted to a grassed waterway, there are probably metal or
demolition debris in the fill that will stop a soil boring. An extensive, deep excavation of D422 will be necessary to document what the feature actually is. If it is a filled sinkhole, the expansion should not be permitted.

References:

EXHIBIT 2
EXHIBIT 3
**NOAA Atlas 14, Volume 8, Version 2**  
*Location name: Lewiston, Minnesota, USA*  
*Latitude: 43.9843*, *Longitude: -91.9038*  
*Elevation: 1200.11 ft*  
*Source: ESRI Maps*  
*Source: USGS*

### PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)

<table>
<thead>
<tr>
<th>Duration</th>
<th>Average recurrence interval (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.366 (0.263-0.469)</td>
</tr>
<tr>
<td>2</td>
<td>0.430 (0.331-0.550)</td>
</tr>
<tr>
<td>5</td>
<td>0.537 (0.413-0.690)</td>
</tr>
<tr>
<td>10</td>
<td>0.630 (0.482-0.812)</td>
</tr>
<tr>
<td>25</td>
<td>0.763 (0.567-1.02)</td>
</tr>
<tr>
<td>50</td>
<td>0.871 (0.632-1.17)</td>
</tr>
<tr>
<td>100</td>
<td>0.982 (0.742-1.55)</td>
</tr>
<tr>
<td>200</td>
<td>1.10 (0.819-1.82)</td>
</tr>
<tr>
<td>500</td>
<td>1.26 (0.878-2.02)</td>
</tr>
<tr>
<td>1000</td>
<td>1.38 (0.878-2.02)</td>
</tr>
</tbody>
</table>

**Notes:**  
1 Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).  
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
Please refer to NOAA Atlas 14 document for more information.

**Back to Top**
Maps & aerials

Small scale terrain
Table 3: Wells listed in the Minnesota Well Index located in adjacent Township Sections to the Daley Farm.

<table>
<thead>
<tr>
<th>Well Number</th>
<th>Well Name</th>
<th>Type/Use</th>
<th>Status</th>
<th>Year</th>
<th>Depth</th>
<th>Aquifer</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1000014069</td>
<td>LUEHMANN, EDWARD</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>200</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>*187629</td>
<td>PITCOCK, TONY</td>
<td>domestic</td>
<td>Active</td>
<td>1983</td>
<td>360</td>
<td>Jordan</td>
</tr>
<tr>
<td>226829</td>
<td>CADY GOLF &amp; RECREATION I</td>
<td>commercial</td>
<td>Active</td>
<td>1972</td>
<td>288</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>1000014108</td>
<td>KIESE, HAROLD</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>260</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>1000014347</td>
<td>THEIN, LEO</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>280</td>
<td>Prairie Du Chien-Jordan</td>
</tr>
<tr>
<td>1000014061</td>
<td>PANGRAC, DALE</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>200</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>789564</td>
<td>PANGRAR, DALE</td>
<td>domestic</td>
<td>Active</td>
<td>2012</td>
<td>690</td>
<td>Unknown</td>
</tr>
<tr>
<td>*719931</td>
<td>LUEHMANN, GERALD</td>
<td>domestic</td>
<td>Active</td>
<td>2005</td>
<td>640</td>
<td>Tunnel City-Wonewoc</td>
</tr>
<tr>
<td>1000014106</td>
<td>LEUHMANN, RALPH</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>300</td>
<td>Prairie Du Chien-Jordan</td>
</tr>
<tr>
<td>519618</td>
<td>CASSEL, RON &amp; CASSEL</td>
<td>domestic</td>
<td>Active</td>
<td>1993</td>
<td>350</td>
<td>Jordan</td>
</tr>
<tr>
<td>506808</td>
<td>REGRE, GARY &amp; LOIS</td>
<td>domestic</td>
<td>Active</td>
<td>1989</td>
<td>625</td>
<td>Wonewoc Sandstone</td>
</tr>
<tr>
<td>*132996</td>
<td>BROWN, PAT</td>
<td>domestic</td>
<td>Active</td>
<td>1977</td>
<td>380</td>
<td>Jordan-St. Lawrence</td>
</tr>
<tr>
<td>665464</td>
<td>RIEBEL, DAVE</td>
<td>domestic</td>
<td>Active</td>
<td>2002</td>
<td>545</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>*506807</td>
<td>MUSSEL, MARVIN &amp; PHYLLIS</td>
<td>domestic</td>
<td>Active</td>
<td>1989</td>
<td>560</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>*546893</td>
<td>DALEY, MICHAEL</td>
<td>domestic</td>
<td>Active</td>
<td>1994</td>
<td>578</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>767571</td>
<td>YOUNG, MARK</td>
<td>domestic</td>
<td>Active</td>
<td>2009</td>
<td>512</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>778533</td>
<td>HERBER, SCOTT</td>
<td>domestic</td>
<td>Active</td>
<td>2010</td>
<td>512</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>1000014043</td>
<td>BEYER, WAYNE</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>278</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>820575</td>
<td>BEYER, BRIAN</td>
<td>domestic</td>
<td>Active</td>
<td>2017</td>
<td>536</td>
<td>Unknown</td>
</tr>
<tr>
<td>268928</td>
<td>NUSZLOCH, DEAN</td>
<td>domestic</td>
<td>Active</td>
<td>1917</td>
<td>240</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>*1000014063</td>
<td>TIMM, JOHN</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>300</td>
<td>Unknown</td>
</tr>
<tr>
<td>*464600</td>
<td>PETERSON, ILES</td>
<td>domestic</td>
<td>Active</td>
<td>1990</td>
<td>560</td>
<td>St. Lawrence-Tunnel City</td>
</tr>
<tr>
<td>*1000014045</td>
<td>PETERSON, LAVERNE</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>270</td>
<td>Prairie Du Chien-Jordan</td>
</tr>
<tr>
<td>761790</td>
<td>SANDERS, ROGER &amp; BETTY</td>
<td>domestic</td>
<td>Active</td>
<td>2008</td>
<td>539</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>475515</td>
<td>SANDERS, STEVE</td>
<td>domestic</td>
<td>Active</td>
<td>1991</td>
<td>540</td>
<td>Tunnel City/Lone Rock Fm</td>
</tr>
<tr>
<td>528887</td>
<td>CULLEN, JOHN</td>
<td>domestic</td>
<td>Active</td>
<td>1992</td>
<td>325</td>
<td>Jordan</td>
</tr>
<tr>
<td>101459</td>
<td>WILSON, DONALD</td>
<td>domestic</td>
<td>Active</td>
<td>1975</td>
<td>400</td>
<td>Jordan</td>
</tr>
<tr>
<td>1000014071</td>
<td>TIMM, MORRIS</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>250</td>
<td>Prairie Du Chien Group</td>
</tr>
<tr>
<td>1000014351</td>
<td>GOLISH, MELVIN</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>350</td>
<td>Prairie Du Chien-Jordan</td>
</tr>
<tr>
<td>1000014046</td>
<td>ELLINGHUYSE, NORBERT</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>210</td>
<td>Unknown</td>
</tr>
<tr>
<td>603088</td>
<td>LEWISTON WWTP</td>
<td>Commercial</td>
<td>Active</td>
<td>2001</td>
<td>335</td>
<td>Jordan</td>
</tr>
<tr>
<td>1000014047</td>
<td>DALEY, STEVE</td>
<td>Unknown</td>
<td>Active</td>
<td>Unknown</td>
<td>262</td>
<td>Prairie Du Chien-Jordan</td>
</tr>
</tbody>
</table>
EXHIBIT 5
Table 4: Groundwater appropriations from the MPARS system within five miles of the Daley Farm.

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Permit Total Volume (mgy)</th>
<th>Landowner</th>
<th>Well Depth (ft)</th>
<th>Aquifer</th>
<th>Use Type</th>
<th>Use in 2017 (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*2010-0352</td>
<td>30</td>
<td>Daley Farm of Lewiston LLP</td>
<td>715</td>
<td>Wonewoc</td>
<td>Livestock Watering</td>
<td>14.9</td>
</tr>
<tr>
<td>*2010-0352</td>
<td>30</td>
<td>Daley Farm of Lewiston LLP</td>
<td>720</td>
<td>Wonewoc</td>
<td>Livestock Watering</td>
<td>14.9</td>
</tr>
<tr>
<td>2010-0240</td>
<td>5.3</td>
<td>T &amp; E Farms, LLP; Heritage Hills Dairy, LLC</td>
<td>240</td>
<td>Prairie du Chien</td>
<td>Livestock Watering</td>
<td>5.9</td>
</tr>
<tr>
<td>2016-1933</td>
<td>5</td>
<td>Thompson, Clifford</td>
<td>80</td>
<td>Unknown</td>
<td>Livestock Watering</td>
<td>2.3</td>
</tr>
<tr>
<td>2016-2074</td>
<td>5</td>
<td>Kieffer, Linda; Kieffer, Gary</td>
<td>160</td>
<td>Unknown</td>
<td>Livestock Watering</td>
<td>4.9</td>
</tr>
<tr>
<td>1980-5072</td>
<td>15</td>
<td>Utica, City of</td>
<td>420</td>
<td>Jordan</td>
<td>Municipal/Public Water Supply</td>
<td>8.1</td>
</tr>
<tr>
<td>1980-5072</td>
<td>15</td>
<td>Utica, City of</td>
<td>480</td>
<td>Jordan</td>
<td>Municipal/Public Water Supply</td>
<td>0.0</td>
</tr>
<tr>
<td>2012-0103</td>
<td>7.5</td>
<td>Wirt, Duane</td>
<td>643</td>
<td>Wonewoc</td>
<td>Livestock Watering</td>
<td>7.0</td>
</tr>
<tr>
<td>1984-5048</td>
<td>80</td>
<td>Lewiston, City of</td>
<td>352</td>
<td>Jordan</td>
<td>Municipal/Public Water Supply</td>
<td>0.0</td>
</tr>
<tr>
<td>1984-5048</td>
<td>80</td>
<td>Lewiston, City of</td>
<td>411</td>
<td>Jordan</td>
<td>Municipal/Public Water Supply</td>
<td></td>
</tr>
<tr>
<td>1984-5048</td>
<td>80</td>
<td>Lewiston, City of</td>
<td>721</td>
<td>Jordan-Eau Claire</td>
<td>Municipal/Public Water Supply</td>
<td>0.0</td>
</tr>
<tr>
<td>1984-5048</td>
<td>80</td>
<td>Lewiston, City of</td>
<td>1154</td>
<td>Prairie du Chien-Mt. Simon</td>
<td>Municipal/Public Water Supply</td>
<td>15.8</td>
</tr>
<tr>
<td>1984-5048</td>
<td>80</td>
<td>Lewiston, City of</td>
<td>712</td>
<td>Wonewoc</td>
<td>Municipal/Public Water Supply</td>
<td>17.8</td>
</tr>
</tbody>
</table>
November 19, 2004

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Ben Daley
Daley Farms of Lewiston, LLP
18774 Highway 14
Lewiston, MN  55952

RE: Executed Schedule of Compliance / Failure to Comply with Part 7, subparts e and f

Dear Mr. Daley:

The executed Schedule of Compliance (Agreement), dated September 15, 2004, required Daley Farms of Lewiston, LLP, (Regulated Party), to submit to the Minnesota Pollution Control Agency (MPCA) an updated manure management plan and a plan to address the pollution hazards created by the liquid manure storage basins known as basin numbers 1, 3, and 4. The deadline to submit these items was within 60 days of the execution of the Agreement or November 15, 2004. To date, the Regulated Party has not submitted either of these items.

Part 8, subpart b of the Agreement states that if the Regulated Party fails to comply with the requirements in Part 7, subparts d – f of the Agreement, the Regulated Party will pay a penalty in the amount of $150 per requirement for each day of failure. Penalties shall accrue from the date that the Regulated Party was to have fulfilled the requirement until the Regulated Party fulfills the requirement.

Part 7, subpart e of the Agreement required the Regulated Party to submit an updated manure management plan to the MPCA. The plan does not have to be submitted at this time. The liquid manure storage basin known as basin number 2 is near completion and should soon be fully functional; therefore there will be no loss of manure storage going into the winter months. Penalties allowed by Part 8, subpart b of the Agreement shall not accrue.

Part 7, subpart f of the Agreement required the Regulated Party to submit a plan to address the pollution hazards created by basin numbers 1, 3 and 4, by November 15, 2004. The plan has not be received by the MPCA and therefore, **penalties of $150 per day have accrued since November 15, 2004, and will continue to accrue through the date the Regulated Party fulfills the requirement.**
Once the Regulated Party submits the plan required by Part 7, subpart f of the Agreement, the Regulated Party will receive written notice from the MPCA requesting payment of the penalty accrued for the non-compliance. The Regulated Party is required to pay the requested penalty within 30 days after receiving written notice that the penalty is due.

Please submit the plan required by Part 7, subpart f of the Agreement to Robert Kostinec at the MPCA’s Rochester Office; 18 Wood Lake Drive SE, Rochester, MN 55904.

If you have any questions about this letter or the Agreement, please contact me at (218) 846-0498. If you have question regarding the information that must be contained in the plan required by Part 7, subpart f of the Agreement, please contact Robert Kostinec at (507) 285-7305.

Sincerely,

Lisa M. Scheirer
Regional Division
Detroit Lakes Office

LMS:

cc: Michael Tiry, P.E., Tiry Engineering, Chippewa Falls, WI
    Douglas Boese, Attorney at Law, Dunlap & Seeger, P.A., Rochester
    Robert Kostinec, MPCA Rochester
    Jerry Hildebrandt, MPCA, Rochester
IN THE MATTER OF: Daley Farms of Lewiston, LLP

SCHEDULE OF COMPLIANCE

Part 1. **PARTIES.** This Schedule of Compliance ("Agreement") applies to and is binding upon the following parties:

a. Daley Farms of Lewiston, LLP ("Regulated Party"); and
b. The Minnesota Pollution Control Agency ("MPCA").

Unless specified otherwise in this Agreement, where this Agreement identifies actions to be taken by the MPCA, the Commissioner or the Commissioner's designees shall act on the MPCA's behalf.

Part 2. **PURPOSE AND SCOPE OF SCHEDULE OF COMPLIANCE.** The purpose of this Agreement is to resolve the alleged violations set out in Part 6 of this Agreement by specifying actions the Regulated Party agrees to undertake. By entering into this Agreement, the Regulated Party is settling a disputed matter between itself and the MPCA and does not admit that the alleged violations set out in Part 6 of this Agreement occurred. However, the Regulated Party agrees that the MPCA may rely upon the alleged violations set out in Part 6 as provided in Part 10 of this Agreement. Except for the purposes of implementing and enforcing this Agreement, nothing in this Agreement constitutes an admission by either Party, or creates rights, substantive or procedural, that can be asserted or enforced with respect to any claim of or legal action brought by a person who is not a party to this Agreement.

Part 3. **AUTHORITY.** This Agreement is entered under the authority vested in the MPCA by Minn. Stat. chs. 115 and 116.

Part 4. **DEFINITIONS.** Unless otherwise explicitly stated, the definitions in Minn. Stat. chs. 115, 115A, 115B, 115C, 116, 116B and in Minn. R. chs. 7000 to 7150 apply, as appropriate, to the terms used in this Agreement.

Part 5. **BACKGROUND.** The following is the background of this Agreement:
a. The Regulated Party is a Limited Liability Partnership and operates a 1,996 animal unit dairy facility located in the Section 16, Utica Township, Winona County, Minnesota, hereafter the "Facility."

b. Manure and process wastewaters produced at the Facility are stored in four liquid manure storage basins (Basins), each designed to be lined with 2.5 feet of compacted clay and 40 mil high density polyethylene (HDPE) material. For identification purposes, the Basins are known as Basin Numbers 1, 2, 3, and 4. The MPCA provided the Regulated Party the authorization to construct the Basins on November 17, 1999, with MPCA Feedlot Permit, MPCA-I 1748(A)R2.

c. On December 12, 2001, the Regulated Party was provided National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit coverage under the State of Minnesota General Livestock Production Permit; Permit Number MNG440074 ( Permit).

d. The Basins have formed bubbles beneath the HDPE liners. The bubbles have damaged the HDPE liners and therefore, the liners are not functioning as designed.

e. The Regulated Party has not yet repaired damage to the HDPE Basin liners with similar materials and installation techniques as required by the Regulated Party’s manure management plan (MMP) or replaced the HDPE liners with other materials.

Part 6. **ALLEGED VIOLATIONS.** The MPCA alleges that the Regulated Party has violated the following requirements of statute, rule and/or permit condition:

**State of Minnesota General Livestock Production Permit NPDES/SDS Permit, Part 3.0, Prerequisite Plans for Submitting a Permit Application.**

The following documents are required as part of the general permit application in accordance with Minn. R. ch. 7020, and are incorporated as enforceable requirements of the permit. ...

3.3. A manure management plan (MMP) in accordance with Minn. R. 7020.2225, subp. 1 and subp. 4.
The MPCA alleges that the Regulated Party has not replaced the HDPE liner from Basin Number 2 or investigated whether the integrity of the HDPE liners from Basin Numbers 1, 3, and 4 have been damaged from the bubbles, as described in the MMP submitted with the Regulated Party’s Permit application.

**Part 7.  REGULATED PARTY REQUIREMENTS.** The Regulated Party agrees to the following requirements:

a. Within 15 days of the execution date of the Agreement, the Regulated Party shall remove all manure and process wastewaters from Basin Number 2.

b. Within 15 days of the execution date of the Agreement, the Regulated Party shall discontinue use of Basin Number 2. No manure or process wastewaters shall be added to Basin Number 2 until the Basin has been re-constructed according to Minn. R. 7020.2100, and MPCA’s fact sheet titled, *Siting Manure Storage Areas in Minnesota’s Karst Region: State Requirements.*

c. Within 15 days of the execution date of the Agreement, the Regulated Party shall install a control device on the transfer pipe that leads from the barn to Basin Number 2, so that manure or processed wastewaters cannot be transferred from the barn to the Basin.

d. Within 60 days of the execution date of the Agreement, the Regulated Party shall close Basin Number 2 in accordance with Minn. R. 7020.2025, or submit to the MPCA for review and approval design plans and specifications for the reconstruction of Basin Number 2. The design plans and specifications must be prepared and submitted in accordance with Minn. R. 7020.2100, and MPCA’s fact sheet titled, *Siting Manure Storage Areas in Minnesota’s Karst Region: State Requirements.* Upon approval by the MPCA of the design plans and specifications, the design plans and specifications shall become an enforceable part of this Agreement and the Regulated Party shall implement each requirement and term in the design plans and specifications.

e. Within 60 days of the execution date of the Agreement, the Regulated Party shall submit to the MPCA for review and approval, an updated MMP. The updated MMP shall include a description of how manure and process wastewaters produced at the Facility will be managed due to the loss of storage from the unavailability of Basin Number 2. Upon approval by the MPCA, the MMP shall become an enforceable part of this Agreement and the Regulated Party shall implement each requirement and term in the MMP.
f. Within 60 days of the execution date of the Agreement, the Regulated Party shall submit to the MPCA for review and approval a plan to eliminate the pollution hazards created by Basin Numbers 1, 3 and 4. The plan shall be prepared by a professional engineer licensed in the state of Minnesota or a representative of the company that manufactured the Basin’s HPDE liners and shall include the following components: 1) methods that will be used to evaluate the structural integrity of the HDPE liners from Basin Numbers 1, 3 and 4; and 2) corrective or protective measures needed to restore the functionality of the liners from Basin Numbers 1, 3 and 4, as designed. Upon approval by the MPCA of the plan, the plan shall become an enforceable part of this Agreement and the Regulated Party shall implement each requirement and term in the plan.

Part 8. PENALTIES FOR VIOLATIONS OF THIS AGREEMENT.

a. If the Regulated Party fails to comply with requirements of Part 7, subparts a – c, of this Agreement, the Regulated Party shall pay to the MPCA a penalty in the amount of $250.00 per requirement for each day of failure.

b. If the Regulated Party fails to comply with requirements of Part 7, subparts d - f, of this Agreement, the Regulated Party shall pay to the MPCA a penalty in the amount of $150.00 per requirement for each day of failure.

c. Penalties for failure to comply with requirements of Part 7 of this Agreement shall accrue from the date the Regulated Party was to have fulfilled the requirement until the Regulated Party fulfills the requirement. Penalties shall not accrue while the MPCA considers a timely extension request under Part 13 or during dispute resolution under Part 11; unless the MPCA determines that the Regulated Party filed the request or initiated dispute resolution solely for purposes of delay. If the Regulated Party does not pursue dispute resolution under Part 11 for denial of a timely extension request, penalties shall accrue from the date the extension request is denied by the MPCA Case Contact. If the Regulated Party pursues dispute resolution for denial of an extension request and does not file a timely challenge in a court of competent jurisdiction as provided by Part 11, penalties shall accrue from the date of a Commissioner’s dispute resolution decision against the Regulated Party until the Regulated Party fulfills the requirement that is the subject of the extension request.
d. The Regulated Party shall pay a penalty under this Part within 30 days after receiving written notice from the MPCA that the penalty is due. The written notice shall specify the provision of the Agreement that the Regulated Party has not fulfilled and indicate the date penalties began to accrue. If the Regulated Party fails to make timely payment, the MPCA may assess and the Regulated Party agrees to pay a late payment charge, in addition to the stipulated penalty, to be assessed as follows. Forty-five days after receipt of written notice, the Regulated Party shall be obligated to pay a late charge in an amount equal to ten percent of the unpaid stipulated penalty. Sixty days after receipt of written notice, the Regulated Party shall be obligated to pay an additional late charge in an amount equal to twenty percent of the unpaid stipulated penalty.

e. In dispute resolution before the Commissioner under Part 11, the Regulated Party can contest the factual basis for the MPCA’s determination that the Regulated Party has not fulfilled a requirement of this Agreement covered by this Part. However, the Regulated Party waives its right to challenge, on legal grounds, the requirement that it pay penalties under this Part.

f. The Regulated Party shall not be liable for payment of penalties for failure to comply with requirements of Part 7 of this Agreement covered by this Part if it has submitted to the MPCA a timely request for an extension of schedule under Part 13 and the MPCA has granted the request. The MPCA’s grant of an extension of schedule waives the payment of penalties covered by this Part only on the requirements for which the MPCA granted an extension of schedule and only for the time period specified by the MPCA in the grant of an extension. An extension of schedule for one requirement of Part 7 does not extend the schedule for any other requirement of Part 7.

g. Any requirement of this Agreement may be enforced as provided in Minn. Stat. § 115.071 (2002). Payment of a stipulated penalty does not relieve the Regulated Party of its obligation to fulfill and complete requirements under the Agreement and to otherwise comply with the terms and conditions of the Agreement.

**Part 9. COVENANT NOT TO SUE AND RESERVATION OF REMEDIES.** With respect to the Regulated Party, the MPCA agrees not to exercise any administrative, legal or equitable remedies available to the MPCA to
address the violations alleged and described in Part 6 as long as the Regulated Party performs according to and has complied with the terms, covenants and agreements contained in this Agreement. The MPCA reserves the right to enforce this Agreement or take any action authorized by law, if the Regulated Party fails to comply with the terms and conditions of this Agreement. Further, the MPCA reserves the right to seek to enjoin violations of this Agreement and to exercise its emergency powers pursuant to Minn. Stat. § 116.11 (2002) in the event conditions or the Regulated Party’s conduct warrant such action. Nothing in this Agreement shall prevent the MPCA from exercising these rights nor and nothing in this Agreement constitutes a waiver of these rights.

The Regulated Party agrees to waive all claims it may now have, as of the effective date of this Agreement, under Minn. Stat. § 15.472 for fees and expenses arising out of matters leading up to and addressed in this Agreement.

Part 10. REPEAT VIOLATIONS. Federal and state environmental programs establish harsher penalties for violations of environmental laws or rules that constitute repeat violations. In a proceeding to resolve alleged violations by the Regulated Party, if any, occurring after the date of the alleged violations set out in Part 6 of this Agreement, the Regulated Party may argue about the extent to which the violations alleged in Part 6 of this Agreement should affect the penalty amount for the later violations, but waives the right: 1) to contend that the violations alleged in Part 6 of this Agreement did not occur as alleged; and 2) to require the MPCA to prove the violations alleged in Part 6 of this Agreement.

Part 11. RESOLUTION OF DISPUTES. The parties to this Agreement shall resolve disputes that arise as to any part of the Agreement as follows:

a. Either party, acting through its case contact, may initiate dispute resolution by providing to the case contact of the other party an initial written statement setting forth the matter in dispute, the position of the party, and the information the party is relying upon to support its position. The other party, acting through its case contact, shall provide a written statement of its position and supporting information to the case contact of the initiating party within 14 calendar days after receipt of the initial written statement.

b. If the parties, acting through their case contacts, do not reach a resolution of the dispute and reduce such resolution to writing in a form agreed upon by the parties within 21 calendar days after the
initiating party receives the statement of position from the responding party, the Commissioner shall issue a written
decision resolving the dispute. The written decision may address stipulated penalties assessed pursuant to Part 8.
The Commissioner's decision shall be considered a final decision of the MPCA for purposes of judicial review.

c. The Commissioner's decision shall become an integral and enforceable part of this Agreement unless the Regulated Party timely challenges the decision in a court of competent jurisdiction. Failure to timely challenge means the Regulated Party agrees to comply with the MPCA Commissioner’s decision on the matter in dispute and to pay any penalties that accrue pursuant to Part 8 for failure to fulfill requirements of this Agreement that are the subject of the dispute resolution. Further, if the Commissioner’s decision assesses penalties pursuant to Part 8 of this Agreement, the Regulated Party agrees to and shall pay the amount of penalty determined by the Commissioner within 60 days after receiving the Commissioner’s decision.

d. Throughout any dispute resolution, the Regulated Party shall comply with all portions of the Agreement that the MPCA determines are not in dispute.

Part 12. VENUE. Actions brought by the MPCA to enforce requirements and terms of this Agreement shall be venued in Ramsey County District Court.

Part 13. EXTENSION OF SCHEDULES. If the Regulated Party wants an extension of a deadline included in a schedule set out in Part 7, the Regulated Party must request the extension in writing at least ten days before the scheduled deadline, or as soon as possible before that date if the reason for the extension request arises less than ten days before the deadline. Each deadline extension request shall separately specify the reason why the extension is needed. No requested extension shall be effective until approved in writing by the MPCA, acting through the MPCA Case Contact or the Commissioner. The MPCA shall grant an extension only for the period of time the MPCA determines is reasonable under the circumstances. The written approval or grant of an extension request shall be considered an enforceable part of the Agreement.

The Regulated Party has the burden of demonstrating to the satisfaction of the MPCA that the request for the extension is timely, and that good cause exists for granting the extension. Good cause can include, but is not limited to, the following:

a. circumstances entirely beyond the reasonable control of the Regulated Party; and
b. delays caused by the MPCA in reviewing timely submittals required by this Agreement, the Regulated Party submitted in complete and approvable form, which make it not feasible for the Regulated Party to meet the required schedules.

Good cause does not include unanticipated costs, increases in the cost of control equipment, or delays in MPCA review of submittals when the submittals are not in complete and approvable form.

The Regulated Party may challenge a decision by the MPCA to deny a request for an extension under Part 11.

Part 14. CASE CONTACT. The MPCA and the Regulated Party shall each designate a Case Contact for the purpose of overseeing the implementation of this Agreement. The MPCA Case Contact is: Lisa Scheirer. The Regulated Party's Case Contact is: Ben Daley. Either party may change its designated Case Contact by notifying the other party in writing, within five days of the change. To the extent possible, communications between the Regulated Party and the MPCA concerning the terms and conditions of this Agreement shall be directed through the Case Contacts. The address and telephone Number of the MPCA’s Case Contact is:

714 Lake Avenue, Suite 220, Detroit Lakes, MN 56501 (218) 846-0498.

Part 15. REGULATED PARTY INFORMATION. The Regulated Party shall not knowingly make any false statement, representation or certification in any record, report, plan or other document filed or required to be submitted to the MPCA under this Agreement. The Regulated Party shall immediately upon discovery report to the MPCA any errors in such record, report, plan or other document.

Part 16. REVIEW OF SUBMITTALS. The MPCA, acting through its Commissioner, Case Contact, or other designated MPCA staff, shall review all submittals made by the Regulated Party as required by this Agreement and shall notify the Regulated Party in writing of the approval or disapproval of each submittal. The MPCA and the Regulated Party shall consult with each other upon the request of either party during the review of submittals or modifications. If any submittal is disapproved in whole or in part, the MPCA Commissioner or designated MPCA staff shall notify the Regulated Party of the specific inadequacies and shall indicate the necessary amendments or reviews. Within 15 calendar days after receipt of any notice of disapproval, the Regulated Party shall submit revisions and take actions to correct the inadequacies.
Part 17. **ACCESS.** During the term of this Agreement, the Regulated Party agrees to provide the MPCA and its staff access to the Facility and its records and documents related to the implementation of this Agreement to the extent provided under Minn. Stat. § 116.091 (2002) or other law, conditioned only upon the presentation of credentials.

Part 18. **SAMPLING AND DATA AVAILABILITY.** The Regulated Party shall make available to the MPCA the results of any sampling, tests, or other data generated by the Regulated Party, or on its behalf, to implement the requirements of this Agreement.

Part 19. **RETENTION OF RECORDS.** The Regulated Party shall retain in its possession all records and documents related to this Agreement. The Regulated Party shall preserve these records, documents, reports and data for a minimum of three years after the termination of this Agreement despite any document retention policy of the Regulated Party to the contrary, and shall promptly make all such documentation available for review upon request by the MPCA.

Part 20. **APPLICABLE LAWS AND PERMITS.** The Regulated Party shall undertake all actions required to be taken pursuant to this Agreement in accordance with the requirements of all applicable state and federal laws and regulations. Except when the MPCA has specified and authorized a different compliance method in Part 7, the Regulated Party must also comply with all applicable permits, orders, stipulation agreements and schedules of compliance. Nothing in this Agreement exempts or relieves the Regulated Party of its obligation to comply with local governmental requirements.

Part 21. **OTHER CLAIMS.** Nothing herein shall release the Regulated Party from any claims, causes of action or demands in law or equity from any person, firm, partnership or corporation not a signatory to this Agreement for any liability it may have arising out of or relating to the release of any pollutant or contaminant from its operations or from a facility. Neither the Regulated Party nor the MPCA shall be held as a party to any contract entered into by the other party to implement the requirements of this Agreement.

Part 22. **HOLD HARMLESS AGREEMENT.** The Regulated Party agrees to indemnify, save and hold the MPCA, its agents and employees harmless from any and all claims or causes of action arising from or on account of acts or omissions of the Regulated Party, its officers, employees, agents, or contractors in implementing the
activities conducted pursuant to this Agreement; provided, however, that the Regulated Party shall not indemnify
the MPCA or save or hold its employees and agents harmless from any claims or causes of action arising out of the
acts or omissions of the MPCA, or its employees and agents. When the Regulated Party is required to hold the
MPCA harmless, the MPCA shall give the Regulated Party notice of any claim or cause of action subject to this Part
and the Regulated Party has the right to participate in the defense against any claim or cause of action. No
settlement shall be effective against the Regulated Party unless the Regulated Party agrees to the settlement.

**Part 23. SUCCESSORS.** This Agreement shall be binding upon the Regulated Party and its successors and
assigns and upon the MPCA, its successors and assigns. If the Regulated Party sells or otherwise conveys or
assigns any of its right, title or interest in the Facility, the conveyance shall not release the Regulated Party from any
obligation imposed by this Agreement, unless the party to whom the right, title or interest has been transferred or
assigned agrees in writing to fulfill the obligations of this Agreement and the MPCA approves the transfer or
assignment.

**Part 24. AMENDMENTS.** Except with respect to extensions of schedules granted under
Part 13 and approved submittals under Part 16, this Agreement may be amended only by written agreement between
the parties.

**Part 25. EFFECTIVE DATE.** This Agreement shall be effective on the date it is signed by the MPCA.

**Part 26. TERMINATION.** The provisions of this Agreement shall be deemed satisfied and terminated when the
MPCA notifies the Regulated Party in writing that an Individual NPDES/SDS Permit has been issued to the
Regulated Party. The Regulated Party agrees that all of the provisions of Part 7 of this Agreement may be
incorporated as enforceable parts of the Individual NPDES/SDS Permit.

**Part 27. SURVIVAL.** The provisions of Parts 2, 9, 10, 15, 18, 19, 20, 21, 22, 23, and 27 of this Agreement and
the rights, duties and obligations of the MPCA and the Regulated Party created in those provisions shall survive
termination of this Agreement.
BY THEIR SIGNATURES BELOW, THE UNDERSIGNED REPRESENT THAT THEY HAVE AUTHORITY TO BIND THE PARTIES THEY REPRESENT, AND THEIR AGENTS, CONTRACTORS, AND SUBSIDIARIES

DALEY FARMS OF LEWISTON, LLP

By: __________________________
Name: _________________________
Title: __________________________
Date: __________________________

STATE OF MINNESOTA
MINNESOTA POLLUTION CONTROL AGENCY

By: __________________________
Name: _________________________
Title: __________________________
Date: __________________________

Katherine Logan, Supervisor
Regional Environmental Management Division
Rochester Office
EXHIBIT 8
### Livestock Production Area Facility Review

#### A. Animal Confinement Areas Operation & Maintenance

<table>
<thead>
<tr>
<th>1) All Barns</th>
<th>NA</th>
<th>2) Open Lots</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Ventilation fans kept clean of built-up dust, feathers, or other debris?  
- Evidence of manure seepage from barn?  
- Upslope clean water diverted around or away from barn(s)?  

- Runoff controls functioning?  
- Runoff controls needed?  
- Evidence of runoff reaching waters of the state?  
- Upslope clean water diverted?

**Compliant** ✗  
**Conditional Compliance** ✓  
**Non-compliant** ☑  
**Not Applicable** ✗  

Return to Compliance by: At the time of issuance of new individual NPDES/SDS permit  

Submit a plan with the NPDES/SDS permit application for addressing the open-cattle yard (dry cows). The plan will be incorporated into the new individual permit.

#### B. Solid Manure Storage Areas Operation & Maintenance

<table>
<thead>
<tr>
<th>1) Short-term Stockpile</th>
<th>NA</th>
<th>2) Permanent Stockpile</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Issues:</td>
<td></td>
<td>Issues:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Stockpile within required setback zones?  
- Located in sand/gravel quarry or bedrock?  
- Are pile slopes < 3.1 or <15% solids?  
- Located on greater than 6% slope?  
- Located on 2-6% slope without clean water diversion and erosion control practices?  
- Are saturated soils within 2 feet?  
- Are coarse-textured soils present throughout top 5 feet at stockpile location?  
- Are soils bare—without vegetation for one year pre/post-use?  
- Has this site been used longer than one year?  
- Does amount in stockpile require over 320 ac. to land apply?  

- Stockpile within required setback zones?  
- Located in sand/gravel quarry or bedrock?  
- Are pile slopes < 3.1 or <15% solids?  
- Does pad exceed permeability requirements?  
- Does pad show large ruts/erosion?  
- Does clean water flows through stockpile?  
- Does runoff flow from the stockpile to waters of state?
### C. Liquid Manure Storage Areas Operation & Maintenance

#### 1) Concrete Pit  NA ✗
- **Yes**  **No**  **NA**  **Issues:**
  - If open-air, depth marker installed?
  - Located under building?
  - Freeboard/capacity shortage?
  - Cracks in need of repair?
  - Sloughing/flaking of concrete?
  - Exposed rebar?
  - Nonfunctional perimeter tile outlet (if constructed after 2000)?
  - Barn constructed prior to 2000?
  - Odorous/discolored liquid in perimeter tile (if monitoring port present)?
  - Evidence of seepage from pit?
  - Build up of manure near pumpouts?
  - Pumpouts exposed (not covered)?
  - Woody/deep rooted vegetation growing near pit walls?
  - Is an anaerobic digester present?

#### 2) Earthen Basin  NA ✗
- **Yes**  **No**  **NA**  **Issues:**
  - If open-air, has depth marker installed?
  - Is the basin covered?
  - Is the cover maintained?
  - Are they flaring captured gases?
  - Is an anaerobic digester present?
  - Freeboard/capacity shortage?
  - Basin modified without approval?
  - Low spots in berm?
  - Evidence of overflows?
  - Odorous/discolored liquid in perimeter tile (if monitoring port present)?
  - Excessive gully erosion in basin walls?
  - Anti-scour device around pipe outlet absent?
  - Pumpout area maintenance problems?
  - Woody/deep rooted vegetation growing on basin walls?
  - Rodent burrows in berm?
  - Evidence of seeping on exterior wall?

#### 3) Synthetic-lined Basin  NA □
- **Yes**  **No**  **NA**  **Issues:**
  - If open-air, has depth marker installed?
  - Is the basin covered?
  - Is the cover maintained?
  - Are they flaring captured gases?
  - Is an anaerobic digester present?
  - Freeboard/capacity shortage?
  - Basin modified without approval?
  - Low spots in berm?
  - Evidence of overflows?
  - Liner torn or damaged?
  - Odorous/discolored liquid in perimeter tile (if monitoring port present)?
  - Evidence of seeping on exterior wall?
  - Pumpout area maintenance problems?
  - Woody/deep rooted vegetation growing on basin walls?

#### 4) Slurry Store or Above-ground Tank  NA □
- **Yes**  **No**  **NA**  **Issues:**
  - If open-air, has depth marker installed?
  - Is the structure covered?
  - Is the cover maintained?
  - Freeboard/capacity shortage?
  - Structure is leaking and/or overflowing?
  - Evidence of past leak and/or overflow?
  - Transfer valve not properly maintained?
5) Manure Storage Area Emergency Response Plan
Yes  No  NA  Issues:
☑  ☐  ☐  Has site plan showing release points to surface water (surface tile intakes, road ditches, etc.)?
☐  ☐  ☐  Has plan of action for emergency spill response at facility and during transport to land application?
☑  ☐  ☐  Trains employees?

Compliant  ☑  Conditional Compliance  ☒  Non-compliant  ☐  Not Applicable  ☐  Issue(s):
Basin #4 has bubbled liner
Fencing required around basins 1-4
Depth Markers installed on basins 1-4
Submit plans and specifications for the repair/rebuilding of basin#4 along with an application packet for a new individual NPDES/SDS permit
Submit plans for fence installation around basins 1-4
Submit plans for the installation of depth markers in basins 1-4

Return to Compliance by:
At the time of issuance of new individual NPDES/SDS permit

6) Air Emission Notification for Exemption
Yes  No  NA  Is notification made for exemption during agitation and pumping for land application activities?

D. Other Production Area Features Operation & Maintenance

1) Feed Storage Area  NA  ☐  Issues:
Piles of spoiled feed around storage bin?
Exposed feed or spillage on storage pad?
Clean water flows through feed area?
Silage leachate can flow to waters?
Exposed feed or spillage on storage pad?

Compliant  ☑  Conditional Compliance  ☒  Non-compliant  ☐  Not Applicable  ☐  Issue(s):
Potential for leachate and feed pad contaminated run-off to reach the water way located near the east edge of the feed pad.
Submit plans and specifications for addressing the silage leachate and feed pad run-off with the application packet for a new NPDES/SDS permit

Return to Compliance by:
At the time of issuance of new individual NPDES/SDS permit

2) Milkhouse Wastewater  NA  ☐  Issues:
Discharges to land surface?
Discharging to surface water?
Other:

3) Permanent Stormwater Controls  NA  ☒  Issues:
Required permanent stormwater controls in place?
Adequate permanent vegetation?
Freeboard on control structure absent?
Structure outlets eroding?

Compliant  ☑  Conditional Compliance  ☒  Non-compliant  ☐  Not Applicable  ☐  Issue(s):
Potential for leachate and feed pad contaminated run-off to reach the water way located near the east edge of the feed pad.
Submit plans and specifications for addressing the silage leachate and feed pad run-off with the application packet for a new NPDES/SDS permit

Return to Compliance by:
At the time of issuance of new individual NPDES/SDS permit

E. Carcass Disposal

1) Rendering  NA  ☐  Issues:
Offsite pickup site accessible to scavengers?
Carcasses present more than 72 hours non-refrigerated?

Compliant  ☑  Conditional Compliance  ☒  Non-compliant  ☐  Not Applicable  ☐  Issue(s):
Potential for leachate and feed pad contaminated run-off to reach the water way located near the east edge of the feed pad.
Submit plans and specifications for addressing the silage leachate and feed pad run-off with the application packet for a new NPDES/SDS permit

Return to Compliance by:
At the time of issuance of new individual NPDES/SDS permit

2) Incineration  NA  ☒  Issues:
Structure designed for this purpose?
No afterburner?

Compliant  ☑  Conditional Compliance  ☒  Non-compliant  ☐  Not Applicable  ☐
### 3) Composting

- **Issues:**
  - Impervious pad not present?
  - Exposed carcasses?
  - Temperature not measured daily?
  - Leachate not contained?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

### 4) Burial

- **Issues:**
  - Carcasses not covered?
  - Coarse-textured soils?
  - Within 5 feet of water table?
  - Within shoreland zone?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

### F. Non-Feedlot Operation & Maintenance

#### 1) Well

- **Issues:**
  - Un-used wells are MDH sealed?
  - Anti-backflow protection on waterline connections?
  - DNR Water Appropriation Permit

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

#### 2) On-site sewage system

- **Issues:**
  - Straight-piped to surface water? (Report)
  - Discharging to ground surface? (Report)
  - Toilet plumbed to manure storage area?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

#### 3) Burn Barrels

- **Issues:**
  - Solid waste burned on site?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

#### 4) Sharps Disposal

- **Issues:**
  - Stored in heavy-duty plastic container for later disposal?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

#### 5) Chemicals, Gas, and Oil Storage

- **Issues:**
  - Chemicals leaking onto ground?
  - Pesticide containers accumulating?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

### Facility Record-Keeping Review

#### G. Land Application of Manure

- **Level I**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

- **Level II**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

- **Level III**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

- **Attach review form**

- **Issues:**
  - Rainfall amounts when runoff from land application sites occurs?

- **Compliance:**
  - [ ] Compliant
  - [ ] Conditional Compliance
  - [ ] Non-compliant
  - [ ] Not Applicable

- **Return to Compliance by:**

- **Issue(s):**
  - Did not perform record review at time of facility inspection. Mr. Daley was going to send application records to the MPCA in Rochester after 2009 spreading season was complete
### Facility Records Review

1) O & M Records
- Yes No NA Issues:
  - Water lines checked daily? ☒
  - Weekly stormwater diversion devices? ☒
  - Weekly runoff diversion structures? ☒
  - Weekly devices channeling runoff to containment area(s)? ☒
  - Weekly of all LMSAs? ☒
  - Weekly LMSA depth marker(s) readings? ☒
  - Weekly examinations of LMSA drain tile line(s)? ☒
  - Periodic inspections of land application equipment? ☒

2) Facility & Maintenance Records
- Yes No NA Issues:
  - Current design of all LMSAs? ☒
  - LMSA maintenance? ☒
  - Soil-lined poultry barn floor soil test results? ☒
  - SWPPP maintenance & modification? ☒
  - Improvements to runoff control & barns? ☒
  - Activities that alter site or increase pollution potential? ☒

3) Short-term Stockpiling Records NA ☒
- Yes No NA Issues:
  - Location information? ☒
  - Date stockpile formed? ☒
  - Volume of manure stored? ☒

4) Composting Records: Mortality or Manure NA ☒
- Yes No NA Issues:
  - Quantities of materials delivered to site? ☒
  - Temperature of compost? ☒
  - Retention time of compost? ☒
  - Analysis of finished compost? ☒

| Compliant ☒ | Issue(s): |
| Conditionally Compliant | |
| Non-compliant ☒ | |
| Not Applicable | |

Return to Compliance by:
December 26, 2012

Mr. Ben Daley
18942 County Road 18
Lewiston, MN 55952

RE: October 23, 2012, Inspection
    Feedlot Registration Number 169-50002
    NPDES/SDS Permit Number MN0067652

Dear Mr. Daley:

Please find enclosed a Minnesota Feedlot NPDES/SDS Facility Inspection Checklist (Checklist) for Daley Farms of Lewiston LLP (Facility) located at 18942 County Road 18 Lewiston, Minnesota in Winona County. An inspection was conducted by the Minnesota Pollution Control Agency (MPCA) staff on October 23, 2012, others present at the inspection include Ben Daley (co-owner), and Mark Gernes Winona County feedlot officer. The inspection consisted of a Compliance and Land App II inspection. The purpose of the inspection was to evaluate the Facility for compliance with Minnesota feedlot rules and statutes.

The following is a summary of the MPCA staff’s findings and comments resulting from the inspection. Please refer to the enclosed Checklist for additional details regarding the inspection.

Areas of Concern or General Comments

1. The feed storage area, at the time of inspection, was in compliance with the National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Permit.
2. At the time of the inspection, the confinement barns, liquid manure storage areas (LMSAs) and manure separating facilities were all being operated in compliance.
3. Install fence around LMSAs when the landscaping is complete.
4. Maintain records of water usage, daily water line checks, weekly tile monitoring checks, and diversion maintenance.
5. Submit an Annual report to the MPCA by March 1st, along with the records that are required on MPCA forms (MPCA manure management planner excel version).
6. Some fields inspected within the land application records contained application rates that were 20 percent higher than allowed by rule. This is due, in part, to the use of old manure management planning software that allowed higher rates. When planning and applying manure, make sure to be aware that for corn on corn the maximum Nitrogen rate from all sources is 180 pounds, 140 pounds of Nitrogen for corn following soybeans, and remember to take Nitrogen credits from alfalfa plow down first year credits 150 pounds and second year credits of 75 pounds.
If you have any questions regarding the inspection report, please contact me at 507-206-2618.

Sincerely,

Steven Schmidt
Pollution Control Specialist Senior
Rochester Office
Watershed Division

SS:cme

Enclosure

☑ Checklist ☐ Fact Sheet(s) ☐ LOW ☐ NOV ☐ Other

cc: Mark Gernes, Winona CFO (w/enclosure)
September 18, 2015

Mr. Ben Daley
17755 County Rd 18
Utica, MN 55979

RE: 9/10/2015 Feedlot Compliance Inspection
Daley Farm of Lewiston, LLP (West Farm); Feedlot Registration Number 169-82503

Dear Mr. Daley:

Thank you for the opportunity to meet with you on 9/10/2015 and to view your feedlot facility.

Please find enclosed a Minnesota Feedlot non-NPDES Permitted Facility Inspection Checklist for Daley Farm of Lewiston, LLP (West Farm) located at 23866 Cemetery Rd. The Checklist indicates areas of the feedlot that were checked for compliance with Winona County and State feedlot rules and statutes.

The following is a summary of the County staff’s findings and comments resulting from the inspection. Please refer to the enclosed Checklist for additional details regarding the inspection.

Areas of Concern or General Comments:
1. Milkhouse waste water discharging into ditch; historical pollution hazard. Upon issuance of Feedlot Permit, waste water will be handled through an irrigation system.
2. Manure nutrient analysis from manure storage area is from March 30, 2010 (older than 4 years).

Minnesota Rule 7020.2225 Subp. 2.: “Manure from all manure storage areas storing manure produced from more than 100 animal units must be tested by the owner of the animal feedlot for nitrogen and phosphorus...Ongoing testing must continue at least once every four years unless more frequent testing is required.”

Required Corrective Actions:
1. By February 1, 2016, obtain a current manure nutrient analysis from an accredited lab and submit a copy of nutrient analysis to Winona County Feedlot Officer.

If you have any questions regarding the inspection report, please contact me at 507-457-6580.

Thank you, again, for your cooperation and coordination.

Sincerely,

Emily Bartusek
Winona County Feedlot Officer

Enclosures:
☒ Checklist
Minnesota Feedlot
(Non-NPDES) Inspection Checklist

NPDES/SDS Feedlot Program
National Pollutant Discharge Elimination System/
State Disposal System (NPDES/SDS)

Doc Type: Inspection (wq-f3-45e)

Key at the end of the checklist

Instructions: The MPCA or Delegated County staff should complete this form upon an inspection to evaluate non-NPDES permitted feedlots for compliance with Minnesota feedlot rules and statutes. A copy of the form will be returned to the feedlot owner following the inspection.

General Information
Name of facility: Daley Farm (West Farm)  Date of inspection (mm/dd/yyyy): 9/10/2015
Registration No: 169-82503  Inspector Name: Emily Bartusek
Owner/Operator: Ben Daley (Mark, Brian & Shelly)  Others Present: 
Phone: 507-251-2444  Fax:  
E-mail:  
Weather Conditions (at time of inspection): Foggy & semi-wet

Facility Location
County: Winona  Twp: Utica  Sect: 9  Qtr: SW
Facility address: 23866 Cemetery Rd
City: Lewiston  State: MN  Zip Code: 55952  Parcel ID: 15.000.0780

Inspection Type (check all that apply):
☑ Facility Compliance  ☐ Land Application Level II Records Review  ☐ Land Application Level III Field Inspection

A. Feedlot History (Date format: mm/dd/yyyy)
Type of most recent inspection: Compliance  Date of most recent inspection: 10/23/2012
Type of most recent enforcement action: n/a  Date of enforcement action: n/a
Permit Type: n/a  Issuance Date: n/a  Expiration Date: n/a
Date of most recent registration: 10/23/2012

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1 Does a MinnFarm or FLEval exist for the feedlot?</td>
<td>☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.2 Is the feedlot located in a Drinking Water Supply Management Area?</td>
<td>☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.3 Is the feedlot located in Shoreland?</td>
<td>☑</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.4 Enrolled in the Open Lot Agreement?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Feedlot Components

<table>
<thead>
<tr>
<th>Animal Types Registered or On-Site</th>
<th>Animal (head) Numbers Registered</th>
<th>On-Site</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy – calf</td>
<td>150</td>
<td>150</td>
<td>Registered for 170 AU</td>
</tr>
<tr>
<td>Dairy – heifer</td>
<td>200</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

wq-f3-45e  Feedlot (Non-NPDES) Inspection Checklist  Revised 12-4-12
### B. Feedlot Components (continued)

<table>
<thead>
<tr>
<th>Checklist Questions</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1 Is Registration current (date within previous 4-year block)?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2 Have animal units and animal species, types and numbers changed since the most recent registration or inspection?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.3 Have animal holding areas or manure storage areas changed since the most recent permit, Notice of Construction or Expansion, MinnFarm or inspection?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Inspection Requirement**

<table>
<thead>
<tr>
<th>C. Concentrated Animal Feeding Operation (CAFO) Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checklist Questions</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>C.1 Does the maximum capacity of this feedlot meet or exceed the CAFO threshold (# of head per species) or 1,000 animal units? (if yes the feedlots must seek NPDES Permit Coverage)</td>
</tr>
<tr>
<td>C.2 Does the owner own (all or part of) other feedlots adjacent to or within ¼ mile of this feedlot?</td>
</tr>
<tr>
<td>C.4 Is the owner required to seek NPDES/SDS permit coverage for this feedlot and other commonly owned feedlots? (Refer to Minnesota Pollution Control Agency (MPCA))</td>
</tr>
</tbody>
</table>

1. **Open Lot Agreement (OLA)**

   Not Applicable to this Facility

2. **Animal Confinement Barn(s)**

   Checklist Questions | Y | N | NA | NI | Notes: |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Is any manure seepage from barns visible?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Does upslope water drain through the barn(s)?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. **Open Lot(s)**

   Checklist Questions | Y | N | NA | NI | Notes: |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Do animals have access to a lake classified by the Minnesota Department of Natural Resources (DNR)? (7020.2015, subp. 2)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2 Are clean-water diversions in place, operational and maintained?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.3 Are runoff controls in place, operational, and maintained?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.4 Is there evidence of runoff leaving the open lot(s) or runoff control(s)? (past or present)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Yes - Evaluate the following:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Run off from open lot goes through pasture area that has been re-seeded to establish permanent vegetation.</td>
</tr>
<tr>
<td>Is runoff currently reaching surface waters?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there evidence runoff reached surface waters or tile intakes, sinkholes, fractured bedrock, well, mine or quarry? (e.g. inadequate buffer, steep slopes, channels, matted or dead vegetation, clean water run-on, stormwater flow)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there evidence runoff could impact ground water? (e.g., ponding, coarse-textured soils, depth to water table)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Inspection Requirement**

<table>
<thead>
<tr>
<th>3.7 Open Lot discharge requirements met.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[7020.2003, subp. 1 &amp; 3, 7050.0210, subp. 2 &amp; 13, 7060.0600, subp. 2]</td>
</tr>
</tbody>
</table>

4. **Feed Storage Area(s)**

   Checklist Questions | Y | N | NA | NI | Notes |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Are the soils beneath the storage area coarse-textured?</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>Feed is hauled over from main dairy on a daily basis. No feed storage on site.</td>
</tr>
</tbody>
</table>

Page 1 of 4 of the Checklist  Inspection Date: 9/10/2015
### 4. Feed Storage Area discharge requirements met.

Technical Requirements (Questions 4.1 - 4.6)

- Is there evidence of runoff leaving the feed storage area or feed storage area runoff controls? (past or present)
- Is more than 1,000 tons of sweet corn silage stored on site at any one time?

**Inspection Requirement**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### 5. Milkhouse Waste Handling System(s)

#### Checklist Questions

- Is milk-house wastewater contained in an approved structure or treated by an approved system?
- Is there evidence of milk-house wastewater leaving the control devices? (past or present)

**Inspection Requirement**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### 6. Short-term Manure Stockpile Site(s)

**Not a Component of this Facility**

### 7. Permanent Manure Stockpile Site(s)

#### Checklist Questions

- Are the required location prohibitions of 7020.2005 met? (shoreland, flood plain, sinkhole, and public wells)
- Are rock quarry(s), gravel or sand pit(s), bedrock, or any mining excavation site(s) used for the stockpile site?
- Is stockpile on an impervious pad?
- Does the stockpile stack have a slope of at least 3:1 or does the manure have at least 15% solids? (if no, manure cannot be stockpiled)
- Are upslope clean water diversions present if slopes are greater than 2%?
- Is runoff contained in an approved structure or treated by an approved system?

**Discharge Requirements (Question 7.7)**

- Is there evidence of runoff leaving the site? (past or present)

**Inspection Requirements**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### 8. Manure Compost Site

**Not a Component of this Facility**

### 9., 10., & 11. Liquid Manure Storage Area(s) (LMSA)

**Not a Component of this Facility**

### 12. Poultry Barn Floor(s)

**Not a Component of this Facility**

### 13. Carcass Management

**Type of Carcass Management (check all that apply) **single-click**

- Render
- Compost
- Burial
- Incinerate

#### Carcass Management Questions

- Is there a dead box for rendering pick-up?

**Render Checklist Questions**

<table>
<thead>
<tr>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Page 2 of 4 of the Checklist

**Inspection Date: 9/10/2015**
### Facility Name: Daley Farm (West Farm)

### Registration Number: 169-82503

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13.2</td>
<td>Are carcasses picked up within 72 hours?</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

**Referral**

- Referred to Board of Animal Health

#### 14. Level I Land Application of Manure Record Keeping for 100-299 AU (Non-CAFO)

<table>
<thead>
<tr>
<th>Checklist Questions</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.1 Is a MMP available for the next crop year? (crop 1yr from now)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td>Manure tests submitted are older than 4 years.</td>
</tr>
<tr>
<td>14.2 Is there a manure analyses within the last 4 years?</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td>Corrective action:</td>
</tr>
<tr>
<td>Not required if 100 AU or less contribute to manure storage</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td>1. By March 1, 2016 obtain manure nutrient analysis and submit to County Feedlot Officer.</td>
</tr>
<tr>
<td>List the manure analysis from manure storage area or stockpile with the two highest number of animal units:</td>
<td></td>
<td></td>
<td>N</td>
<td>P</td>
<td>K</td>
</tr>
<tr>
<td>Livestock species: Dairy</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>◐</td>
</tr>
<tr>
<td>Livestock species:</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>◐</td>
</tr>
<tr>
<td>Amounts of manure applied per acre for each field</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Livestock species: Solid</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Livestock species: Liquid</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Amounts of manure applied per acre for each field</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Livestock species: Solid</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Livestock species: Liquid</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Method(s) of manure application</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Are there records with these items?</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field IDs and acres for each field</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amounts of manure applied per acre for each field</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method(s) of manure application</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are records kept of application dates?</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are records kept of plant-available N per acre from manure and commercial fertilizers, including carry-over N? (P2O5 records also required if 100 or more AU and in DWSMA)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List the <strong>Highest</strong> rate of crop-available N applied:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Crop: Corn</td>
<td>Previous Crop: Corn</td>
<td>Amount N Applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.9 Are records kept of application dates?</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are records kept of plant-available N per acre from manure and commercial fertilizers, including carry-over N? (P2O5 records also required if 100 or more AU and in DWSMA)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List the <strong>Highest</strong> rate of crop-available P2O5 applied (if in DWSMA):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2O5</td>
<td>Crop: Corn</td>
<td>Previous Crop: Corn</td>
<td>Amount P2O5 Applied</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.12 Land Application Recording keeping requirements met.</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inspection Requirements</th>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
</table>

#### 15. Level II Land Application of Manure Inspection (Non-CAFO)

*Not inspected for this facility*

#### 16. Level III Land Application of Manure Inspection (Non-CAFO)

*Not inspected for this facility*

#### 17. Animal Feedlot and Manure Storage Area Closure

*Not Applicable to this Facility*

#### 18. Interim Permit

*Not Applicable to this Facility*

#### 19. Summary of Environmental Upgrades

*Not Applicable for this Inspection*

*End of Inspection.*

**Key**

- **C** = Compliance – At the time of the inspection, the feedlot and/or owner meet the requirements of applicable state rules and statutes or permit conditions.
- **NC** = Non-Compliance – At the time of the inspection, the feedlot and/or owner do not meet the requirements of applicable state rules and statutes or permit conditions.
- **NA** = Not Applicable – The condition is not present at this feedlot.
- **NI** = Not Inspected – The condition was not inspected.
- **Y** = Yes – Does not indicate compliance or non-compliance.
- **N** = No – Does not indicate compliance or non-compliance.
Checklist Question = Checklist questions are used by the inspector to evaluate feedlot conditions.

Inspection Requirement = Inspection requirements are statements that summarize the regulatory requirements of applicable state rules and statutes or permit conditions
EXHIBIT 11
Feedlot NPDES/SDS Permitted Facility Inspection Checklist

NPDES/SDS Feedlot Program
National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS)

Doc Type: Inspection

General Information
Name of facility: Daley Farms of Lewiston LLP 1
Date of inspection (mm/dd/yyyy): 9/6/2016

Facility address: 18762 Highway 14
City: Lewiston State: MN Zip code: 55952

Phone: ___________ Fax: ___________ E-mail: ___________

Owner/Operator: Daley Farms of Lewiston LLP Inspector Name: Mark Gernes

Registration No: 169-115453 Qtr: NE Sect: 16 Twp: Utica
County: Winona Parcel ID: ___________

Others present: Emily Bartusek

Types of inspections (check all that apply): ✗ Facility compliance ☐ Land App II ☐ Land App III

A. Feedlot History (Date format: mm/dd/yyyy)
Date of most recent inspection: 6/21/2013 Type of most recent inspection: Land App II
Date of most recent enforcement action: 9/20/2004 Type of enforcement action: SOC

Permit Issuance Date: 11/17/2010 Permit Expiration Date: 11/17/2015 Permit Type: Individual NPDES (Multi-site)

Date of most recent registration: 11/17/2010

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1</td>
<td>Does a MinnFarm or FLEval exist for the feedlot?</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>A.2</td>
<td>Is the feedlot located in a Drinking Water Supply Management area?</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>A.3</td>
<td>Is the feedlot located in Shoreland?</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>A.4</td>
<td>Enrolled in the Open Lot Agreement?</td>
<td>☐</td>
<td>☑</td>
</tr>
</tbody>
</table>

B. Feedlot Components
Registered animal types and numbers: 100 cows over 1,000 lbs = 140 AU
Actual animal types and numbers on site: Same
### Key

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Compliance – At the time of the inspection, the facility and/or Permittee meets the requirements of the permit and applicable state and federal rules and regulations.</td>
</tr>
<tr>
<td>NC</td>
<td>Non-Compliance – At the time of the inspection, the facility and/or Permittee does not meet the requirements of the permit and applicable state and federal rules and regulations.</td>
</tr>
<tr>
<td>NA</td>
<td>Not Applicable – This condition is not present at this facility.</td>
</tr>
<tr>
<td>N</td>
<td>Not Inspected – This condition was not inspected.</td>
</tr>
<tr>
<td>Y</td>
<td>Yes. Option applies to Review &amp; Checklist Questions. This is not a statement of compliance.</td>
</tr>
<tr>
<td>N</td>
<td>No. Option applies to Review &amp; Checklist Questions. This is not a statement of compliance.</td>
</tr>
</tbody>
</table>

### Checklist question:

Checklist questions are used by the inspector to evaluate compliance with the requirements of the permit and applicable state and federal rules and regulations.

### Inspection requirement:

Inspection requirements are statements that summarize the regulatory requirements of the permit and applicable state and federal rules and regulation for each major facility component for Permittees operating under the Minnesota National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit. Each section of the checklist evaluates a single component.

### Section II: Inspection

#### Checklist questions:

<table>
<thead>
<tr>
<th>Checklist questions:</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1 Animal numbers are at or below permitted numbers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.2 Animal species and types are the same as current permit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.3 Other components, e.g. barns, lots, LMSAs, are the same as current permit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Inspection requirement:

| B.4. Facility components match permitted components. | C | NC | NA | NI |

#### 1 Animal Confinement Barn Operation & Maintenance

<table>
<thead>
<tr>
<th>Checklist questions:</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Are ventilation fans kept clean of built-up dust, feathers and other debris?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Is any manure seepage from barns visible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3 Is the clean water diverted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Inspection requirement:

| 1.4 Confinement barn(s) meet(s) zero discharge standards. | C | NC | NA | NI |

#### 2 Open Lot Operation & Maintenance

<table>
<thead>
<tr>
<th>Checklist questions:</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Are clean water diversions in place and operational?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Is all manure-contaminated runoff contained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3 Is the transfer system between open lot and storage structure operating properly and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 Is the runoff contained in approved structure or system?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Inspection requirement:

| 2.5 Open lot(s) meet zero discharge standards. | C | NC | NA | NI |

**Notes:**

Noted at the time of inspection: runoff controls/collection measures have not been implemented.

**Required Corrective Actions:**

1. Corrective Actions for implementation of planned measures to address runoff from the open lot area will be included in the new Individual NPDES permit when it is issued.

#### 3 Feed Storage Area(s) Operation & Maintenance

| Inspection requirement: | C | NC | NA | NI |

#### 3.7 Feed storage area meets zero discharge.

#### 4 Process Wastewater(s) Handling System Operation & Maintenance

| Inspection requirement: | C | NC | NA | NI |

#### 4.5 Process wastewater handling meets zero discharge standards.
### Short-term Manure Stockpile Site Operation & Maintenance

**Stockpile location checklist questions:**

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the required 50 feet horizontal and 300 feet flow distance to surface water met?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Short-term manure stockpile area was not inspected at the time of inspection.</td>
</tr>
<tr>
<td>If a well is nearby, is it greater than or equal to 100 feet away if the well is cased or 200 feet if it is not cased?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>When stockpiling manure requirements 5.1 to 5.11 need to be followed.</td>
</tr>
<tr>
<td>Is the stockpile located on slopes less than 6%?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the stockpile site are saturated soils greater than 2 feet below the surface?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the stockpile site are at least some soils in top 5 feet verified sandy-loam or finer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are rock quarry(s), gravel or sand pit(s), bedrock, or any mining excavation site(s) used for the stockpile site?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the manure in the stockpile stack with slopes of at least 3:1 or have at least 15% solids been confirmed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the volume of stockpiled manure less than 320 acres based on N?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are clean water diversions in place and operational?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is all manure removed from the site within 1 year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is vegetation re-established for 1 growing season prior to site re-use as a stockpile?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Inspection requirements:**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.12 Short-term stockpile location restrictions met.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.13 Short-term stockpile site technical requirements met.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Permanent Stockpile Site Operation & Maintenance

**Checklist questions:**

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
</table>

### Manure Composting Operation & Maintenance

**Inspection requirements:**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3 Manure composting requirements met.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Manure compost site (if within footprint of facility) meets zero discharge standard.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Earthen Basin Liquid Manure Storage (LMSA) with or without Synthetic Lining Requirements

**Inspection requirements:**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.14 Earthen LMSA O&amp;M requirements met.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.15 Earthen LMSA meets zero discharge standards.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Concrete Liquid Manure Storage (LMSA) Requirements

**Inspection requirements:**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.16 Concrete LMSA O&amp;M requirements met.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.17 Concrete LMSA meets zero discharge standards.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Above-ground Liquid Manure Storage System (LMSA) Requirements

**Inspection requirements:**

<table>
<thead>
<tr>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.8 Above-ground LMSA O&amp;M requirements met.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.9 Above-ground LMSA meets zero discharge standards.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Technical Requirements for Poultry Barn Floor

**Notes:**
11.1 Poultry barn floor maintenance requirements met.

12 Carcass Management Requirements

12.1 Checklist questions:

12.1.1 Is the Facility following their submitted Animal Mortality Plan?

12.2 Rendering checklist items:

12.2.1 Is the carcass storage container animal-proof?

12.2.2 Is the off-site carcass storage container at least 200' from the closest neighbor's buildings?

12.2.3 Are carcasses picked up within 72 hours?

12.3 Composting checklist items:

12.4 Burial checklist items:

12.5 Incineration checklist items:

12.6 Method of carcass management meets BAH & MPCA technical requirements.

12.7 Dead animal disposal or storage containment meets the zero discharge standard if it lies within the footprint of the facility.

13 Record-Keeping Requirements

13.1 Are the Level I manure application record-keeping requirements met?

13.2 Are the daily water line observation records kept?

13.3 Are the weekly LMSA inspection records kept?

13.4 In open-air systems, are the LMSA liquid level depth marker records kept?

13.5 Where required, are the perimeter tile system observation records kept?

13.6 Where required, are the storm water diversion structure observation records kept?

13.7 Where required, are the records of runoff diversion observations kept?

13.8 Where required, are the records of observation of devices channeling runoff kept?

13.9 Where Permittee applies own manure, are records of manure application equipment inspection and maintenance kept?

13.10 Are the records of actions taken to correct problems for items 13.2 through 13.9 kept?

13.11 Are the record-keeping requirements of mortality disposal activities met?

13.12 Are the record-keeping requirements of LMSA overflows met?

13.13 Are the record-keeping requirements of stockpiling & manure composting activities met?

13.14 Are the record-keeping requirements for poultry barn floor maintenance met?

13.15 Record-keeping requirements met.

14 Level II Land Application Inspection
### MMP records and plans checklist questions:

14.1 Is the MMP for next year available for review?  
14.2 Are the soil phosphorus test (SPT) results less than or equal to four years old?  
14.3 Is manure analysis obtained annually?  
14.4 Do the records kept for transferred-ownership manure meet requirements?  
14.5 Do the records kept for non-transferred-ownership manure meet requirements?  
14.6 Are records available for all manure applications?  
14.7 Is emergency winter application of manure conducted only at sites with MPCA pre-approval?  
14.8 Is the total available N less than or equal to limits in 7020 rules?  
14.9 Is summer manure application (June – August) followed with a planted cover-crop?  
14.10 Is manure applied to sandy soils only after mid-October?  

### Phosphorus management checklist questions:

14.11 In special protection areas or within 300 feet of open tile intakes on soils over 21 ppm Bray or 16 Olsen, is P applied during the rotation (6 years) less than P removed? See worksheet.  
14.12 In special protection areas or within 300 feet of open tile intakes is an approved P strategy followed for manure applied on soils greater than 75 ppm Bray or 60 Olsen?  
14.13 In special protection areas or within 300 feet of open tile intakes is manure incorporated within 24 hours?  
14.14 Approved P strategy is followed for manure applied on soils greater than 150 ppm Bray or 120 Olsen for land greater than 300 feet from sensitive features.  

### Inspection requirements:

14.15 MMP records & plans meet requirements.  
14.16 Nitrogen management meets requirements.  
14.17 Phosphorus management meets requirements.  

### Level III Land Application Inspection

Facility where manure originated:  
Other (name):  
Inspected during application:  
Inspected after application:  

### Land application technical requirements checklist questions:

15.1 Is the method of application consistent with the approved MMP?  
15.2 Is the manure spread in a uniform pattern?  
15.3 Is manure prevented from entering waters, tile intakes, sinkholes and wells during the application process?  
15.4 Is a surface application occurring when chances of ½ inches or more of rain are less than 50% within the next 24 hours?  
15.5 Is a cover crop planted in fields after receiving manure application during summer months (June – August)?  
15.6 Is the manure applied into the road right-of-way?  
15.7 Manure application less than or equal to rates allowed by Minn. R. 7020.  

### Non-Frozen soils setback requirements checklist questions:

15.8 Is the 25 foot setback from sensitive features followed?  
15.9 Is the 50 foot setback from sinkholes and wells followed?  
15.10 Is the manure injected or incorporated within 24 hours on all land within 300 feet of sensitive features?  

### Winter manure application requirements checklist questions:

15.11 Is the manure getting applied only to fields identified in the Permittee’s MMP?  
15.12 Is solid manure being applied to slopes greater than 6%?  
15.13 Is liquid manure being applied to slopes greater than 2%?
15.14 Is manure application occurring during times of high snowmelt potential?

15.15 Is the application meeting the 300 foot setback to sensitive feature(s)?

<table>
<thead>
<tr>
<th>Inspection requirements:</th>
<th>C</th>
<th>NC</th>
<th>NA</th>
<th>NI</th>
</tr>
</thead>
</table>

15.16 Land application technical requirements met.

15.17 Non-frozen Soils setback requirements met.

15.18 Winter application requirements met.

### Additional individual permit requirements:

<table>
<thead>
<tr>
<th>Checklist questions:</th>
<th>Y</th>
<th>N</th>
<th>NA</th>
<th>NI</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.1 If site is operating under an individual permit, all additional permit conditions are met?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other and emerging issues (Do not track in Delta)

19.1 Any additional county requirements?
19.2 Agitation and Pumpout Notification for Exemption
19.3 Have they identified potential release points to surface water at the site and along transportation route for manure application?
19.4 Do employees receive regular training on emergency procedures?
19.5 Secondary carcass management plan available?
19.6 Program updates

### Printed materials distribution (Do not track in Delta)

<table>
<thead>
<tr>
<th>Requested</th>
<th>Delivered</th>
<th>Mailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.1 Copy of Minn. R. 7020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.2 'Applying Manure in Sensitive Areas’ booklet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.3 Transferred manure Record-keeping pad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.4 Record-keeping form for greater than 300 AU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.5 Field Records Booklet (MES)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.6 Manure Application Rate Guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.7 Carcass Disposal Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.8 Catastrophic Loss Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.9 LMSA Maintenance Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.10 LMSA Closure Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.11 Silage Management Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.12 Well setback MDH Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.13 ISTS/SSTS Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.14 Burn Barrel Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.15 Solid/Hazardous Waste Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.16 Truck Wash Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.17 Stormwater Control Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.18 Sharps Disposal Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.19 Water Appropriation Permit Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.20 “Pasture vs Feedlot”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.21 Winter Grazing Factsheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.22 Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Exhibit 3
This updated report was developed by Dan Shaw (Senior Ecologist/Vegetation Specialist) and Suzanne Rhees (Conservation Projects Coordinator)

Previous publishing dates/updates:

   January 2013
   December 2016

BWSR is reducing printing and mailing costs by using the Internet to distribute reports and information to wider audiences. This report is available on the BWSR website (Landscape Resiliency and Climate Change) and available in alternative formats upon request.
# Table of Contents

- Executive Summary ........................................................................................................................................ 1
  - A note on terminology .......................................................................................................................... 3
- Why does climate change matter to BWSR? .................................................................................................3
  - Soil and Water Conservation Grants ........................................................................................................ 4
  - Conservation Easements (Reinvest in Minnesota Reserve) .......................................................................4
  - Wetland Protection (administration of the Minnesota Wetland Conservation Act) .............................. 4
- How do soil and water conservation programs mitigate the effects of climate change? ............................. 5
- What are potential long-term trends and impacts from climate change? .................................................... 6
  - Minnesota’s climate background ............................................................................................................. 6
  - Climate observations and trends in Minnesota: What has changed and what has not? ......................... 6
  - Increased precipitation ........................................................................................................................... 7
  - Heavy rainfall and unprecedented extremes .......................................................................................... 8
  - Projected continued enhancement of extreme precipitation .................................................................. 9
  - Impacts of climate change and extreme weather events in Minnesota ............................................... 11
- Observed threats and projected impacts to Minnesota’s natural resources and BWSR programs ............ 13
  - Soil and Water Conservation Grants ...................................................................................................... 13
  - Conservation Easements (Reinvest in Minnesota Reserve) .................................................................. 13
  - Wetland Protection (administration of the Minnesota Wetland Conservation Act) ............................ 14
- How do BWSR’s current programs help reduce greenhouse gas emissions and mitigate climate change? .................................................................................................................................. 15
  - Soil and Water Conservation Grants for conservation practices ........................................................... 15
  - Conservation Easements (Reinvest in Minnesota Reserve) .................................................................. 16
  - Wetland Protection (administration of the Minnesota Wetland Conservation Act) ............................ 16
  - Multiple benefits of conservation programs ......................................................................................... 17
- How do BWSR’s current programs help with adaptation to climate change? ............................................ 18
  - Local water management planning ....................................................................................................... 18
  - Wetland protection and restoration ....................................................................................................... 18
  - Agricultural conservation practices ....................................................................................................... 18
  - Multipurpose drainage management .................................................................................................... 18
  - Increasing landscape resiliency .............................................................................................................. 19
  - Adaptive landscape management .......................................................................................................... 19
  - Northern forest management .................................................................................................................. 20
List of Figures

Figure 1. Observed trends among common weather hazards ................................................................. 7
Figure 2. Statewide annual precipitation by decade, 1895-2017 ................................................................. 8
Figure 3. Changes in heavy precipitation frequency and intensity, 1916-2015 ........................................... 9
Figure 4. Snapshot of projected and expected trends among common weather hazards ....................... 10
Figure 5. Projected changes in number of heavy precipitation days by mid-century ................................. 11

List of Tables

Table 1. Wetland classifications and acreage ............................................................................................. 31
Table 2. Comparison of conservation practices between eLINK, RIM, MPCA and COMET .................... 33
Table 3. Summary of conservation practices tracked in eLINK and GHG emissions ............................... 35
Table 4. Summary of RIM easement conservation practices and GHG emissions ................................. 36
Executive Summary

The mission of the Minnesota Board of Water and Soil Resources is to improve and protect Minnesota’s water and soil resources by working in partnership with local organizations and private landowners. Climate change affects BWSR’s ability to fulfill its mission. The extreme weather patterns and disrupted natural cycles associated with climate change reduce program effectiveness and threaten the environmental and economic benefits that Minnesota’s landscapes provide. However, BWSR’s programs, while focused on improving water quality and soil health, also work to mitigate the impacts of climate change and to increase landscape and habitat resiliency.

This report identifies the benefits provided by agricultural conservation practices, retirement of marginal agricultural lands, and wetland conservation and restoration. These benefits fall into two broad categories: 1) mitigation; and 2) adaptation (see “A note on terminology” below).

Mitigation: Soil and water conservation programs mitigate the effects of climate change by storing carbon in the soil and by reducing the amount of fertilizers, fuel, and other inputs needed for agriculture. This report estimates the reductions in greenhouse gas emissions that result from conservation practices such as nutrient management, cover crops, reduced tillage, filter strips and riparian buffers. Estimates are based on formulas developed in a comprehensive study by the Minnesota Pollution Control Agency (MPCA) of over 20 such conservation practices, matching these to practices that BWSR systematically tracks for cost-share, grants, and easement programs. Results of this analysis include the following:

- Soil and water conservation grants have resulted in conservation practices across more than 500,000 acres and are estimated to reduce greenhouse gas (GHG) emissions by about 300,000 metric tons per year, measured as CO₂ equivalents.
- Conservation easement through the Reinvest in Minnesota Reserve (RIM) program have restored almost 290,000 acres of land, much of it marginal farmland, to grassland, wetlands, or forest, since the program began in 1987. Conservation practices have been tracked on about 180,000 acres and are estimated to have reduced GHG emission by about 232,400 metric tons per year.
- Minnesota’s wetland banking program has created over 380 wetland banks, covering 42,000 acres, including both existing and restored wetlands. Wetland restoration can enhance carbon sequestration but also result in methane emission. By weighing these impacts, accounting for wetland type (permanently or seasonally inundated), we estimate that the 11,800 acres in restored wetland banks result in GHG emission reductions of about 13,500 metric tons per year. In addition, preservation of existing high-quality wetlands can avert the increased emissions that would result from conversion to agriculture or urban development.

Adaptation: Landscape resiliency can be defined as the ability of natural and working landscapes to adapt to a changing climate, and specifically to extreme weather events and other stressors. Programs that promote integrated water resources management, multipurpose drainage management, and adaptive landscape management all increase landscape resiliency. Moreover, the same soil and water conservation programs that contribute to mitigation also increase resiliency by reducing runoff and nutrient loss, reducing erosion and flooding, and maintaining agricultural productivity.

The combined total GHG reductions of BWSR’s programs are approximately 550,100 CO₂-equivalent metric tons, or 606,400 U.S. CO₂ e-tons. The estimated emissions of the agriculture and forestry sector are estimated by the MPCA at about 34.5 million CO₂ e-tons, of which almost 27 million e-tons are
emitted from cropland. Using the estimates outlined above, the combined impacts of BWSR’s conservation and easement programs on the emissions of the agricultural-forestry-land use sector are clearly quite small – **1.7 percent of total emissions, or 2.2 percent of cropland emissions**. However, this assessment does not include the impacts of related state and federal programs and of voluntary practices. By continuing to assess and quantify the benefits of these programs, we can gain a clearer picture of the contributions of the agricultural sector to climate change mitigation and the potential for increasing those efforts.

**Action steps to guide future direction**

BWSR will continue emphasizing the role of its conservation programs in mitigating and adapting to the effects of climate change. In addition, the following are priority initiatives to increase landscape resiliency:

- **Emphasize and seek additional incentives for the implementation of climate mitigation and adaptation practices** in conjunction with existing soil and water conservation programs. Recognizing and incentivizing the multiple environmental and economic benefits provided by these programs can encourage their successful adoption.

- Guide the implementation of plan content requirements for **One Watershed One Plan** with a focus on climate mitigation and adaptation.

- Increase the focus on restoration of **high-quality pollinator habitat** to support declining pollinator populations, through BWSR’s new Lawns to Legumes program, the Habitat Friendly Solar Program, and related initiatives.

- Emphasize and promote practices that provide **year-round cover on agricultural fields**, including perennial and winter annual cover crops, conservation crop rotations, and reduced tillage practices.

- Continue updating information in BWSR’s **Native Vegetation Establishment and Enhancement Guidelines** about **plant selection, establishment and management considerations** to maximize climate adaptation and mitigation.
A note on terminology

This report uses several terms commonly used in climate science that are similar but not interchangeable:

- **Carbon sequestration**: Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change. Soil that sequesters carbon is referred to as a “carbon sink.”

- **Greenhouse gas (GHG) emission reduction**: Reduction of the quantity of greenhouse gases (carbon dioxide, nitrous oxide, and methane) being emitted into the atmosphere. GHG emission reduction is achieved both through carbon sequestration (offsetting emissions) and through reduction in emission-producing activities such as fertilizer use and fossil fuel consumption associated with agricultural production. GHG reduction is expressed in this report in terms of metric tons of carbon dioxide equivalents (see Appendix C for details).

- **Adaptation and Mitigation**: Climate adaptation is defined as developing and implementing strategies, initiatives, and measures to help human and natural systems prepare for and address climate change impacts. Climate change mitigation, the focus of this report, emphasizes reducing greenhouse gas emissions with the goal of limiting the magnitude or progression of climate change (ICAT 2017)

Why does climate change matter to BWSR?

The mission of the Minnesota Board of Water and Soil Resources (BWSR) is to improve and protect Minnesota's water and soil resources by working in partnership with local organizations and private landowners. The extreme weather patterns and disrupted natural cycles associated with climate change may decrease the ability of Minnesota landscapes to sustainably provide important environmental and economic benefits. Therefore, BWSR recognizes the existing and potential effects of climate change in our conservation programs and practices. Our programs are focused on private lands, which make up approximately 75% of Minnesota's land area, through wetland protection, conservation easements (retirement of marginal agricultural lands), and providing soil and water conservation grants. These programs play an important role in mitigating the impacts of climate change by reducing emissions of...
greenhouse gases, diversifying the agricultural economy, and increasing landscape and habitat resiliency.

The following primary BWSR programs play significant roles in climate mitigation and adaptation.

**Soil and Water Conservation Grants**

BWSR’s soil and water conservation grant programs provide funding to local government units for the implementation of targeted conservation projects and practices in rural and urban landscapes. A wide variety of conservation practices sequester carbon and decrease nitrous oxide emissions from fertilizer, including tree planting, grass planting, prairie and wetland restoration, windbreaks/shelterbelts, grassed waterways, contour buffer strips, filter strips, riparian buffers, critical area planting, and cover crops. These practices also increase landscape resiliency and often help protect productive agricultural fields from extreme weather events. Grants also fund nutrient management plans that decrease nitrous oxide and methane emissions.

**Conservation Easements (Reinvest in Minnesota Reserve)**

BWSR’s RIM program is focused on the acquisition and enhancement of critical habitat in the predominantly agricultural areas of the state by converting marginal croplands to permanent native vegetative cover, thereby storing increasing amounts of carbon in soil, plant roots, and other biomass. The retirement of marginal agricultural lands also decreases emissions from machinery and nitrous oxide emissions from fertilizers. Restoration activities, such as restoring wetlands, establishing riparian buffers, protecting sensitive groundwater areas, planting critical winter cover for wildlife, preserving habitat for rare plant and animal species, increasing pollinator habitat, and preserving spawning and reproduction areas for fish, also increase resiliency to climate change.

**Wetland Protection (administration of the Minnesota Wetland Conservation Act)**

The primary goal of the Minnesota Wetland Conservation Act is to achieve no net loss in the quantity, quality, and biological diversity of Minnesota's 10.6 million acres of existing wetlands. This is accomplished through avoiding direct or indirect impacts from activities that destroy or diminish wetlands and replacing wetlands where avoidance of such activity is not feasible and prudent. Minnesota's wetland banking program includes both private and state-sponsored wetland banks which have “credits” that are used to offset (mitigate) authorized wetland impacts.

Wetlands effectively sequester large amounts of carbon but are also sources of methane, particularly if they are continuously inundated. However, the majority of land in the wetland banking program consists of seasonally inundated wetland or adjacent upland, creating a net reduction in emissions (see Appendix C).
How do soil and water conservation programs mitigate the effects of climate change?

Soils contain vast quantities of carbon -- more than double the amount in the atmosphere. Carbon levels in soil vary depending on climate, soil parent material, vegetation type, landscape position, and human activities. Healthy soil holds the carbon that plants absorb from the air and incorporate into their root systems. Carbon is stored in the soil as roots, root exudates, and decomposed plant matter. Repeated plowing and chemical fertilizer use can reduce soil carbon, as well as soil fertility and water-holding capacity. Wetland drainage also leads to reduced soil carbon.

The same practices that are known to improve soil health and water quality can also increase carbon sequestration. These include conservation practices that keep soil covered year-round, such as cover crops, reduced tillage, or perennial vegetation, thereby reinvigorating soil biology and increasing carbon sequestration. Conservation practices can also reduce the amount of fertilizers, fuel, and other inputs needed for agriculture, thus reducing greenhouse gas emissions while reducing costs.

*Grass waterway eroded from extreme precipitation*
What are potential long-term trends and impacts from climate change?

The following section draws from the 2017 Interagency Climate Adaptation Team (ICAT) report “Adapting to Climate Change in Minnesota”.

Minnesota’s climate background

Minnesota’s position near the center of North America, halfway between the Equator and the North Pole, brings with it an exceptional variety of weather. In a single year, most Minnesotans will experience blinding snow, bitter wind chills, howling winds, pounding thunderstorms, torrential rains, and heat waves, as well as dozens of bright and sunny days. Given the high variability that we expect from Minnesota’s climate, it can be difficult to discern where, when, and how climatic conditions have changed in our state.

The conditions, however, have changed rapidly, and an overwhelming base of scientific evidence projects that Minnesota’s climate will see additional significant changes through the end of the 21st century. Over the last several decades, the state has experienced substantial warming during winter and at night, with increased precipitation throughout the year, often from larger and more frequent heavy rainfall events. These changes alone have damaged buildings and infrastructure, limited recreational opportunities, altered our growing seasons, impacted natural resources, and affected the conditions of lakes, rivers, wetlands, and our groundwater aquifers that provide water for drinking and irrigation. The years and decades ahead in Minnesota will bring even warmer winters and nights, and even larger rainfalls, in addition to other climatic changes not yet experienced in the state.

Climate observations and trends in Minnesota: What has changed and what has not?

In 2014, the U.S. Global Change Research Program completed its third National Climate Assessment. This comprehensive scientific review of the state of climate change science demonstrated that the U.S. is already seeing increasing temperatures, larger rainfalls with increased flash-flooding, heavier snowstorms, more severe heatwaves, and worsening drought conditions in some areas. Within particular regions of the U.S., some of these observed changes are more intense, some are less intense, and some are negligible or not yet occurring.

Both the science summarized in the National Climate Assessment and high-quality climatic data show that in Minnesota and the Midwest, rising temperatures have been driven by a dramatic warming of winter and also nights, with both the frequency and the severity of extreme cold conditions declining rapidly. Annual precipitation increases have been punctuated by more frequent and more intense heavy rainfall events. The heaviest snowstorms have also become larger, even as winter has warmed (see Figure 1).

Changes in temperature also affect lake temperatures, particularly on the Great Lakes. According to Minnesota Sea Grant, since 1980 surface water temperatures on Lake Superior in summer has warmed twice as much as the air above it. Over the winter, the area of the lake covered by ice is decreasing by about .5% per year. Ice cover in Lake Superior has decreased from 23% to 12% over the last century.

Several other changes noted elsewhere in the U.S. and the world have not yet been observed in Minnesota. For instance, summer high temperatures have not increased in several decades, and heat waves have not worsened when compared to historical patterns. Droughts in Minnesota also have shown no long-term increase in magnitude, duration, or geographic coverage. Tornadoes, large hail, and damaging thunderstorm winds are difficult to compare historically but show a complex tendency toward
more “outbreaks” consisting of multiple events at a time, though no increases in overall numbers or severity.

**Figure 1**

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Observed Trend</th>
<th>Confidence Change is Occurring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme cold</td>
<td>Rapid decline in severity &amp; frequency</td>
<td>Highest</td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Becoming larger and more frequent</td>
<td>High</td>
</tr>
<tr>
<td>Heavy snowfall</td>
<td>Large events more frequent</td>
<td></td>
</tr>
<tr>
<td>Severe thunderstorms &amp; tornadoes</td>
<td>Overall numbers not changing but tendency toward more “outbreaks”</td>
<td>Moderately Low</td>
</tr>
<tr>
<td>Heat waves</td>
<td>No recent increases or worsening</td>
<td>Lowest</td>
</tr>
<tr>
<td>Drought</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Confidence Scale**

![Confidence Scale](image)

Snapshot of observed trends among common weather hazards in Minnesota, and confidence that those hazards are changing in response to climate change. Graphic based on information from 2014 National Climate Assessment and data analyzed by the Minnesota DNR State Climatology Office.

**Increased precipitation**

Higher temperatures globally have evaporated more surface and ocean water into the atmosphere, which in turn has provided more potential moisture for precipitating weather systems. This has resulted in more precipitation for Minnesota, which now finds itself in its wettest period in over 125 years of record. Since 1990, Minnesota has been 10% wetter on average than period 1895 to 1989 (see Figure 2).

This precipitation increase is found in all seasons, but spring and summer are becoming wetter at faster rates than fall and winter. Whereas temperature increases have been greatest in the northern parts of the state, precipitation increases have been well distributed geographically, and have somewhat favored southern Minnesota, which has better access to moisture from the Gulf of Mexico, and is more frequently near the “low-level jet” airflow (a relatively fast-moving zone of winds in the lower atmosphere) that influences precipitation production.
Heavy rainfall and unprecedented extremes

Heavy rainfall events in Minnesota are already becoming larger and more common and have been contributing to an increasing share of annual precipitation in Minnesota. The state has 40 daily weather observing sites whose records stretch back more than 100 years. These long-term stations have shown a 20% increase in the annual number of 1-inch daily rainfalls, a 65% increase in the number of 3-inch rainfalls, and a 13% increase in the size of the heaviest rainfall of the year. Additionally, the single heaviest rainfall amount recorded per 10-year interval at those 40 sites has roughly doubled (from just over five inches to just over 10 inches) during that same period (see Figure 3).

New National Oceanic and Atmospheric Administration rainfall frequency data (NOAA Atlas 14) has shown that the amount of rainfall for given storm frequencies (5-yr., 10-yr. etc.) has risen substantially in many areas of the U.S. in recent decades. This rainfall increase could generate approximately one third more runoff volume than estimated using the old data. The previous 100-year 24-hour event that generated approximately six inches of rainfall will now have a probability of occurring two to three times in 100 years (rather than once per 100 years).

Research specific to the Upper Midwest indicates that the physical mechanisms supporting heavy rainfall events in Minnesota are likely to have begun intensifying in response to climate change. This research also shows that these major events may be taking place earlier during the growing season than the
historical average. Thus, in addition to increases in the frequency and intensity of heavy rainfall, its seasonal timing may be expanding across the calendar.

Figure 3

Changes in the frequency of one-inch rainfalls relative to the 1916-1960 average (vertical bars), from 40 long-term stations in Minnesota. Also shown are the 10-year average (lower dotted line, right axis) and 10-year maximum values (upper solid line, right axis) of the heaviest single rainfall amount recorded each year at any of the 40 stations. Note that the 10-year maximum value has doubled from just over five inches at the beginning of the record, to just over 10 inches at the end of the record. Courtesy of Minnesota State Climatology Office.

In addition to increases in the frequency and magnitude of heavy rain, Minnesota has also seen a dramatic increase in large-coverage flash floods events in recent years. Since the year 2000, the state has had eight catastrophic “mega-rain events” — when at least six inches of rain falls on an area greater than 1,000 square miles. The years 2002 and 2016 both had two of these damaging rainstorms. By contrast, the 30 years from 1970 through 1999 saw only four. Incidentally, the mega-rains since 2000 have included the largest, earliest, and latest on record, suggesting that we are seeing not just an intensification, but also a lengthening of our heavy and extreme rainfall season.

Projected continued enhancement of extreme precipitation

In the years and decades ahead, winter warming and increased extreme rainfall will continue to be Minnesota’s two leading symptoms of climate change (see Figure 4).
Figure 4

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Projections through century</th>
<th>Confidence in projected changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme cold</td>
<td>Continued loss of cold extremes and dramatic warming of coldest conditions</td>
<td>Highest</td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Continued increase in frequency and magnitude; unprecedented flash-floods</td>
<td></td>
</tr>
<tr>
<td>Heat waves</td>
<td>More hot days with increases in severity, coverage, and duration of heat waves</td>
<td>High</td>
</tr>
<tr>
<td>Drought</td>
<td>More days between precipitation events, leading to increased drought severity, coverage, and duration</td>
<td>Moderately High</td>
</tr>
<tr>
<td>Heavy snowfall</td>
<td>Large events less frequent as winter warms, but occasional very large snowfalls</td>
<td>Moderately low</td>
</tr>
<tr>
<td>Severe thunderstorms &amp; tornadoes</td>
<td>More “super events” possible, even if frequency decreases</td>
<td></td>
</tr>
</tbody>
</table>

Confidence Scale

Snapshot of projected and expected trends among common weather hazards in Minnesota, and confidence that those hazards will change (further) through the year 2099 in response to climate change. Graphic based on information from 2014 National Climate Assessment, and data analyzed by the Minnesota DNR State Climatology Office.

Greenhouse gas concentrations will continue rising through the century, and the air’s ability to trap heat from the earth’s surface will increase accordingly. As a result, winters, and cold conditions in particular, will continue warming well beyond historical bounds. Continued warming of the atmosphere will evaporate even more water into the air, further limiting the amount of cooling Minnesota will be able to achieve at night and during the winter. This increased water vapor will also enhance precipitating weather systems, continuing the trend toward more – and larger – heavy rainfall events (see Figure 5). Minnesota can expect unprecedented rainfall events during the remainder of the 21st century.
Figure 5

Projected changes by mid-century in number of days annually with heavy rainfall, defined as the upper 2% of daily precipitation for the 1971-2000 climate period. Left image is the “ensemble” or model average for a lower emissions scenario. The right image is the same, but for a higher emissions scenario. Images derived from output used for the 2014 National Climate Assessment, courtesy of GLISA (Great Lakes Integrated Science + Assessments).

Impacts of climate change and extreme weather events in Minnesota

The observed measurements and future projections described by the National Climate Assessment and the Minnesota State Climatology Office provide insight into climate trends that are impacting Minnesota now as well as those anticipated in the future. Complicating the varied impacts of climate change is that these changes also interact with and reinforce each other. For example, drought and heat may both contribute to wildfires, which may in turn lead to changes in plant and animal populations as well as other ecological shifts. Extreme precipitation may increase flooding, along with the potential for runoff or combined-sewer overflow and contamination of recreational and drinking water sources, which may already be in short supply due to drought. In addition, climate change will amplify the effects of existing public health and environmental challenges, such as impaired air quality, loss of wildlife habitat, invasive species, and limitations to clean water supplies.

As informed by climate data and trends, Minnesota state agencies have identified significant current and future climate change-related impacts. These impacts, including variable and considerable changes in temperature and precipitation, are expected to have substantial effects on public health, community infrastructure, ecosystem health, environmental quality, and natural resource-based economies.

Both observed climate data as well as future projections indicate increases in very heavy precipitation in Minnesota. Heavy precipitation events, storms, and flooding have significant impacts on Minnesota’s communities and ecosystems. These include effects on water and soil resources, agriculture, drainage infrastructure, human health, stormwater management, wastewater treatment, solid waste management, and emergency response.

Extreme weather events have the potential to impact the quality of water and soil resources throughout Minnesota.
More frequent, heavier, or longer-duration rainfall events will increase soil erosion and runoff, thereby increasing deposition of sediment and contaminants in water bodies.

More frequent extreme weather events will impact Minnesota agriculture, resulting in increased runoff of fertilizers, pesticides, and sediment, particularly from agricultural fields that do not have best management practices in place such as buffers, grassed waterways, and crop residue left on the fields. Field flooding can result. There are also costs to the state for disaster assistance, (e.g., the DNR’s Flood Damage Reduction grant program) which will likely increase as a result of climate change.

Damage to feed crops from extreme weather also affects livestock. Greater precipitation increases challenges for applying manure in an environmentally safe manner to fields. Flooding can also cause overflow of manure storage basins which have inadequate storage capacity, leading to contamination of nearby water bodies and death of aquatic organisms.

Increased extreme weather events put additional pressure on the state’s drainage infrastructure. There is a potential for more erosion within older drainage systems that do not have adequate outlets or erosion controls in place.

Flash flooding from extreme precipitation can damage the built environment, affecting commercial and residential buildings, roads, parks, and stormwater infrastructure. Water-saturated soils can destabilize bluffs, trees, and utility poles.

Changes in amount, frequency, and intensity of precipitation impact stormwater management, potentially exceeding the design capacity of stormwater treatment structures or impacting future structure design. Extreme weather also adds to challenges in monitoring water quality.

Populations particularly vulnerable to flooding and extreme weather events include the elderly and those without the ability to evacuate when necessary. Farm families and rural communities are also particularly vulnerable to the financial and emotional stresses that result from damages to land and equipment. Community infrastructure (cohesion, relationships, ability to respond as a whole) should be considered just as much as environmental and built infrastructure.
Observed threats and projected impacts to Minnesota’s natural resources and BWSR programs

Soil and Water Conservation Grants

- There have been increased requests for assistance to repair and replace structures installed to manage water and improve habitat.
- Flooding has caused significant damage to private lands and conservation practice infrastructure in Minnesota.
- Conservation practices such as grassed waterways, filter strips, vegetated buffers, etc. have helped farmers retain topsoil and agricultural productivity during extreme weather events.
- Emissions of the greenhouse gas nitrous oxide (N₂O) from agricultural activities, primarily fertilizer application and other agricultural practices that increase nitrogen availability in the soil, increased by 12% between 2005 and 2016, (U.S. EPA 2018).
- Water quality in streams, rivers, wetlands, and lakes will likely degrade and/or be more challenging to restore, due to runoff from heavy rainfall, particularly in agricultural lands that are prone to erosion.
- Soil productivity and crop yields may decrease due to increased soil erosion and loss of organic content.

Conservation Easements (Reinvest in Minnesota Reserve)

- State easements with aquatic systems may degrade due to changing hydrology conditions.
- Combinations of extreme storms, flooding, harmful insects, and invasive species will further degrade natural wetlands, prairies and forests.
- With climate change, the National Wildlife Federation concludes that there will be diminished numbers of migratory waterfowl, pheasants, moose, walleyes, northern pike and brook trout, and fish kills will likely become more prevalent (National Wildlife Federation 2013).
- Upland and wetland northern forests could significantly change in structure from the spread of woody invasive species such as common and glossy buckthorn and invasive honeysuckles, invasive insects, and changes in dominant tree species. Some areas may transition from northern coniferous forest to savanna (Frelich & Reich 2010).
Wetland Protection (administration of the Minnesota Wetland Conservation Act)

- Wetland health has been impacted due to more frequent extreme water fluctuations and prolonged inundation of vegetation that favors invasive species and disrupts the life-cycle of aquatic organisms.
- Northern black ash swamps covering about one million acres in Minnesota may significantly change in structure due to emerald ash borer and the loss of black ash trees.
- Extreme precipitation may be overwhelming stormwater systems around high quality wetlands, changing their hydrology. For example, invasive cattail species are moving into intact sedge meadows.

*Climate change may lead to the transition from coniferous trees to deciduous trees in northern forests.*
How do BWSR’s current programs help reduce greenhouse gas emissions and mitigate climate change?

Conservation practices designed to improve water quality, reduce soil erosion, reduce flood damage and enhance habitat also have significant climate benefits by fostering carbon sequestration and decreasing greenhouse gas emissions. BWSR’s grants programs support agricultural conservation practices, its easement programs support retirement of marginal agricultural land, and its wetlands programs support conservation and restoration of wetlands. The following programs are significant contributors to greenhouse gas (GHG) emissions reduction.

GHG reduction estimates represent the average impact of a conservation practice compared to baseline conditions, generally defined as standard cropland management practices. However, we recognize that there is a high degree of uncertainty in estimates of GHG emissions due to variation in local climate, land use, and the duration and effectiveness of conservation practices. See Appendix A for a description of how the estimates used in this report were developed.

Soil and Water Conservation Grants for conservation practices

BWSR’s grant and cost-share programs fund a broad range of conservation practices. Conservation practices sequester carbon and decrease nitrous oxide emissions from fertilizer by promoting cover crops, nutrient management, conservation tillage, conservation cover, and other soil health initiatives.

The primary programs supporting such practices are:

- **Clean Water Fund grants: Projects and Practices:** This grant makes an investment in on-the-ground projects and practices that will protect or restore water quality in lakes, rivers or streams, or will protect groundwater or drinking water. Examples include stormwater practices, agricultural conservation practices, livestock waste management, lakeshore and stream bank stabilization, stream restoration, and SSTS upgrades.

- **Erosion Control and Water Management (State Cost Share Program):** Funds are granted to SWCDs to assist with structural, vegetative, or nonstructural land management practices to correct existing problems. Vegetative practices include establishment of permanent vegetation through practices such as critical area planting and filter strips. Nonstructural land management practices include cover crops, residue management, and nutrient management practices that are incorporated into a farm management plan and have erosion control or water quality improvement benefits.

Conservation practices are tracked in BWSR’s eLINK conservation tracking system. The most widely implemented practices include conversion of cropland to grassland, installation of riparian buffers, field borders and filter strips, reduced tillage, and improved fertilizer management. To date, conservation practices have been implemented across more than 500,000 acres and are estimated to reduce greenhouse gas emissions by about 300,000 metric tons per year, measured as CO₂ equivalents.
Conservation Easements (Reinvest in Minnesota Reserve)

Since the program began in 1987, almost 290,000 acres of land, much of it marginal farmland, have been restored to grasslands, wetlands, or forestland (or CRP conversion to agriculture has been prevented) through easement programs. Reduction of nitrous oxide and carbon dioxide entering the atmosphere from fertilization, fertilizer production, and consumption of fossil fuels for farming marginal agricultural fields also contribute to total emission reductions.

While not all easements incorporate conservation practices, and the database of conservation practices on existing easements is incomplete, practices can be tracked on 180,281 acres and are estimated to have reduced GHG emission reductions by about 232,437 metric tons per year (measured as CO₂ equivalents). Appendix C describes the process used in developing these estimates.

BWSR, working with local partners, continues to secure easements on approximately 5,000 - 8,000 acres per year. Current activity is focused on securing easements through the Conservation Reserve Enhancement Program (CREP), a federal-state partnership targeting environmentally sensitive land in 54 counties in southern and western Minnesota. This program will enroll up to 60,000 acres of marginal cropland often associated with buffer areas and drained or altered wetlands in the Conservation Reserve Program, followed by a perpetual conservation easement.

Re-enrollment of lands in CRP into conservation programs prevents loss of landscapes where carbon sequestration has been occurring for many years. Easement programs also promote GHG reduction through the following activities:

- Promoting restoration of high functioning and sustainable conservation prairies and wetlands in key corridors and complexes informed by the Minnesota Prairie Conservation Plan and other key plans.
- Preserving natural shoreline forest lands around shallow wild rice production lakes through permanent riparian easements in northern Minnesota forest regions.
- Converting floodplain lands in frequently flooded areas from crop production to permanent native floodplain forest cover.

Wetland Protection (administration of the Minnesota Wetland Conservation Act)

The Minnesota Wetland Conservation Act has been in place since 1991 and has significantly reduced the loss of wetland acres. Wetlands contain significant amounts of carbon that can be released to the atmosphere with wetland losses. Drainage of wetlands and conversion to cropland can release significant amounts of long-stored carbon through organic matter decomposition. However, wetlands
also emit methane, making it difficult to assess their role relative to GHG emissions. Methane emissions are highest in wetlands that are permanently or frequently inundated, while less frequently inundated wetland types such as wet meadows appear to sequester more GHGs than they emit.

Minnesota's wetland banking program includes both private and state-sponsored wetland banks which have “credits” that are used to offset (mitigate) authorized wetland impacts. To date, over 380 wetland banks have been established, covering 42,000 acres. These sites include both existing wetlands that are preserved and previously drained wetlands that have been restored. BWSR wetlands staff developed a GIS-based process for assessing the acreage and estimating the net impacts on GHG reduction and emissions, using the National Wetlands Inventory (NWI). The process is described in Appendix C. Results of the analysis, accounting for methane emission as well as carbon sequestration, show that the 11,800 acres in restored wetland banks result in GHG emission reductions of about 13,500 metric tons per year.

Other BWSR initiatives also contribute to wetland protection and enhancement:

- Restoration of high quality, diverse, and resilient wetlands to replace wetland losses can mitigate the increased emissions that result from conversion of wetlands to agriculture or urban development. Evidence suggests more carbon is sequestered by a richer mix of native species (such mixed forests) and that such communities are more stable over time. BWSR has developed technical resources to help practitioners restore diverse and resilient landscapes, such as the Minnesota Wetland Restoration Guide and Native Vegetation Establishment and Enhancement Guidelines.

- Restoration of forested wetlands (particularly white cedar and tamarack swamps) through planting and hydrology restoration in northern Minnesota maintain and enhance natural communities with high potential for carbon sequestration.

Multiple benefits of conservation programs

These conservation programs have many benefits to Minnesotans. In addition to mitigating climate change, programs provide important recreational opportunities such as hunting, fishing, bird watching, boating and swimming. Conservation projects also provide jobs in areas such as restoration planning and design, native seed production, construction, native seeding, vegetation management and regulatory and conservation program administration.

Grant/Information Links:

- Wetland Banking: [https://bwsr.state.mn.us/wetland-bank-credits-and-fees](https://bwsr.state.mn.us/wetland-bank-credits-and-fees)
- Conservation Easements (Reinvest in Minnesota): [https://bwsr.state.mn.us/reinvest-minnesota-overview](https://bwsr.state.mn.us/reinvest-minnesota-overview)
- Soil and Water Conservation Grants: [https://bwsr.state.mn.us/grants](https://bwsr.state.mn.us/grants)
- Disaster Recovery Assistance: [http://www.bwsr.state.mn.us/grants/DRAP.html](http://www.bwsr.state.mn.us/grants/DRAP.html)
How do BWSR’s current programs help with adaptation to climate change?

Local water management planning
BWSR supports and promotes integrated water resources management that uses a watershed approach to solve soil and water resource issues and considers the potential for more extreme weather events and their implications for the water and land resources. This includes the use of design standards for stormwater and conservation projects that address larger precipitation events. A new white paper on “Building Resiliency to Extreme Precipitation in Minnesota” has been developed by the Interagency Climate Adaptation Team.

Wetland protection and restoration
Wetland and upland buffer restoration and protection conducted through the Reinvest in Minnesota (RIM) Reserve Program and federal partnerships, Wetlands Conservation Act implementation, and Clean Water Fund projects, help to restore and maintain water retention, runoff reduction, wildlife habitat, and water quality in Minnesota. This, in turn, enhances adaptation to climate change. The ecosystem services provided by wetlands also protect against intense storm events and periods of drought. Associated upland buffers protect wetland ecosystems and provide landscape connectivity and other functions that promote landscape resiliency. Restoration projects also increase infiltration rates and store water on the landscape.

Agricultural conservation practices
BWSR promotes a variety of conservation practices in agricultural areas that promote soil health and the ability of soils to capture and store rainfall, store carbon and decrease heat absorption from tilled ground. Examples of conservation practices that minimize impacts from larger storms include cover crops, field terraces, no-till farming, buffer strips, retention areas, and constructed wetlands.

Multipurpose drainage management
BWSR promotes and supports implementation of traditional and new conservation practices for multiple purposes, including conservation drainage and drainage water management practices. These practices help reduce runoff and nutrient loss, avoid runoff concentration, protect areas where runoff concentrates, reduce peak flows to reduce erosion, maintain agricultural productivity, improve water quality and habitat,
and reduce flooding. Multipurpose drainage practices help make working lands as well as artificial and natural drainage systems more resilient to high intensity rainfall.

**Increasing landscape resiliency**

A variety of restoration and land management strategies are promoted to increase the resiliency of conservation projects to extreme storms and other landscape stressors. Some basic principles for increased resiliency include:

1) Restoring healthy natural systems where they can have the greatest landscape benefits.
2) Decreasing fragmentation of intact plant communities and creating habitat corridors.
3) Restoring plant communities and vegetation that fit current and expected project site conditions.
4) Promoting individual species for projects that can handle expected conditions and provide ecological functions.
5) Promoting species diversity to increase resiliency and promote habitat for a wide range of wildlife species including pollinators.
6) Using deep rooted plants to promote infiltration and groundwater recharge.
7) Restoring high quality habitat for pollinators and other beneficial insects.
8) Managing invasive species across geographic and ownership boundaries to minimize their competitive advantage.
9) Adapting project design, implementation and management approaches based on project experience.
10) Taking a long-term view to the management of natural resources.

See the web-based [Landscape Resiliency Toolbox](#) for further details. BWSR’s [Native Vegetation Establishment and Enhancement Guidelines](#) includes specific guidance on seed sourcing in relation to climate change.

**Adaptive landscape management**

Disturbances associated with climate change can give invasive species a competitive advantage over native species. BWSR’s Cooperative Weed Management Area (CWMA) program is focused on forming local organizations that share invasive species management expertise and resources across ownership boundaries. CWMAs are also focusing on controlling emerging weed threats that benefit from warming climate such as woody invasive species that are invading northern forests. By promoting adaptive landscape management practices such as forest management and prescribed burning, BWSR is also working to increase the landscape’s ability to sequester carbon and withstand large rain events.
Northern forest management

BWSR is working through partnerships to protect the integrity of northern forests. Recent efforts include the protection of wild rice lakes and surrounding forests through the RIM Program, an effort to protect and restore white cedar wetlands that are becoming less common, and support of CWMAs in northern Minnesota to address emerging weed threats. BWSR also promotes managing forests for high diversity to adapt to climate variation, large storms, diseases, and pathogens.

Disaster response

Flooding has caused significant damage to private lands and conservation practice infrastructure in Minnesota. Since 2000, BWSR has provided $53 million for flooding in southeast, northeast and northwest Minnesota through the Disaster Recovery Assistance Program, with a focus on rebuilding infrastructure that will be resilient to future storms.

BWSR action steps to guide future direction

Priority initiatives in 2019

1. **Emphasize and seek additional incentives for the implementation of climate mitigation and adaptation practices** in conjunction with existing soil and water conservation programs. Recognizing and incentivizing the multiple environmental and economic benefits provided by these programs can encourage their successful adoption.

2. Further guide the implementation of plan content requirements for **One Watershed, One Plan** with a focus on climate mitigation and adaptation.
   - BWSR guidance for plan development includes language that states: “Planning partners are strongly encouraged to consider the potential for more extreme weather events and their implications for the water and land resources of the watershed in the analysis and prioritization of issues. While these events cannot be predicted with certainty as to time and occurrence, the meteorological record shows increased frequency and severity of extreme weather events, which has a direct effect on issues in local water planning”.
   - Continue to work with partners developing plans in new watersheds to incorporate climate adaptation planning for landscape resiliency to more extreme precipitation events. BWSR will develop sample language to be included in plans and will conduct outreach about resiliency strategies summarized in the white paper “**Building Resiliency to Extreme Precipitation in Minnesota**”.

3. Through BWSR’s **Pollinator Initiative**, increase focus on maximizing benefits to pollinators through all BWSR conservation programs. Pollinators play a key role in supporting landscape resiliency by pollinating about 30% of crops and 70% of native plants that in turn provide many landscape functions. As a land cover type, pollinator habitat is largely identical to restored prairie or grassland.
in its carbon sequestration and emission reductions benefits. BWSR’s Pollinator Initiative includes several programs designed to incentivize and guide creation of pollinator habitat.

- Through Lawns to Legumes, a new program established by the Legislature in 2019, BWSR is working with other agencies and organizations to offer landowners incentives and technical assistance to plant residential lawns with native vegetation and pollinator friendly forbs and legumes. Funded through the Environment and Natural Resources Trust Fund (ENRTF), the program is anticipated to result in establishment of pollinator habitat on about 600 acres.

- BWSR’s Habitat Friendly Solar Program promotes the plantings of diverse native vegetation on solar projects. State legislation allows solar developers to claim that they are “Habitat Friendly” if they meet standards defined in BWSR’s Assessment forms. These projects add habitat value as well as increased carbon sequestration on solar installations. It is estimated that about 1,000 acres of solar sites are being developed annually in Minnesota.

- Also recommended by the Legislative-Citizen Commission on Minnesota Resources for funding beginning in 2020 is a Pollinator and Beneficial Insect Strategic Habitat Program that would restore and enhance approximately 1,000 acres of diverse native habitat across 100 projects. Projects could be located on public and private lands, including parks and existing easements, selected to address the habitat needs of a wide diversity of insects, including at-risk species.

4. **Emphasize and promote practices that provide year-round cover on agricultural fields**, including perennial and winter annual cover crops, conservation crop rotations, and reduced tillage practices to promote soil health and the ability of soils to capture and store carbon, reduce runoff and erosion, protect groundwater, and decrease heat absorption from tilled ground. BWSR will emphasize the value of these practices in guidance materials for One Watershed One Plan and other local water planning efforts.

- In the past few years, cover crops have been recognized as a new cost share-eligible practice. BWSR will continue to promote their use and assess their benefits.

- Drawing on BWSR’s 2018 Working Lands Watershed Restoration Feasibility Study, BWSR will continue to promote transition of marginal lands to harvestable perennial crops such as alfalfa and Kernza (intermediate wheat grass), with a focus on source water protection areas.

- Promote the Minnesota Agricultural Water Quality Certification Program, a voluntary program designed to accelerate adaption of on-farm conservation practices that protect soils and restore water quality in Minnesota’s lakes and rivers. Producers who implement and maintain approved farm management practices are certified and assured that their operation meets the state’s water quality goals and standards for a 10-year period.

5. Continue updating information in BWSR’s Native Vegetation Establishment and Enhancement Guidelines about **plant selection, establishment and management considerations** to maximize climate adaptation and mitigation. The Guidelines have been updated to focus on promoting plant species diversity to increase landscape resiliency and enhance habitat for a wide range of wildlife species, including pollinators.

- The Guidelines also identify the types of plant species that can handle expected conditions at project sites, such as drought-adapted prairie species and rhizomatous emergent plants for fluctuating water levels.
Ongoing Activities

1. Continue tracking of carbon sequestration and emission reductions of BWSR-funded conservation projects using eLINK and other tools. Greenhouse gas reductions resulting from conservation programs are summarized in this report and will continue to be updated annually. BWSR, with agency partners, is also working with the U.S. Climate Alliance to improve statewide inventories of natural and working lands and their role in greenhouse gas reductions.

2. Use the Minnesota Prairie Conservation Plan, the Nature Conservancy’s Resilient Landscapes Tool, and other key landscape ecology planning documents when selecting conservation and restoration practices in habitat complexes and corridors to promote resiliency to landscape stressors and to provide refuge for wildlife species. These documents will help guide the development of planting plans for RIM easements and other conservation lands.

3. Provide information to local governments about practices, policies and programs they can promote to address climate mitigation and adaptation, including design standards and approaches to assessing sites and updating water plans.
   - BWSR’s Landscape Resiliency Toolbox and Landscape Resiliency and Climate Change webpage have been updated to guide local government partners about key practices, policies and programs.

4. Continue to focus on tree planting in urban areas and previously forested areas to sequester carbon, improve air quality, reduce stormwater runoff, decrease the heat island effect in urban areas, control erosion, promote biodiversity and stabilize watersheds.

5. Promote and support implementation of conservation drainage and drainage water management practices, as well as water storage at various scales, that help reduce runoff and nutrient loss, avoid runoff concentration, protect concentrated flow areas, reduce peak flows to reduce erosion, maintain agricultural productivity, improve water quality and habitat, and reduce flooding.
   - Provide outreach about the updated Minnesota Public Drainage Manual and redesigned BWSR Drainage webpage, as well as the Clean Water Fund Multipurpose Drainage Management Program and other potential sources of technical and financial assistance.

6. Investigate and implement methods to restore wetlands and lakes that are more resilient to landscape stressors, with improved site assessment, installation and maintenance techniques.
   - Refine and increase the use of BWSR’s Wetland Resiliency Calculator.
   - In northern Minnesota, protect stored carbon by preserving natural shorelines around shallow wild rice production lakes via permanent riparian easements.
Focus on restoration of high quality, diverse, and resilient wetlands to replace wetland losses. Evidence suggests that more carbon is sequestered by a richer mix of native species (such as mixed forests) and communities are more stable over time.

7. Use **adaptive management strategies** to maintain landscapes in a way that will increase landscape resiliency and increase climate mitigation.

- Promote long-term monitoring and management of wetlands to control invasive species and promote plant diversity and study the long-term resiliency of restored wetlands and how wetland functions change over time.
- Promote Cooperative Weed Management Areas (CWMAs), local organizations that provide a mechanism for sharing invasive species management expertise and resources across jurisdictional boundaries in order to achieve widespread invasive species prevention and control in a broader geographic region.
- Increase focus on controlling emerging weed threats that are benefitting from a warming climate, such as woody invasive species that are starting to invade northern forests.
- Promote landscape management practices such as forest management and prescribed burning that can increase the landscape’s ability to store carbon. Soils rich in organic carbon are better able to withstand large rain events.

*Native prairie sequesters large quantities of carbon in soil, perennial vegetation and deep plant roots.*
Appendix A: Summary of Recent Climate Reports

**NOAA Atlas 14** – New National Oceanic and Atmospheric Administration rainfall frequency data (NOAA Atlas 14) show that the amount of rainfall for given frequencies has risen substantially.

**Minnesota Environment and Energy Report Card** (2017) – Minnesota’s climate is changing rapidly with increasing temperatures, especially in winter and at night, and with increasing frequency of extreme precipitation. Winter lows in northern Minnesota have increased 40% faster than in southern Minnesota.

U.S. Global Change Research Program. **Fourth National Climate Assessment (2018)** – Concludes that by mid-century, the average temperature of the Midwest Region will increase by 4.21°F under a lower-emissions scenario to 5.29°F under a higher emissions scenario, relative to the average for 1976 to 2005. Increasing heavy rains are leading to more soil erosion and nutrient loss on Midwestern cropland. The frequency and intensity of heavy precipitation events are projected to continue to increase over the 21st century.

Intergovernmental Panel on Climate Change. **Special Report: Global Warming of 1.5°C**. (2018) – Human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, and global warming is likely to reach 1.5°C at mid-century if it continues at the current rate. At continental, regional and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones.

Intergovernmental Panel on Climate Change. **Special Report on Climate Change and Land**. (2019) – Agriculture, forestry, and other land use activities accounted for around 13% of CO₂, 44% of methane (CH₄), and 82% of nitrous oxide (N₂O) emissions from human activities globally during 2007-2016, representing 23% of total net anthropogenic emissions of GHGs. Climate change creates additional stresses on land, exacerbating existing risks to livelihoods, biodiversity, human and ecosystem health, infrastructure, and food systems.
Appendix B: References


Interagency Climate Adaptation Team (ICAT). 2017. Adapting to Climate Change in Minnesota. Minnesota Pollution Control Agency. [https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf](https://www.pca.state.mn.us/sites/default/files/p-gen4-07c.pdf)


Appendix C. Greenhouse Gas Reduction Estimation Methodology

Since 2009, BWSR has been estimating carbon storage from a variety of conservation practices, ranging from wetland restoration to establishment of cover crops and field windbreaks, documented in the eLINK reporting system and through the RIM easement program. Those estimates, based on a 2008 study (Anderson, et. al.), were due for an update in light of recent research advances. This report updates the estimates, with a number of changes from the previous ones:

- It includes all the major greenhouse gases (GHGs): carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄).
  - Carbon dioxide (CO₂) is the most abundant GHG and has the largest effect on our climate. Fossil fuel combustion is responsible for most CO₂ emissions in the U.S. Total GHG emissions are measured in CO₂-equivalents.
  - Nitrous oxide (N₂O) is emitted during agricultural and industrial activities, combustion of fossil fuels and solid waste, as well as during treatment of wastewater.
  - Methane (CH₄) is emitted from livestock and other agricultural practices, production and transport of fossil fuels, and from the decay of organic waste in municipal solid waste landfills, as well as certain wetlands and water bodies.

- Where previous assessments focused on carbon sequestration in soils and plant materials, this assessment estimates greenhouse gas emissions – that is, how GHG emissions are reduced under conservation practices, compared to conventional cropping practices.

A primary source for the analysis is a draft report prepared by the MPCA’s Air Policy Unit, “Greenhouse Gas Reduction Potential of Agricultural Best Management Practices,” referred to below as the “MPCA GHG Reduction Study.” The report provides a comprehensive synthesis of the methodologies used to estimate greenhouse gas emissions reduction potential from 21 practices related to changing land use, cropping practices, and nutrient reduction.

A secondary source is the COMET-Planner tool and planning documents developed by USDA to estimate GHG reductions from NRCS conservation practices. We relied on COMET estimates for a few practices not included in the MPCA report.

How are emissions estimated?

Different GHGs can have different effects on the Earth’s warming. Two key ways in which these gases differ from each other are their ability to absorb energy (their "radiative efficiency"), and how long they stay in the atmosphere (also known as their "lifetime").

The Global Warming Potential (GWP) metric was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO₂). The larger the GWP, the more that a given gas warms the Earth compared to CO₂ over that time period. The time period usually used for GWPs is 100 years. GWPs provide a common unit of measure, which allows analysts to add up emissions estimates of different gases (e.g., to compile a national GHG
inventory), and allows policymakers to compare emissions reduction opportunities across sectors and gases.¹

The MPCA prepares a report to the Minnesota Legislature every two years on state greenhouse gas emissions. The most recent report (January 2019), Greenhouse Gas Emissions in Minnesota: 1990-2016, identifies emissions by sector – transportation, electricity generation, agriculture/forestry/land use, residential, commercial, and waste. The 2019 report identified a decline in emissions from the agriculture and forestry sector compared to 2005, but also a high degree of variability in emissions. Animal agriculture is identified as the largest source of methane emissions. However, the report does not quantify the GHG reductions provided by agricultural conservation practices. One goal of this BWSR report is to improve the ability to quantify these “working lands” benefits.

The MPCA’s GHG Reduction Study addresses GHG emissions from soils (N₂O, CH₄ and CO₂), surface waters (N₂O), fuel use in field machinery in crop production (CO₂, N₂O), and mostly out-of-state manufacture of agricultural chemicals and fuels (mostly CO₂ and CH₄). The MPCA study also addresses terrestrial carbon sequestration, during which atmospheric CO₂ is withdrawn from the atmosphere and stored in terrestrial soil and biomass. To the degree that CO₂ is withdrawn from the atmosphere through photosynthesis, terrestrial carbon sequestration acts to lower atmospheric CO₂ levels, offsetting surface emissions of GHGs to the atmosphere.

The amount of offset from terrestrial carbon sequestration depends on how long the CO₂ that has been removed from the atmosphere is stored in terrestrial carbon pools before re-release to the atmosphere. To fully offset 1 ton of CO₂ emitted from the combustion of fossil fuels like coal, one ton of CO₂ removed from the atmosphere would need to be retained in soils and standing biomass for roughly 50 years. To offset about one-half of a ton of emitted CO₂, carbon removed from the atmosphere would need to remain stored in soils and biomass for about 25 years.

The MPCA’s GHG Reduction Study assumes that CO₂, once removed from the atmosphere, will remain in storage for 20 years, offsetting about 0.4 tons of emitted GHGs for each ton sequestered. In the language of climate science, this is equivalent to a GWP of 0.4.

The MPCA uses a 20-year time period for reasonably certain future storage of sequestered carbon for several reasons:

- 20 years is considered a reasonable assumption for the duration of agricultural and forestry practices. Some practices, such as cover crops and conservation tillage can have relatively short durations, based on changes in land ownership, program funding, or other economic considerations. Others, such as conservation cover planted through an easement program, are theoretically permanent. Therefore, the 20-year timeframe provides a common denominator across practices and programs.

- Climate change itself can affect the feasibility and effectiveness of many conservation practices, e.g., increasing wildfires changing the composition and health of forests, flooding affecting perennial crops, drought affecting wetlands, etc. Looking beyond a 20-year horizon would increase the uncertainty on practice effectiveness.

¹ https://www.epa.gov/ghgemissions/understanding-global-warming-potentials
For internal consistency, the MPCA applied the GWP value of 0.4 to all instances of terrestrial sequestration in all practices. However, it is important to note that most of BWSR’s easement programs provide permanent protection, which can increase the effectiveness of carbon sequestration over as much as 40 or 50 years, or substantially longer than the 20 years assumed in the MPCA study.

Conservation practices tracked in eLINK

We assessed the conservation practices tracked in eLINK and selected those that have are directly comparable to the practices assessed in the MPCA GHG Reduction Study, or to practices identified in COMET-Planner. We then created a crosswalk table (Table 2) that compares all the assessed practices. Table 2 is a compilation of acreage in each practice as of 2018, and the estimated metric tons per acre of GHG reduction, in CO₂ equivalents. Note:

- Where dimensions of a practice are recorded in linear feet – windbreaks, for example – we used an estimate of average width to derive acres – generally 30 to 50 feet, depending on the practice.
- In a few instances where practices are simply counted, such as water and sediment control basins, we estimated an acreage likely to be vegetated – for example, one acre of perennial vegetation was assigned for each basin.
- For wetlands, we made several assumptions, based on discussions with MPCA staff and related research:
  - Methane emissions are highest in wetlands that are permanently or frequently inundated, while seasonally inundated wetland types such as wet meadows seem to sequester more GHGs than they emit.
  - About two-thirds of restored or created wetlands appear to consist of wet meadows and other areas that are seasonally inundated. These wetland types seem to act more like riparian buffers. The remaining one-third are permanently inundated, making them net sources of methane.
  - Using this ratio, we estimated net GHG emissions from all restored and created wetlands. Combining these estimates, net carbon sequestration is greater than methane emissions.
  - Additional research and geospatial analysis of wetland types and their respective emissions profiles would help refine these and other estimates.
- Another major assumption is that practices, once installed, remain in place. Grant requirements generally require that structural practices remain in place for at least 10 years, while non-structural practices vary in duration. Land management practices such as cover crops are required to remain in place for three years under current grant policies. We are unable to verify the current status of installed practices.

Conservation practices on RIM easements

RIM easements are managed through development of a conservation plan that identifies the acreage on each easement property to be protected or restored through a variety of conservation practices. We tracked the following conservation practices applied to RIM easements:

- Conservation Cover
- Diversion
- Windbreak/Shelterbelt Establishment
- Grassed Waterway
- Tree/Shrub Establishment
- Water and Sediment Control Basin
- Restoration and Management of Declining Habitats
- Wetland Restoration
- Wetland Creation

As with the eLINK data, practices were equated to the MPCA-identified conservation practices and the same estimates were used.

Several easement categories were not included in the estimates. Army Compatible Use Buffers (ACUB) easements, used to limit development around Camp Ripley, were not included since most do not require conservation practices. Wetland bank easements were not included since they were calculated separately.

Due to changes in the database and recording practices, easements recorded between 1987 and 2003 show discrepancies between total acreage and the acreage in the conservation plan, leading to substantial overcounting. Parcels with minimal discrepancies – 2.5 acres or less – are included in the acreage totals. Parcels with larger discrepancies are excluded; these comprise about 75,000 acres, or about one-third of the pre-2004 easement acres.

Easements including already established practices are also included in the analysis, since most “established” acres were converted from cropland under previous programs, generally CRP, before they were placed under easement. The results of this analysis are shown in Table 4.

**Wetland restoration through wetland banking**

Minnesota's wetland banking program includes both private and state-sponsored wetland banks which have “credits” that are used to offset (mitigate) authorized wetland impacts. To date, over 380 wetland banks have been established, covering 42,000 acres. These sites include both existing wetlands that are preserved and previously drained wetlands that have been restored, as well as associated upland buffers. BWSR wetlands staff developed a GIS-based process for assessing the acreage and estimating the net impacts on GHG reduction and emissions, using the National Wetlands Inventory (NWI):

- Removed the “preservation” bank sites, where restoration did not occur or was a minimal component
- Selected the NWI features that were within the wetland bank boundary layer
- Assigned wetland types, using the Simplified Plant Community classification system in the NWI, to two general categories:
  - Inundated
  - Seasonally Inundated
- Calculated the wetland bank acreages within the two categories.
- Calculated upland acreage by identifying bank areas not included in the NWI (adjacent upland areas are typically included as buffers in wetland bank sites).
Applied the same assumptions described above under “Conservation Practices Tracked in eLINK” to the inundated and seasonally inundated categories:

- Inundated wetlands are treated as “wetlands” in terms of their higher methane emissions
- Seasonally inundated wetlands are treated as “grassland riparian buffers”
- The upland category is treated as “grassland”

Table 1 below shows the classification and the acreage in each wetland category.

<table>
<thead>
<tr>
<th>SPCC Description</th>
<th>Broad Category for Duration of Hydrology</th>
<th>Sum of acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificially Flooded Deep Marsh</td>
<td>Inundated</td>
<td>693</td>
</tr>
<tr>
<td>Artificially Flooded Shallow Marsh</td>
<td>Inundated</td>
<td>1,561</td>
</tr>
<tr>
<td>Artificially Flooded Shrub Wetland</td>
<td>Seasonal</td>
<td>135</td>
</tr>
<tr>
<td>Coniferous Bog</td>
<td>Seasonal</td>
<td>46</td>
</tr>
<tr>
<td>Deep Marsh</td>
<td>Inundated</td>
<td>9</td>
</tr>
<tr>
<td>Hardwood Wetland</td>
<td>Seasonal</td>
<td>354</td>
</tr>
<tr>
<td>Non-Vegetated Aquatic Community</td>
<td>Inundated</td>
<td>1,018</td>
</tr>
<tr>
<td>Open Bog</td>
<td>Seasonal</td>
<td>55</td>
</tr>
<tr>
<td>Seasonally Flooded/Saturated Emergent Wetland</td>
<td>Seasonal</td>
<td>3,973</td>
</tr>
<tr>
<td>Shallow Marsh</td>
<td>Inundated</td>
<td>2,673</td>
</tr>
<tr>
<td>Shallow Open Water Community</td>
<td>Inundated</td>
<td>276</td>
</tr>
<tr>
<td>Shrub Wetland</td>
<td>Seasonal</td>
<td>1,012</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>11,805</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Summary</th>
<th>Acres</th>
<th>CO2-e MT/ac/yr</th>
<th>Total MT change ac/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inundated</td>
<td>6,230</td>
<td>-0.60</td>
<td>-3,738</td>
</tr>
<tr>
<td>Seasonal</td>
<td>5,575</td>
<td>0.70</td>
<td>3,902</td>
</tr>
<tr>
<td>Upland</td>
<td>9,099</td>
<td>1.47</td>
<td>13,376</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13,541</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions: impacts of BWSR programs on the agricultural sector

The combined total GHG reductions of BWSR’s programs are approximately 550,100 CO₂-equivalent metric tons, or 606,400 U.S. CO₂ e-tons. The estimated emissions of the agriculture and forestry sector are estimated by the MPCA at about 34.5 million CO₂ e-tons, of which almost 27 million e-tons are emitted from cropland. Using the estimates outlined above, the combined impacts of BWSR’s conservation and easement programs on the emissions of the agricultural-forestry-land use sector are clearly quite small – 1.7 percent of total emissions, or 2.2 percent of cropland emissions. However, this
assessment does not include the impacts of related state and federal programs and of voluntary practices:

- **NRCS programs** such as EQIP and CSP are used to support conservation practices on thousands of acres in Minnesota, including the same practices that BWSR supports and tracks in eLINK. Quantifying the extent and GHG mitigation benefits of those federally-supported acres is an important next step.

- Likewise, the benefits provided by the roughly 1.13 million acres in the **Conservation Reserve Program** in 2018 have not been quantified. While CRP acreage has declined in the past decade, the 2018 farm bill increases the nationwide cap on CRP acreage from 24 million to 27 million acres, and includes practices such as grassed waterways, filter strips, riparian buffers, and wetland restoration.

- The **Minnesota Agricultural Water Quality Certification Program**, a voluntary program administered by the Minnesota Department of Agriculture, tracks the GHG mitigation benefits of practices adopted by participating producers – currently almost 800 producers on over 500,000 acres participate, with estimated GHG reductions of over 30,000 CO₂-e tons per year.

- **Minnesota’s Buffer Law**, enacted in 2015, requires a continuous riparian buffer of perennial vegetation along public waters (a 50-foot average width and 30-foot minimum width) and public drainage ditches (16.5-foot minimum). It is estimated that over 100,000 acres of new buffers are being installed to comply with the law, with related GHG reduction benefits.

- In addition, many farmers and landowners adopt conservation practices independent of any federal or state program. The **2017 Census of Agriculture** shows increases in the acreage in many GHG-reducing conservation practices:
  - Acreage in no-till practices increased from 818,754 in 2012 to 1,091,337 in 2017, or about 33%
  - Acreage in other conservation tillage practices increased from 6.1 million in 2012 to 8.2 million in 2017, or about 34%
  - Cover crop acreage increased from 408,190 to 579,147, or 41%

By continuing to assess and quantify the benefits of these programs, we can gain a clearer picture of the contributions of the agricultural sector to climate change mitigation and the potential for increasing those efforts.
### Table 2: Comparison of Conservation Practices Between eLINK, RIM, MPCA and COMET

<table>
<thead>
<tr>
<th>eLINK BMPs</th>
<th>NRCS Code</th>
<th>RIM Practices</th>
<th>MPCA &quot;Top 20&quot;</th>
<th>CO₂-eq tons/100,000 ac/yr</th>
<th>Convert to MT ac/yr</th>
<th>COMET Tool Equivalent</th>
<th>CO₂ MT ac/yr</th>
<th>N₂O (CO₂-eq) MT ac/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel Vegetation</td>
<td>RR14</td>
<td>RR1 - Existing Watercourse/drainage ditch</td>
<td>Forested and Multispecies Riparian Buffers</td>
<td>203,251</td>
<td>1.84</td>
<td>Riparian Restoration (woody)</td>
<td>2.19</td>
<td>n/a</td>
</tr>
<tr>
<td>Conservation Cover</td>
<td>327</td>
<td>RR1, RR2 - Native Grasses</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Conservation Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Conservation Cover Easement</td>
<td>327</td>
<td>RR1, RR2 - Native Grasses</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Conservation Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Conservation Crop Rotation</td>
<td>328</td>
<td>Add Perennial Grass to Crop Rotation</td>
<td>49,685</td>
<td>0.45</td>
<td>0.21</td>
<td>Conservation Crop Rotation</td>
<td>0.21</td>
<td>0.01</td>
</tr>
<tr>
<td>Conservation Tillage</td>
<td>329A</td>
<td>345</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contour Buffer Strips</td>
<td>332</td>
<td>RR1 - Contour Buffer Strips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cover Crop - incorp. in rowcrops</td>
<td>340</td>
<td>RR1, RR2 - Native Grasses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Area Planting</td>
<td>342</td>
<td>RR2 - Native Grasses</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Critical Area Planting (disturbed areas)</td>
<td>1.90</td>
<td>n/a</td>
</tr>
<tr>
<td>Critical or Sensitive Area Protection</td>
<td>342</td>
<td>RR2 - Critical Area Planting</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Critical Area Planting (disturbed areas)</td>
<td>1.90</td>
<td>n/a</td>
</tr>
<tr>
<td>Diversion</td>
<td>368</td>
<td>RR5       - Diversion</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>161,038</td>
<td>1.46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Border</td>
<td>386</td>
<td>RR1       - Field Border</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>161,038</td>
<td>1.46</td>
<td>Field Border</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Field Windbreak</td>
<td>380</td>
<td>RR4       - Field Windbreak</td>
<td>Shelterbelts, Hedgerows</td>
<td>269,265</td>
<td>2.44</td>
<td>Windbreak/Shelterbelt Establishment</td>
<td>1.81</td>
<td>0.28</td>
</tr>
<tr>
<td>Filter Strip - herbaceous, capture overland flow</td>
<td>386/393</td>
<td>RR7 - Filter Strip</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>161,038</td>
<td>1.46</td>
<td>Filter Strip</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Forage and Biomass Planting</td>
<td>512</td>
<td>RR1 or RR2</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grassed Waterway</td>
<td>412</td>
<td>RR7 - Grass Waterway</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>161,038</td>
<td>1.46</td>
<td>Grassed Waterway</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Hedgerow planting</td>
<td>422</td>
<td>RR1, RR2</td>
<td>Shelterbelts, Hedgerows</td>
<td>269,265</td>
<td>2.44</td>
<td>Hedgerow Planting</td>
<td>1.42</td>
<td>0.28</td>
</tr>
<tr>
<td>Introduced Grasses - to be established</td>
<td>327</td>
<td>RR1 - Introduced Grasses &amp; Legumes</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Conservation Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Native Grasses - to be established</td>
<td>327</td>
<td>RR2 - Native Grasses</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Conservation Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Nutrient Management (S90)</td>
<td>327</td>
<td>RRFB - Native Grasses with Forbs</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Conservation Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Pasture and Hayland Planting</td>
<td>512</td>
<td>RR2 - Pasture and Hayland Planting</td>
<td>Cropland to Hayland</td>
<td>121,339</td>
<td>1.10</td>
<td>Forage and Biomass Planting - full</td>
<td>0.27</td>
<td>0.19</td>
</tr>
<tr>
<td>Restoration and Mgmt of Declining Habitats:</td>
<td>643</td>
<td>RR2, RR2PP - Pollinator Planting</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>162,411</td>
<td>1.47</td>
<td>Critical Area Planting (disturbed areas)</td>
<td>1.90</td>
<td>n/a</td>
</tr>
<tr>
<td>Trees (native terrestrial/aquatic ecosystem)</td>
<td>643, 612</td>
<td>RR3 - Tree and/or Shrub Planting</td>
<td>Cropland Idling: Afforestation</td>
<td>262,611</td>
<td>2.38</td>
<td>Tree/Shrub Establishment</td>
<td>1.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Riparian Forest Buffer</td>
<td>391</td>
<td>RR3 - Tree and/or Shrub Planting</td>
<td>Forested and Multispecies Riparian Buffers</td>
<td>203,251</td>
<td>1.84</td>
<td>Riparian Forest Buffer</td>
<td>2.19</td>
<td>0.28</td>
</tr>
<tr>
<td>Riparian Herbaceous Cover (flood-tolerant)</td>
<td>390</td>
<td>RR2 - Native Grasses</td>
<td>Grassland Riparian Buffers</td>
<td>77,299</td>
<td>0.70</td>
<td>Riparian Herbaceous Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Saturated Buffer</td>
<td>604</td>
<td>RR2 - Native Grasses</td>
<td>Grassland Riparian Buffers</td>
<td>77,299</td>
<td>0.70</td>
<td>Riparian Herbaceous Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Sediment Basin</td>
<td>350</td>
<td>RR6 - Erosion Control Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater Retention Basin</td>
<td>155M</td>
<td>RR6 - Erosion Control Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streambank and Shoreline Protection</td>
<td>155M</td>
<td>RR2 - Native Grasses</td>
<td>Grassland Riparian Buffers</td>
<td>77,299</td>
<td>0.70</td>
<td>Riparian Herbaceous Cover</td>
<td>0.98</td>
<td>0.28</td>
</tr>
<tr>
<td>Practice</td>
<td>MPCA</td>
<td>COMET Tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stripcropping</td>
<td>585</td>
<td>No-Till</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tree/Shrub establishment</td>
<td>612</td>
<td>RR3 - Tree and/or Shrub Planting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upland Wildlife Habitat Management</td>
<td>644</td>
<td>RR2b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and Sediment Control Basin</td>
<td>638</td>
<td>RR6 - Erosion Control Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetland Creation</td>
<td>658</td>
<td>RR12 - Wetland Creation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetland Restoration (to natural conditions)</td>
<td>657, 133M</td>
<td>RR8 - Wetland Restoration (assumes deep water wetlands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetland Restoration - crop cessation</td>
<td>657</td>
<td>RR8 - Wetland Restoration (wet meadow = riparian buffer)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windbreak/Shelterbelt establishment</td>
<td>380</td>
<td>Shelterbelts, Hedgerows</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>farmstead shelterbelt</td>
<td>380</td>
<td>RR4 - Field Windbreak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>field windbreak</td>
<td>380</td>
<td>RR4 - Field Windbreak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>living snowfence</td>
<td>380</td>
<td>RR11 - Highway Windbreak (Living Snowfence)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>MPCA</th>
<th>COMET Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochar</td>
<td>119,713</td>
<td>1.17 Replacing Syn. N Fertilizer w/ Soil Amend. (590)</td>
</tr>
<tr>
<td>Nitrification and Urease Inhibitors</td>
<td>24,033</td>
<td>0.23 Mulching (484)</td>
</tr>
<tr>
<td>Controlled Release Fertilizers</td>
<td>27,369</td>
<td>0.27 Prescribed Grazing (528)</td>
</tr>
<tr>
<td>Corn-Soybean Replacing Cont. Corn</td>
<td>-39,830</td>
<td>-0.39 Combustion System Improvement (Imp. Fuel Eff.) (372)</td>
</tr>
<tr>
<td>Split Fertilizer Application</td>
<td>13,455</td>
<td>0.13</td>
</tr>
<tr>
<td>15% Fertilizer Use Reduction</td>
<td>5,878</td>
<td>0.06</td>
</tr>
<tr>
<td>Spring Fertilizer Application</td>
<td>-2,115</td>
<td>-0.02</td>
</tr>
<tr>
<td>Subsurface Fertilizer Placement</td>
<td>-31,060</td>
<td>-0.30</td>
</tr>
<tr>
<td>ELINK BMP</td>
<td>NRCS CODE</td>
<td>TOTAL ACRES</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>327 - Conservation Cover</td>
<td>327</td>
<td>3,161</td>
</tr>
<tr>
<td>327M - Conservation Easement</td>
<td>327M</td>
<td>5,772</td>
</tr>
<tr>
<td>328 - Conservation Crop Rotation</td>
<td>328</td>
<td>475</td>
</tr>
<tr>
<td>329B - Conservation Tillage (No-Till, Strip-Till, Reduced Tillage)</td>
<td>329B, 345, 346</td>
<td>28,460</td>
</tr>
<tr>
<td>332 - Contour Buffer Strips</td>
<td>332</td>
<td>660</td>
</tr>
<tr>
<td>340 - Crop Cover</td>
<td>340</td>
<td>66,357</td>
</tr>
<tr>
<td>342 - Critical Area Planting</td>
<td>342</td>
<td>42,093</td>
</tr>
<tr>
<td>362 - Diversion</td>
<td>362</td>
<td>132</td>
</tr>
<tr>
<td>380 - Windbreak/Shelterbelt Establishment</td>
<td>380</td>
<td>4,109</td>
</tr>
<tr>
<td>390 - Riparian Herbaceous Cover</td>
<td>390</td>
<td>383</td>
</tr>
<tr>
<td>391 - Riparian Forest Buffer</td>
<td>391</td>
<td>4,394</td>
</tr>
<tr>
<td>393 - Filter Strip</td>
<td>393</td>
<td>31,881</td>
</tr>
<tr>
<td>412 - Grassed Waterway and Swales</td>
<td>412</td>
<td>13,362</td>
</tr>
<tr>
<td>512 - Forage and Biomass Planting</td>
<td>512</td>
<td>514</td>
</tr>
<tr>
<td>528 - Prescribed Grazing</td>
<td>528</td>
<td>8,233</td>
</tr>
<tr>
<td>543 - Land Reclamation, Abandoned Mined Land</td>
<td>543</td>
<td>2</td>
</tr>
<tr>
<td>580 - Streambank and Shoreline Protection</td>
<td>580</td>
<td>1,014</td>
</tr>
<tr>
<td>585 - Stripcropping</td>
<td>585</td>
<td>1,281</td>
</tr>
<tr>
<td>590 - Nutrient Management</td>
<td>590</td>
<td>224,568</td>
</tr>
<tr>
<td>600 - Terrace</td>
<td>600</td>
<td>14,118</td>
</tr>
<tr>
<td>604 - Saturated Buffer</td>
<td>604</td>
<td>112</td>
</tr>
<tr>
<td>612 - Tree/Shrub Establishment</td>
<td>612</td>
<td>30,874</td>
</tr>
<tr>
<td>638 - Water and Sediment Control Basin</td>
<td>638</td>
<td>6,685</td>
</tr>
<tr>
<td>643 - Restoration and Management of Declining Habitats</td>
<td>643</td>
<td>6,652</td>
</tr>
<tr>
<td>650 - Windbreak/Shelterbelt Renovation</td>
<td>650</td>
<td>99</td>
</tr>
<tr>
<td>657 - Wetland Restoration</td>
<td>657</td>
<td>5,922</td>
</tr>
<tr>
<td>658 - Wetland Creation</td>
<td>658</td>
<td>49</td>
</tr>
</tbody>
</table>

**Total:** 502,001

**Total MT Reduction/acyr:** 304,186

**Coding:**
- Generally accepted practices for GHG reductions
- Practices in need of further research
- 4,109 - acres derived from linear feet * width

[Link to spreadsheet](#) with detailed calculations.
## Table 4: Summary of RIM Easement Conservation Practices and GHG Emissions

<table>
<thead>
<tr>
<th>RIM PRACTICE</th>
<th>NRCS CODE</th>
<th>PRACTICE DESCRIPTION</th>
<th>MPCA EQUIVALENT</th>
<th>PRACTICE ACRES</th>
<th>MT/ACRE</th>
<th>TOTAL MT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR2 - Native Grasses</td>
<td>327</td>
<td>Conservation Cover</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>41,148</td>
<td>1.47</td>
<td>60,487</td>
</tr>
<tr>
<td>RRF8 - Native Grasses with Forbs</td>
<td>327</td>
<td>Conservation Cover</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>32,695</td>
<td>1.47</td>
<td>48,061</td>
</tr>
<tr>
<td>RR1 - Introduced Grasses and Legumes</td>
<td>327</td>
<td>Conservation Cover</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>7,542</td>
<td>1.47</td>
<td>11,087</td>
</tr>
<tr>
<td>RR9 - Vegetative Cover Already Established</td>
<td>327AE</td>
<td>Conservation Cover Already Established</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>27,481</td>
<td>1.47</td>
<td>40,397</td>
</tr>
<tr>
<td>RR5 - Diversion</td>
<td>362</td>
<td>Diversion</td>
<td>Shelterbelts, Hedgerows</td>
<td>2</td>
<td>1.46</td>
<td>4</td>
</tr>
<tr>
<td>RR4 - Field Windbreak</td>
<td>380</td>
<td>Windbreak/Shelterbelt Establishment</td>
<td>Shelterbelts, Hedgerows</td>
<td>94</td>
<td>2.44</td>
<td>230</td>
</tr>
<tr>
<td>RR11 - Highway Windbreak (Living Snowfence)</td>
<td>380</td>
<td>Windbreak/Shelterbelt Establishment</td>
<td>Grassland Riparian Buffers</td>
<td>34</td>
<td>2.44</td>
<td>82</td>
</tr>
<tr>
<td>RR14 - Existing Watercourse/drainage ditch</td>
<td>390AE</td>
<td>Riparian Herbaceous Cover Already Established</td>
<td>Field Borders, Filter Strips, etc.</td>
<td>1,072</td>
<td>0.7</td>
<td>750</td>
</tr>
<tr>
<td>RR7 - Grass Waterway</td>
<td>412</td>
<td>Grassed Waterway</td>
<td>Cropland Idling: Afforestation</td>
<td>1</td>
<td>1.46</td>
<td>2</td>
</tr>
<tr>
<td>RR3 - Tree and/or Shrub Planting</td>
<td>612</td>
<td>Tree/Shrub Establishment</td>
<td>Cropland Idling: Afforestation</td>
<td>9,313</td>
<td>2.38</td>
<td>22,164</td>
</tr>
<tr>
<td>RR10 - Trees and/or Shrubs- Already Established</td>
<td>612AE</td>
<td>Tree/Shrub Already Established</td>
<td>Grassland Riparian Buffers</td>
<td>15,623</td>
<td>2.38</td>
<td>37,183</td>
</tr>
<tr>
<td>RR6 - Erosion Control Structure</td>
<td>638</td>
<td>Water and Sediment Control Basin</td>
<td>Cropland Idling: Grassland Restoration</td>
<td>3</td>
<td>0.59</td>
<td>2</td>
</tr>
<tr>
<td>RR2PP - Pollinator Planting</td>
<td>643</td>
<td>Restoration and Management of Declining Habitats</td>
<td>Constructed and Restored Wetlands</td>
<td>255</td>
<td>1.47</td>
<td>375</td>
</tr>
<tr>
<td>RR8 - Wetland Restoration</td>
<td>657</td>
<td>Wetland Restoration</td>
<td>Constructed and Restored Wetlands</td>
<td>34,196</td>
<td>0.6/0.7</td>
<td>8,822</td>
</tr>
<tr>
<td>RR13 - Existing Wetland/Waterbody</td>
<td>657AE</td>
<td>Wetland Restoration Already Established</td>
<td>Constructed and Restored Wetlands</td>
<td>10,780</td>
<td>0.6/0.7</td>
<td>2,781</td>
</tr>
<tr>
<td>RR12 - Wetland Creation</td>
<td>658</td>
<td>Wetland Creation</td>
<td>Constructed and Restored Wetlands</td>
<td>44</td>
<td>0.6/0.7</td>
<td>11</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>180,281</td>
<td></td>
<td>232,437</td>
</tr>
</tbody>
</table>

[Link to spreadsheet](#) with detailed calculations
Exhibit 4
Note to preparers: This form is authorized for use only for the preparation of Environmental Assessment Worksheets (EAWs) for animal feedlots. Project proposers should consult the guidance Guidelines for Alternative EAW Form for Animal Feedlots (also available at the Minnesota Environmental Quality Board (EQB) website http://www.eqb.state.mn.us/review.html or by calling 651-296-6300) regarding how to supply information needed by the Responsible Government Unit (RGU) to complete the worksheet form.

Note to reviewers: The Environmental Assessment Worksheet (EAW) provides information about a project that may have the potential for significant environmental effects. This EAW was prepared by the Minnesota Pollution Control Agency (MPCA), acting as the Responsible Governmental Unit (RGU), to determine whether an Environmental Impact Statement (EIS) should be prepared. The project proposer supplied reasonably accessible data for, but did not complete the final worksheet. Comments on the EAW must be submitted to the MPCA during the 30-day comment period which begins with notice of the availability of the EAW in the Minnesota Environmental Quality Board (EQB) Monitor. Comments on the EAW should address the accuracy and completeness of information, potential impacts that are reasonably expected to occur that warrant further investigation, and the need for an EIS. A copy of the EAW may be obtained from the MPCA by calling 651-757-2101. An electronic version of the completed EAW is available at the MPCA website http://www.pca.state.mn.us/news/eaw/index.html.

1. Basic Project Information.

   A. Feedlot Name: ____________________________________________

   B. Feedlot Proposer: ________________________________

   C. RGU: Minnesota Pollution Control Agency

   Technical Contact Person ________________________________

   and

   Contact Person ________________________________

   and

   Title ________________________________

   Address ________________________________________________

   and

   Address ________________________________________________

   Phone ________________________________________________

   and

   Phone ________________________________________________

   Fax ________________________________________________

   and

   Fax ________________________________________________

   E-mail ________________________________________________

   and

   E-mail ________________________________________________

   D. Reason for EAW Preparation: (check one)

   EIS _______ Mandatory _______ Scoping _______ Citizen _______

   Discretion _______ Proposer _______ Petition _______

   Volunteered _______

   If EAW or EIS is mandatory, give EQB rule category subpart number and name: ________________________________
E. Project Location: County ____________________ City/Twp ____________________  
    _____ 1/4 _____ 1/4 Section __________ Township __________ Range __________  

Watershed (name and 4-digit code): ____________________  

F. Attach each of the following to the EAW:  
   - County map showing the general location of the project  
   - U.S. Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries (photocopy acceptable)  
   - Site plan showing all significant project and natural features  
   - Map of manure application sites  
   - Map of permanent manure stockpiles  
   - Map showing all wells, tile inlets, residences, and sensitive receptors within a one-mile radius of the feedlot or on manure land application sites (Please use responses to parts 2 and 3 in making this map.)  
   - Feedlot Permit Application (county or state)  

G. Project summary of 50 words or less to be published in the EQB Monitor.  

H. Please check all boxes that apply and fill in requested data:  

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Number Proposed</th>
<th>Type of Confinement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finishing hogs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursery pigs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy cows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beef cattle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkeys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layer hens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chickens</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pullets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please identify species)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I. Project magnitude data.  

    Total acreage of farm: ____________________  
    Number of animal units proposed in this project: ____________________  
    Total animal unit capacity at this location after project construction: ____________________  
    Acreage required for manure application: ____________________  

J. Describe construction methods and timing.
K. Past and future stages.
   Is this project an expansion or addition to an existing feedlot? ☐ Yes ☐ No
   Are future expansions of this feedlot planned or likely? ☐ Yes ☐ No

   If either question is answered yes, briefly describe the existing feedlot (species, number of
   animals and animal units, and type of operation) and any past environmental review or the
   anticipated expansion.

2. Land uses and noteworthy resources in proximity to the site.

   A. Adjacent land uses. Describe the uses of adjacent lands and give the distances and directions to
      nearby residences, schools, daycare facilities, senior citizen housing, places of worship, and other
      places accessible to the public (including roads) within one mile of the feedlot and within or
      adjacent to the boundaries of the manure application sites.

   B. Compatibility with plans and land use regulations. Is the project subject to any of the following
      adopted plans or ordinances? Check all that apply:

      ☐ local comprehensive plan
      ☐ land use plan or ordinance
      ☐ shoreland zoning ordinance
      ☐ flood plain ordinance
      ☐ wild or scenic river land use district ordinance
      ☐ local wellhead protection plan

      Is there anything about the proposed feedlot that is not consistent with any provision of any
      ordinance or plan checked? ☐ Yes ☐ No.

      If yes, describe the inconsistency and how it will be resolved.

      Are there any lands in proximity to the feedlot that are officially planned for or zoned for future
      uses that might be incompatible with a feedlot (such as residential development)? ☐ Yes ☐ No

      If yes, describe the potentially affected use and its location relative to the feedlot, its anticipated
      development schedule, and any plans to avoid or minimize potential conflicts with the feedlot.

   C. Nearby resources. Are any of the following resources on or in proximity to the feedlot, manure
      storage areas, or within or adjacent to the boundaries of the manure application sites?

      ☐ Drinking Water Supply Management Areas designated by the Minnesota Department of Health?
      ☐ Yes ☐ No
      ☐ Public water supply wells (within two miles)? ☐ Yes ☐ No
      ☐ Archaeological, historical or architectural resources? ☐ Yes ☐ No
- Designated public parks, recreation areas or trails?  □ Yes  □ No
- Lakes or Wildlife Management Areas?  □ Yes  □ No
- State-listed (endangered, threatened or special concern) species, rare plant communities or other sensitive ecological resources such as native prairie habitat, colonial waterbird nesting colonies or regionally rare plant communities?  □ Yes  □ No
- Scenic views and vistas?  □ Yes  □ No
- Other unique resources?  □ Yes  □ No

If yes, describe the resource and identify any project-related impacts on the resource. Describe any measures to minimize or avoid adverse impacts.

3. Geologic and soil conditions.

A. Approximate depth (in feet) to:

<table>
<thead>
<tr>
<th></th>
<th>Feedlot</th>
<th>Manure Storage Area</th>
<th>Manure Application Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Water (minimum)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(average)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedrock (minimum)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(average)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. NRCS Soil Classifications (if known)

<table>
<thead>
<tr>
<th></th>
<th>Feedlot</th>
<th>Manure Storage Area</th>
<th>Manure Application Sites</th>
</tr>
</thead>
</table>

C. Indicate with a yes or no whether any of the following geologic site hazards to ground water are present at the feedlot, manure storage area, or manure application sites.

<table>
<thead>
<tr>
<th></th>
<th>Feedlot</th>
<th>Manure Storage Area</th>
<th>Manure Application Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karst features (sinkhole, cave, resurgent spring, disappearing spring, karst window, blind valley, or dry valley)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposed bedrock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soils developed in bedrock (as shown on soils maps)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For items answered yes (in C), describe the features, show them on a map, and discuss proposed design and mitigation measures to avoid or minimize potential impacts.


A. Will the project involve installation or abandonment of any water wells, appropriation of any ground or surface water (including dewatering), or connection to any public water supply?  □ Yes  □ No
If yes, as applicable, give location and purpose of any new wells; the source, duration, quantity and purpose of any appropriations or public supply connections; and unique well numbers and the Department of Natural Resources (DNR) appropriation permit numbers, if available. Identify any existing and new wells on the site map. If there are no wells known on-site, explain methodology used to determine that none are present.

B. Will the project involve installation of drain tiling, tile inlets or outlets?  ☐ Yes  ☐ No

If yes, describe.

C. Will the project involve the physical or hydrologic alteration — dredging, filling, stream diversion, outfall structure, diking, and impoundment — of any surface waters such as a lake, pond, wetland, stream or drainage ditch?  ☐ Yes  ☐ No

If yes, identify water resource affected and give the DNR Protected Waters Inventory number(s) if the water resources affected are on the PWI. Describe proposed mitigation measures to avoid or minimize impacts.

5. Manure management.

A. Check the box or boxes below which best describe the manure management system proposed for this feedlot.

☐ Stockpiling for land application
☐ Containment storage under barns for land application
☐ Containment storage outside of barns for land application
☐ Dry litter pack on barn floors for eventual land application
☐ Composting system
☐ Treatment of manure to remove solids and/or to recover energy
☐ Other (please describe)

B. Manure collection, handling, and storage.

Quantities of manure generated: total ________ by species 1 ________ by species 2 ________

Frequency and duration of manure removal: number of days per cycle __________
Total days per year ________

Give a brief description of how manures will be collected, handled (including methods of removal), and stored at this feedlot:

C. Manure utilization.
Physical state of manure to be applied: □ liquid □ solid □ other - describe:

D. Manure application.

1. Describe application technology, technique, frequency, time of year and locations.

2. Describe the agronomic rates of application (per acre) to be used and whether the rates are based on nitrogen or phosphorus. Will there be a nutrient management plan? □ Yes □ No

3. Discuss the capacity of the sites to handle the volume and composition of manure. Identify any improvements necessary.

4. Describe any required setbacks for land application systems.

E. Other methods of manure utilization. If the project will utilize manure other than by land application, please describe the methods.

6. Air/odor emissions.

A. Identify the major sources of air or odor emissions from this feedlot.

B. Describe any proposed feedlot design features or air or odor emission mitigation measures to be implemented to avoid or minimize potential adverse impacts and discuss their anticipated effectiveness.

C. Answer this item only if no feedlot design features or mitigations were proposed in item 6.B. Provide a summary of the results of an air emissions modeling study designed to compare predicted emissions at the property boundaries with state standards, health risk values, or odor threshold concentrations. The modeling must incorporate an appropriate background concentration for hydrogen sulfide to account for potential cumulative air quality impacts.

D. Describe any plans to notify neighbors of operational events (such as manure storage agitation and
pumpout) that may result in higher-than-usual levels of air or odor emissions.

E. Noise and dust. Describe sources, characteristics, duration, quantities or intensity and any proposed measures to mitigate adverse impacts.

7. Dead Animal Disposal

Describe the quantities of dead animals anticipated, the method for storing and disposing of carcasses, and frequency of disposal.

8. Surface Water Runoff.

Compare the quantity and quality of site runoff before and after the project. Describe permanent controls to manage or treat runoff.


A. Estimate the number of heavy truck trips generated per week and describes their routing over local roads. Describe any road improvements to be made.

B. Will new or expanded utilities, roads, other infrastructure, or public services be required to serve the project? □ Yes □ No

If yes, please describe.

10. Permits and approvals required. Mark required permits and give status of application:

<table>
<thead>
<tr>
<th>Unit of government</th>
<th>Type of Application</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ MPCA</td>
<td>NPDES Permit</td>
<td></td>
</tr>
<tr>
<td>□ MPCA</td>
<td>Minnesota Feedlot Permit</td>
<td></td>
</tr>
<tr>
<td>□ MPCA</td>
<td>NPDES Construction Stormwater Permit</td>
<td></td>
</tr>
<tr>
<td>□ MPCA</td>
<td>Notification/Status Change for Underground Storage Tanks</td>
<td></td>
</tr>
<tr>
<td>□ County</td>
<td>Minnesota Feedlot Permit</td>
<td></td>
</tr>
<tr>
<td>□ County/twp/city</td>
<td>Conditional use or other land use permit</td>
<td></td>
</tr>
<tr>
<td>□ DNR</td>
<td>Water Appropriation</td>
<td></td>
</tr>
<tr>
<td>□ Other*</td>
<td><em>(List any other approvals required along with the unit of government, type of approval needed, and status of approval process.)</em></td>
<td></td>
</tr>
</tbody>
</table>

<Project Title>
<City/Twp>, Minnesota 7 Environmental Assessment Worksheet
11. Other potential environmental impacts, including cumulative impacts. If the project may cause any adverse environmental impacts not addressed by items 1 to 10, identify and discuss them here, along with any proposed mitigation. This includes any cumulative impacts caused by the project in combination with other existing, proposed, and reasonably foreseeable future projects that may interact with the project described in this EAW in such a way as to cause cumulative impacts. Examples of cumulative impacts to consider include air quality, stormwater volume or quality, and surface water quality. *(Cumulative impacts may be discussed here or under the appropriate item(s) elsewhere on this form.)*

12. Summary of issues. List any impacts and issues identified above that may require further investigation before the project is begun. Discuss any alternatives or mitigative measures that have been or may be considered for these impacts and issues, including those that have been or may be ordered as permit conditions.

**RGU CERTIFICATION.**

I hereby certify that:

- The information contained in this document is accurate and complete to the best of my knowledge.
- The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as “phased actions,” pursuant to Minn. R. 4410.0200, subp. 60, 4410.1000, subp. 4, and 4410.4300, subp. 1.
- Copies of this EAW are being sent to the entire EQB distribution list.

**Name and Title of Signer:**

Craig Affeldt, Supervisor, Environmental Review Unit  
St. Paul Office  
Regional Division

**Date:**

---

_The format for the alternative Environmental Assessment Worksheet form has been approved by the Chair of the Environmental Quality Board pursuant to Minn. R. 4410.1300 for use for animal feedlot projects. For additional information contact: Environmental Quality Board, 520 Lafayette Road, St. Paul, Minnesota, 55155-4194, 651-296-6300, or at their website [http://www.eqb.state.mn.us/review.html](http://www.eqb.state.mn.us/review.html)._
Exhibit 5
EAW Guidelines
Preparing Environmental Assessment Worksheets
EAW Guidelines was prepared by the staff of the Environmental Quality Board to assist units of government and others in preparing Environmental Assessment Worksheets. EAW Guidelines is not intended as a substitute for Environmental Quality Board rules and should be used in conjunction with the EAW rule provisions at parts 4410.1000 to 4410.1700. Copies of the rules are available from Minnesota’s Bookstore at 651-297-3000 or 800-657-3757, or at the Revisor of Statutes homepage at www.revisor.mn.gov. Further information about the environmental review process can be found in the Guide to Minnesota Environmental Review Rules, available from the EQB.

The updated guidelines replace the February 2000 edition of EAW Guidelines and correspond to the July 2013 edition of the EAW form. Updates and corrections to the guidelines and EAW form will be posted on the EQB homepage at www.eqb.state.mn.us.

Upon request, the EAW Guidelines will be made available in an alternate format, such as Braille, large print or audiotape. For TTY, contact Minnesota Relay Service at 800-627-3529 and ask for Minnesota Environmental Quality Board.

October 2013

For additional information, or copies of the guidelines, contact:

MINNESOTA ENVIRONMENTAL QUALITY BOARD

Environmental Review Program
520 Lafayette Road North
St. Paul, MN 55155

651-757-2873

website: www.eqb.state.mn.us

e-mail: env.review@state.mn.us
EAW Guidelines

1 ENVIRONMENTAL ASSESSMENT WORKSHEET PROCESS 1

2 GENERAL GUIDANCE FOR PREPARING AN EAW 5

3 ITEM-BY-ITEM GUIDANCE 7

Glossary 47
Environmental Assessment Worksheet Process

**EAW Guidelines** provides information about preparing an Environmental Assessment Worksheet (EAW) to determine whether an Environmental Impact Statement (EIS) is needed for a project. The EAW is defined by state statute as a “brief document which is designed to set out the basic facts necessary to determine whether an EIS is required for a proposed action.” (Minn. Stat. § 116D.04 Subd. 1a)

The purpose of the EAW process is to disclose information about potential environmental impacts of the project. It is not an approval process. The information disclosed in the EAW process has two functions: to determine whether an EIS is needed and to indicate how the project can be modified to lessen its environmental impacts. Such modifications may be imposed as permit conditions by regulatory agencies. The information comes from three sources: the EAW, comments made on the EAW and responses by the Responsible Government Unit (RGU) and project proposer to the comments. All three sources are important, but the EAW generally provides the most significant information.

The EAW process involves four major steps:

**Step 1.** The project proposer supplies all necessary data to the Responsible Governmental Unit, which is assigned responsibility to conduct the review according to the EQB rules.

**Step 2.** The RGU prepares the EAW by completing the standard form supplied by the Environmental Quality Board.

**Step 3.** The EAW is distributed with public notice of its availability for review and comment. The comment period is 30 calendar days. Certain state, federal and local agencies always receive EAWs for review. Any person may review and comment in writing on an EAW. A public meeting to receive oral comments is optional at the discretion of the RGU, but is not commonly held.

**Step 4.** The RGU responds to the comments received and makes a decision on the need for an EIS based on the EAW, comments received and responses to the comments. The RGU and other units of government may require modifications to the project as part of their permits to mitigate environmental impacts as disclosed through the EAW process.

**When an EAW is required**

An EAW is required for any project listed in the mandatory EAW categories in Minnesota Rules part 4410.4300. This listing, as well as mandatory EIS and exemption categories, can also be found in the EQB’s Guide to Minnesota Environmental Review Rules. An EAW is also required whenever any governmental unit with approval authority over the project determines that available evidence indicates that the project may have the potential for significant environmental effects. This is called a discretionary review and typically occurs in response to a citizen petition.

An EAW is also prepared as the first step in scoping an EIS if required for a project. A different approach is necessary to answering questions on the EAW when it is used for scoping purposes.

**Prohibition on governmental approvals and on construction during review**

Whenever an EAW is mandatory or has been ordered, or when a petition for an EAW has been properly filed, state law directs that no final governmental decision may be made to grant a permit, approve or begin a project and that construction on the project may not begin until environmental review is completed. When an EAW is required, review is completed when either the RGU determines that no EIS is needed – issuance of a negative declaration – or when the EIS is completed and found adequate. A final governmental decision is one that conveys rights to the project proposer, whether the last or an intermediate decision. Final decisions include preliminary as well as final plat approvals since they convey rights that may be difficult to alter or undo, conditional use permits and zoning decisions if associated with a specific project. The Guide to Minnesota Environmental Review Rules provides additional information about prohibited approvals.

**How the RGU is determined**

Environmental Quality Board rules (Minnesota Rules Chapter 4410.0500) assign the responsibility of preparing EAWs and determining the need for EISs to specific units of government. The specific unit of government determined to have responsibility for the EAW preparation is the RGU. Commonly, the RGU is the unit with the greatest responsibility for approving or supervising the project as a whole. For projects that exceed a threshold which requires a mandatory EAW, the rules that define these categories also identify the designated RGU. For projects where a citizen petition for an EAW was submitted to EQB, the EQB chair or staff designee assigns the RGU consistent with the Rules. If a unit of government orders an EAW or responds to an EAW request of the project proposer, that unit is the RGU. A state agency is always the RGU for projects it will conduct.

**Responsibility for EAW preparation and costs**

While the RGU prepares the EAW, project proposers are required to supply to the RGU any data or other information in their possession or to which they have reasonable access. Once received, the RGU reviewing the submitted information for completeness. Often, an RGU will hire consultants to prepare all or part of the EAW or to independently review the proposer’s submittal. This topic is covered in detail in the next chapter.

The environmental review statutes do not address the issue of charging for EAW costs, however, some local units of government have enacted ordinances that allow them to recoup...
expenses for preparing an EAW. In most cases, the proposer incurs most data costs.

**The 30-day comment period**

Once the RGU has prepared the EAW, it must be available for public comment for 30 days. The RGU must submit a signed, completed EAW to the Environmental Quality Board staff, (at EQB.monitor@state.mn.us), who publishes a notice of the EAW’s availability in the EQB Monitor. The EQB Monitor is electronically distributed biweekly on Mondays and anyone can receive the EQB Monitor via email by signing up at the EQB website. The public comment period begins on the distribution date of the EQB Monitor containing the EAW notice. The 30-day comment period usually ends on a Wednesday at 4:30 p.m. unless indicated otherwise by the RGU; comments must reach the RGU by this deadline.

At the same time the EAW is sent to the EQB staff, the RGU must also distribute the EAW to all offices on the EQB’s official distribution list. Available online from the EQB, the distribution list includes state, federal, regional and local units of government that have expertise and responsibilities in the environmental area, as well as several libraries that serve as repositories for environmental reports. EAWs may be distributed in electronic form, such as an emailed pdf file or on a mailed CD, however, anyone entitled to receive an EAW must be given a paper copy upon request. Many RGUs now post EAWs on their websites. In addition, copies should be made available locally for public review, at such locations as a local library or the RGU offices. The rules require that a copy be given to any person submitting a written request, although the RGU may charge a copying fee. The RGU should also make extra copies for requests by the public.

Once distributed, the RGU must also announce the availability of the EAW for public review. The RGU must send a press release to, and publish a notice in, at least one newspaper in the project area or an official website for the area. The press release and notice should briefly describe the project, explain that an EAW is available for review and comment, and give details such as when comments are due, a contact person name and address and how to obtain a copy of the EAW for review. If there will be a public meeting to hear comments and to answer the public’s questions.

At the same time, the EAW is sent to the EQB staff, the RGU must also distribute the EAW to all offices on the EQB’s official distribution list. Available online from the EQB, the distribution list includes state, federal, regional and local units of government that have expertise and responsibilities in the environmental area, as well as several libraries that serve as repositories for environmental reports. EAWs may be distributed in electronic form, such as an emailed pdf file or on a mailed CD, however, anyone entitled to receive an EAW must be given a paper copy upon request. Many RGUs now post EAWs on their websites. In addition, copies should be made available locally for public review, at such locations as a local library or the RGU offices. The rules require that a copy be given to any person submitting a written request, although the RGU may charge a copying fee. The RGU should also make extra copies for requests by the public.

Anyone who wishes may review and comment on the EAW during the comment period. Unless the RGU holds an optional public meeting, all comments must be submitted in writing within the 30 days. Comments on an EAW may be submitted in electronic form if the RGU provides an email address in the EAW. The rules suggest that comments address: the accuracy and completeness of the information, potential impacts that may warrant further investigation before the project is commenced and the need for an EIS on the project. Without draft and final versions of the EAW, minor errors or omissions should be noted only if they bear on larger issues. If a reviewer feels that the process is impeded by a lack of information that could be reasonably obtained, the reviewer should ask for the information during the comment period rather than issuing a comment letter.

All substantive comments received during the comment period must be given a written response by the RGU. The number of comment letters received by the RGU varies widely. For some projects only one or two letters are received, usually from state agencies. On other projects, dozens of letters may be received from concerned citizens. If the project is controversial and the RGU anticipates many public letters, it may be advantageous to hold a public meeting to hear comments and to answer the public’s questions.

**RGU decision on the need for an EIS**

The rules require most RGUs to make a decision on the need for an EIS between three working days and 30 days after the comment period ends. This time frame applies to all RGUs where the decision is made by a council or board that only meets occasionally. If the decision will be made by a single individual such as by an agency commissioner, then the decision must be made within 15 working days, although a 15 working day extension may be requested from the EQB chair.

This provision is intended to provide for a postponement only on the basis of important missing information that bears on the question of potential for significant environmental impacts. If the missing information is not critical to the EIS need decision in the opinion of the RGU, the decision should not be delayed. The information can be developed later as part of an appropriate permitting process. In its record of decision, the RGU can describe the information and how it will be obtained and used.

If the project proposer agrees, an RGU can extend the postponement beyond the 30 days stated in the rules. In unusual cases where important information is found to be lacking from the EAW, the RGU may simply withdraw the EAW, revise it and restart the 30-day comment period. This can normally only be justified if the project description information is so incomplete or inaccurate that reviewers are not given a fair chance to review the true project.

**RGU response to comments and record of decision**

As part of the process of determining if an EIS will be needed, the RGU must respond in writing to all substantive comments received during the comment period. Late comments may be responded to if the RGU chooses to do so. Each person or entity that submitted timely and substantive comments must be sent the RGU’s response to those comments. Responses to comments may be distributed electronically, with the proviso that a paper copy must be supplied upon request. Usually the responses are sent along with the notice of the EIS need decision, however, in certain cases, it may be advisable to send out responses in
advance of the decision to solicit comments before the EIS need decision is made. The RGU may ask the proposer to help prepare responses if the comments ask for changes in the project or a commitment to mitigation, or question the purpose or value of the project.

The purpose of the EAW, comments and comment responses is to provide the record on which the RGU can base a decision about whether an EIS needs to be prepared for a project. EIS need is described in the rules: “An EIS shall be ordered for projects that have the potential for significant environmental effects” (Minnesota Rules 4410.1700, subpart 1).

In deciding whether a project has the potential for significant environmental effects, the RGU “shall compare the impacts that may reasonably be expected to occur from the project with the criteria in this rule,” considering the following factors (part 4410.1700, subparts 6 and 7):

A. Type, extent, and reversibility of environmental effects;
B. Cumulative potential effects;
C. The extent to which environmental effects are subject to mitigation by ongoing public regulatory authority provided that the RGU may rely only on mitigation measures that are specific and can reasonably be expected to be effective; and
D. The extent to which environmental effects can be anticipated and controlled as a result of other available environmental studies undertaken by public agencies or the project proposer, including other Environmental Impact Statements.

The rules also require the RGU to document how it reached a decision: “The RGU shall maintain a record, including specific findings of fact, supporting its decision. The record must include specific responses to all substantive and timely comments on the EAW. This record shall either be a separately prepared document or contained within the records of the governmental unit” (Minnesota Rules 4410.1700, subpart 4).

For most RGUs, the staff or a consultant will draft a proposed or sample record of decision document for consideration and possible adoption by the council or board. This document may be in the form of a resolution or it may be adopted by a resolution. Other RGUs may satisfy the requirements for a decision record through detailed meeting minutes that reflect discussion of the relevant information from the EAW, comments and responses about impacts, mitigation and regulatory oversight.

The record of decision should do more than rely on the absence of adverse comments to justify a decision not to order an EIS. The RGU is obligated to examine the facts, consider the criteria and draw its own conclusions about the significance of potential environmental effects, and it is the purpose of the record of decision to document that the RGU fulfilled this obligation.

Among the four criteria, the first and the third are usually the most relevant. The first deals with the nature and significance of the environmental effects that will or could result from the project. It relies directly on the EAW information and may be augmented by information from the comments and responses. The third criterion is frequently the main justification for why an EIS is not required. Projects often have impacts that could be significant if not for permit conditions and other aspects of public regulatory authority. However, the RGU must be careful to rely on ongoing public regulatory authority to prevent environmental impacts only where is it reasonable to conclude that such authority will adequately handle the potential problem.

The second criterion, cumulative potential effects of related or anticipated further projects, has historically been given little attention but is currently in the forefront. It remains difficult to apply in practice when little is known about other potential projects unless they are also under review at the same time. Nevertheless, the RGU must be alert to the possibility that an EIS could be needed because of cumulative potential effects of multiple projects. The RGU should address the project’s interaction with other past, present and future projects in the vicinity when answering EAW questions. The fourth criterion enters in only where the same information that would be sought in an EIS already is available through past studies, including other impact statements. This situation rarely occurs, in part because the environmental issues are usually quite specific to the project in question.

Appeal of an RGU decision
The decision of the RGU whether to prepare an EIS can be appealed in the State Court of Appeals. The appeal must be filed within 30 days of the date on the appealing party receives the final decision and order of the RGU. There is no administrative appeal of an RGU; the EQB has no jurisdiction to review an RGU’s decision.
EAW Process Steps and Timeline

0. Informal communication between project proposer and RGU in preparation for filing EAW data submission (usually in conjunction with discussions about permit information needs)

1. Proposer submits completed data portions of EAW to RGU

2. RGU reviews data submittal for completeness (within 30 days – extendable with agreement of proposer)

3. If complete, notifies proposer within 5 business days

4. If incomplete, returns for corrections (then steps 1 & 2 repeat)

5. RGU prepares and approves EAW for public comment (within 30 days of notice of completeness sent to proposer)

6. RGU submits notice to EQB for publication in EQB Monitor and distributes EAW to official EQB distribution list (within 5 business days of approval of scoping EAW)

7. RGU publishes press release/notice about EAW to at least one newspaper of general circulation in project area or on an official publication website for the political subdivision in which the project is proposed (within 5 business days of submission of notice to EQB)

8. Notice appears in EQB Monitor (varies between 7 and 20 days from receipt of notice at EQB, but usually is 7 days)

9. (Optional: RGU may hold public meeting to receive oral comments; if meeting held, information regarding meeting included in Monitor notice & in press release)

10. Comment period ends (30 days after Monitor notice published)

11. RGU prepares written responses to substantive and timely comments (documented in Record of Decision documents; RGU may request information from proposer as necessary)

12. RGU makes EIS need decision based on whether record (EAW, comments & responses) indicates project has the potential for significant environmental effects (between 3 business and 30 calendar after end of comment period; RGU may postpone decision to gather critical missing information for up to 30 days or a longer period if agreed to by the project proposer; decision must be documented in written record of decision)

13. RGU distributes notice of EIS need decision (within 5 business days to EAW distribution list and anyone else who submitted timely and substantive comments; commenters must receive copy of response to their comments)

14. EQB publishes notice of EIS need decision in EQB Monitor
General guidance for preparing an EAW

An official form must be used for all Environmental Assessment Worksheets, unless an alternative is approved in advance by the Environmental Quality Board chair, or a federal Environmental Assessment is prepared for the same project.

The Environmental Quality Board develops and revises the official EAW form as necessary. The current version was revised in 2013. The worksheet and these guidelines are available on the EQB website.

Submitting data for the EAW
Prior to initiating work on an EAW, proposers are advised to contact the appropriate RGU for guidance. RGUs may have specific requirements for individual EAW items, or for specific categories of projects. The project proposer is required to submit the EAW’s completed data portions to the RGU to initiate EAW preparation. The RGU must promptly review the proposer’s submittal and return the submittal to the proposer if it is found to be incomplete. If the submittal is complete, the RGU must notify the proposer in writing within five working days. Proposers are obligated to supply any relevant information to which they have reasonable access. The proposer usually submits the data portions on a copy of the EAW form. In preparing the submittal the proposer should refrain from offering conclusions. Rather, it should focus on supplying data and other factual information.

The proposer should discuss EAW content requirements with RGU staff before beginning work on the EAW.

Preparing the EAW
The RGU is legally responsible for the accuracy and completeness of the information presented in the EAW. After the RGU notifies the proposer that the submittal is complete, the RGU has 30 days to add additional information, revise the text as necessary and approve the EAW for public distribution. In controversial cases, the RGU governing body—a council or board—often authorizes release of the EAW, but it is not required by the EQB rules.

Even if the proposer’s data submittal seems complete and accurate, the RGU must exercise independent judgment about the information. The RGU must be in charge of any conclusion-type responses that discuss the significance of impacts or the adequacy of mitigation. If the RGU fails to exercise independent review of the proposer’s information, it could lose a legal challenge and have to repeat the EAW process. If the RGU does not have the necessary expertise on staff, it should consider hiring a consultant to help review information and to assist in the preparation of the EAW. If the RGU has adopted the necessary ordinances, it can charge costs to the proposer. Those that have not yet adopted these ordinances may wish to do so before they are needed.

The statutes define the EAW as “a brief document which is designed to set out the basic facts necessary to determine whether an EIS is required for a proposed action” (Minnesota Statutes, section 116D.04, subdivision 1a). Some EAWs are lengthy, however, rivaling the average EIS in length. Several considerations should be taken into account in preparing an EAW and deciding how much information should be included:

- **Presenting more information does not necessarily reduce the need for an EIS.** The statutory requirement for an EIS is whether the project has the potential for significant environmental effects—it is not whether the EAW has adequately disclosed information about potential impacts. At a minimum, an EIS would consider reasonable alternatives that might avoid the impacts and could provide additional information about mitigation for the impacts. An EAW is not designed to be a substitute for the EIS, no matter how thick it is.

- **Information that reduces uncertainties about impacts and their significance belongs in an EAW.** Any information that helps clarify the likelihood or level of significance of a potential impact is useful in an EAW because it helps the RGU make a better determination about the need for an EIS. It could be factual information related to the nature of the impact or its likelihood, or information about how the impact could be mitigated and how that mitigation will be imposed.

- **Incomplete information in the EAW may lead to a delay in the EIS need decision.** The EQB rules provide that if important information is missing in the EAW record, the RGU may postpone the decision. Failure to include relevant information in the EAW may lead to unnecessary delays. In extreme cases, failure to provide adequate information may cause reviewing agencies to suggest that the EAW be withdrawn and redone or that an EIS be prepared.

Use of a federal Environmental Assessment as a substitute for the EAW form
Rule amendments in 1997 authorize the automatic substitution of a federal Environmental Assessment in place of the EAW form as long as the EA addresses all the environmental effects identified by the EAW form. This avoids the need for two different review documents for projects that require both a state EAW and federal National Environmental Policy Act (NEPA) review.

NOTE: Only the document can be substituted—all procedural aspects of the state EAW process must still be followed.

Alternative Urban Areawide Review in lieu of an EAW
A more comprehensive and often more expeditious review can be accomplished through the Alternative Urban Areawide
General guidance for preparing an EAW

Chapter

Review process. If several different projects in the same area will require preparation of an EAW, or if an RGU has concerns about overall development in an area where some projects require review and others do not, the situation may be best suited for an Alternative Urban Areawide Review. RGUs can find guidance about the AUAR process in Chapter 5 of the Guide to Minnesota Environmental Review Rules or by consulting the EQB staff.

Animal feedlots
A special customized EAW form that applies only to animal feedlots was developed by the EQB in 1999. This customized form should be filled out in preparing feedlot EAWs. Forms and guidance are available at the EQB homepage (www.eqb.state.mn.us), from the EQB staff, the Pollution Control Agency and many county feedlot officers.

Industrial, commercial and institutional facilities
Prior to initiating an EAW, local units should review the other mandatory EAW categories to make sure that the project does not fit into a more specific category assigned to a different RGU such as the Pollution Control Agency or Department of Natural Resources. If the project fits two or more categories, all potential government units must agree on which will serve as RGU for the review before it begins; if they cannot agree, the EQB chair must determine the RGU. In general, it is preferable for the state agency to serve as RGU due to the technical nature of the analysis often needed.

Even when the local unit is assigned as the RGU for an industrial project, the proposer should contact the Pollution Control Agency prior to initiating the EAW to discuss whether special information may be needed for adequate review of air, water or waste issues.

In general, an EAW for an industrial project must give special attention to: air emissions (item 16), water discharges (item 11), contamination/hazardous materials/wastes (item 12), transportation issues (item 18), noise (item 17), and site stormwater issues (item 11b(ii)).

In general, an EAW for a commercial or institutional project must give special attention to: vehicle emissions (item 16b), site stormwater runoff (item 11b(ii)), and impacts due to land use conversions such as loss of wildlife habitat (item 9). Since such development frequently takes place in urbanizing or suburbanizing areas, the EAW should attempt to put the project and its impacts into the context of other nearby development and plans, infrastructure needs, and government plans for the area (items 9, 11, and 18).

Residential development
Generally, any infrastructure improvements intended to serve primarily the project are considered part of the project and must be reviewed in the EAW.

“Connected actions” (Minnesota Rules, part 4410.0200, subpart 9b) occur when one action will induce the other or is a prerequisite for the other, or if neither is justified by itself. The rules require that connected actions must be treated as one action (part 4410.1000, subpart 4).

Major infrastructure projects intended to serve a number of projects or a wide area, such as a trunk sewer or collector roadway, generally do not require review as part of a residential project EAW but should be reviewed under the appropriate item. These infrastructural projects may, however, require review on their own.
Item-by-item Guidance

This chapter provides guidance for each item of the Environmental Assessment Worksheet, developed by the Environmental Quality Board (EQB), and revised in 2013. The worksheet is available online from the EQB home page at www.eqb.state.mn.us. The completed EAW Form may be submitted to the EQB in an electronic format.

Note: While the EAW form is standardized to be applicable for all projects, the information included in the EAW document will depend on the project proposed, site location, and features of both. Responsible Government Units (RGUs) must complete each EAW item at a level of detail and complexity that is appropriate for the item as it relates to the project proposed. Project proposers are encouraged to contact RGUs early in the process to ensure an appropriate level of detail is included in EAW data submittals. EAWs should not include very minor effects of the proposed project for each item, and instead it may be appropriate for individual items to be marked as not applicable (N/A). Documentation of why items are considered N/A to the project and why effects are considered by the RGU to be minor should be kept as part of the project record and referenced in the project EAW.

The purpose of an EAW is to identify and assess environmental impacts and mitigation associated with a proposed project. The EAW should not include information that serves only to justify or promote the project but is otherwise irrelevant to the purpose of an EAW.

1. Project title

Provide a descriptive, short title and indicate what kind of project is involved, such as residential subdivision, gravel mine or county road resurfacing; its specific identification and location, including city or county. For example: Joe Smith Gravel Mine, Lincoln Township.

2. Proposer

According to Minnesota Rules 4410.0200 Subpart 68, the proposer means, “the person or governmental unit that proposes to undertake or direct others to undertake a project.” The proposer should be the entity that has applied for or would receive the approval for the project or the governmental unit that will undertake the project and not a consultant, attorney, or other entity or person representing the proposer. However, the contact person is the person to whom information about the project should be provided, and it may be the proposer, the proposer’s consultant or staff. While the proposer, contact person and permitted entity may be the same in some cases, those with permitting authority should be aware that a permitted entity for the project may be different from the proposer or contact person identified in the EAW.

3. RGU

The Responsible Governmental Unit (RGU) should only give an e-mail address and/or fax number if it intends to accept comments electronically. The contact person should be somebody associated with the RGU who will respond to questions or comments on behalf of the RGU.
4. Reason for EAW preparation

Most EAWs are prepared because of mandatory EAW categories found in Minnesota Rules 4410.4300 or as part of scoping of projects in mandatory EIS categories in 4410.4400, and should be noted accordingly. If the EAW is not mandatory, mark an appropriate option to indicate how the EAW process was initiated. If more than one applies — for instance if a citizen petition was filed but the proposer volunteered for an EAW before the RGU acted on the petition — either mark all that apply or none of the items and explain the situation. EIS scoping should be marked only if an EIS is mandatory or the proposer has voluntarily agreed to initiate an EIS. If an EAW or EIS is mandatory, list the citation for the applicable mandatory category(ies) from the EQB rules. The citation can be found in Minnesota Rules parts 4410.4300 or 4410.4400 or in Chapter 7 of the Guide to Minnesota Environmental Review Rules. Also, give the name of the category as listed in the rules after the subpart number.

Preparation of an EAW for scoping an EIS: Before an EIS is done, an EAW is required for “scoping,” which is the decision-making process that determines what alternatives, impacts and issues, and mitigation measures will be assessed and at what level of detail. These decisions are made by the RGU after a period of public and agency input. The function of the scoping EAW is to inform the public and agencies about a project so they can help identify topics and issues that should be addressed in the EIS. The scoping EAW must be accompanied by a draft scoping decision document.

The draft scoping decision document is a draft version of the document that will be adopted by the RGU after the scoping period as the official “blueprint” for the EIS. The scoping EAW focuses on the project, its settings and physical impacts, while the draft scoping decision document focuses on the RGU’s plans for reviewing the project’s impacts, including economic and social impacts, and the impacts of “reasonable alternatives” to the project. For a scoping EAW, mark the box for “EIS Scoping” under this EAW item.

Chapter 5 of The Guide to Minnesota Environmental Review Rules provides guidance about completing the EAW when used for scoping.
5. Project location

People reviewing the EAW are not necessarily familiar with the project site and its surroundings. The purpose of this item is to provide information to allow EAW reviewers to locate the project site and environmental features on or near the site. The information and maps listed on the form are the minimum needed to do this. Additional information, maps and project plans should be included as appropriate to identify features discussed in individual items in the EAW. The project location information relates closely with the project description provided in EAW Item 6.

Public Land Survey (PLS) township, range and section numbers are found in property description on deeds, other property documents, U.S. Geological Survey (USGS) topographic maps, site surveys, and some county highway maps. The county assessor will also have this information. All applicable section numbers should be listed. The tax parcel numbers (property identification numbers) can be obtained from assessor or property information offices. Many counties have internet sites that provide the number. Include the number for all project site parcels.

Additional Resources:


- Geographic Information System (GIS) data on watersheds can be downloaded from the Minnesota Department of Natural Resources (DNR) data deli at: [http://deli.dnr.state.mn.us/](http://deli.dnr.state.mn.us/)

Category Specific Guidance:

**Residential Developments (Subp 19 and 19a):** The site plan should be a copy of the plat drawing, reduced to a suitable size and should include all major features of the project. Other drawings should also be attached, if available, for grading, drainage or other plans relating to changes the project would make to the environment.

**Recreational Development (Subp 20 and 20a):** The site plan should show the layout of all sites as well as support facilities such as sewage lines, stormwater management structures, roads and buildings.

**Stream Diversion (Subp 26):** The site plan should show the existing and proposed new channel alignments and the location of any spoils disposal.
Maps

The project site must be indicated on the maps. Photocopies of maps are acceptable as long as they are legible. If only a portion of the complete map is included (detail) make sure that the label, and all legend information is included so reviewers can refer to the original map if necessary.

Site plans should show all significant project and natural features. The site plan should provide a graphic “close-up” of the project in sufficient detail to identify the key physical construction features, including roads, utilities, buildings, wells, drainage structures, cut and fill areas, materials or waste storage areas, parking lots and project boundaries. A site plan depicting the conditions prior to the project development, (i.e. current conditions) as well as a site plan depicting post-project conditions should be provided. Provide other exhibits as appropriate to illustrate information about the project. These may include modeling review summaries, additional maps showing nearby residences, wetlands, soil types or pipeline routes, proposed management plans for odor or leachate, etc.

If any of the project lies in a shoreland, include the following features if present: ordinary high water mark; building setback line; shore impact zone boundary; wetlands; bluffs; bluff impact zone boundary; steep slopes; ice ridges; nearshore emergent and submersgent vegetation; docks; sand blankets; rip-rap; retaining walls; stairs; patios or platforms; watercraft access; buffers; clearing limits; accessory structures.

Look to specific items later in the EAW to determine what other maps of different types of features should be included. Other exhibits may be included as appropriate to illustrate information about the project. Examples might include:

- Natural Resource Conservation Service (NRCS) Soil maps (Note: not all areas of the state are mapped),
- water features,
- native plant communities and cover types,
- geologic atlases,
- karst features or surficial geology,
- maps showing nearby features, including residences, wetlands, soil types or pipeline routes
- modeling review summaries
- maps of neighboring locations with MPCA air, water, or other permits, and
- conservation lands and easements.

Many maps are available on websites listed for EAW items later in this guidance document. GIS data for many of these features are available for free from the DNR data deli located at http://deli.dnr.state.mn.us/.

Additional Resources:

- DNR Aerial photographs of forested areas: http://www.dnr.state.mn.us/airphotos/index.html
- Minnesota Department of Transportation county highway maps: http://www.dot.state.mn.us/maps/index.html
6. Project description

The project description is the most important item in the EAW. It must be completed thoroughly and accurately. It is best to assume your reader is not familiar with your industry or proposed facility.

Omitting project elements may increase the costs and timeline for the proposed project. Changes made to the project after the EAW is completed but before all approvals have been granted may result in the need for a new EAW, per Minnesota Rules 4410.1000 Subpart 5.

a. Brief summary for publication in the EQB Monitor

This should be a concise statement of the project’s basic nature, characteristics and location. This summary will be printed verbatim in the *EQB Monitor* to serve as a public notice of the EAW. It should be approximately 50 words.

In addition to including this brief summary here in the EAW, this summary should be submitted separately in an e-mail to the EQB Staff according to the EAW Publication Calendar posted on the EQB website. This facilitates accurate reproduction of the summary in the *EQB Monitor*.

b. Complete description

Clear, complete and detailed project descriptions are essential to understanding the potential for environmental effects. If any portion of the project description is vague or incomplete, reviewers may have difficulty understanding the project and may assume certain environmental considerations have been overlooked.

In some cases, other EAW items may be more appropriate for detailed project components. If this is the case, describe those components generally here in EAW Item 6.b. and refer the reader to the EAW item that contains the more detailed information.

The detailed description should be focused on aspects of the project that may directly or indirectly manipulate, alter or impact the physical or natural environment. This can include: construction methods, especially in regard to site preparation; operational features (ongoing operations), especially in regard to waste production and management; and in some cases such as mining and landfilling activities, project closure actions.

The description should distinguish between construction and operational activities. It should describe scheduling, timing, and locations of the activities as well as the time of year, frequency, and duration of the activities. It should also highlight any special concerns, such as proximity to a significant resource. Typical things to consider as part of detailed project description include:

- Project components and structures
- Permanent and temporary structures
- Construction methods, timing (including when construction would begin), and equipment used
- Size of the main components
- Locations and relationships of project components
- Associated infrastructure including new or expanded public utility services or public works necessary to serve the project such as sewers, storm sewers, streets, water mains, water towers, power lines, gas lines,

If the EAW is in response to a petition, note what issues were raised.

**NOTE:** Any infrastructure constructed to serve the project and not independent of project must be treated in the EAW as part of the project. For example, a road built to serve a specific project must be treated as...
part of the project and its impacts should be included in the EAW. According to Minn. Rules 4410, all “connected actions” are to be reviewed as one project. Connected actions are defined as projects related in any of the three following ways:

1. one project would induce the other;
2. one project is a prerequisite for another and the prerequisite project is not justified by itself; or
3. neither project is justified by itself (4410.0200, subpart 9c).

The EAW description should not include information that serves only to justify or promote the project and is thus irrelevant to the EAW process. The purpose of the EAW is to identify and assess environmental impacts and mitigation.

c. Project Magnitude Data

This item asks for data that help quantify the magnitude of the project. Depending on the type of project, some of the data requested may not be applicable, in which case the item may be left blank.

Total project area or length. Information provided here should also be used in response to Item 7. For linear projects—such as roads, trails, and sewers—the length should be given; for other projects the area should be given. If the total acres involved in a linear project are known, provide both the area and length of the project.

Residential units and types (attached or unattached). Single family, duplex and triplex units are considered unattached while four or more units to a building are defined as attached. Each individual dwelling unit counts as one unit; therefore, a 24-unit apartment building equals 24 attached units.

Commercial, industrial and institutional building areas. The form asks for a total of the gross floor space for any project of a commercial, industrial or institutional nature. Count all floors of all enclosed structures on the site except for any space used for parking. For projects with multiple uses (e.g. retail, office, warehouse, manufacturing), it may be useful to specify the floor space by use type. Analyses such as traffic and parking typically use different requirements depending on the uses.

Structure heights. List at least the maximum height of the buildings. List at least the maximum height of the buildings or other structures (i.e. stacks). Provide more information where appropriate, such as an office complex with two or more towers of varying sizes, or a communications tower. If structure height may result in potential conflicts that involve environmental matters, then the assessment of the potential conflicts and mitigation should be discussed under the appropriate EAW item (e.g., Visual, Wildlife, Historic Properties, etc.).

d. Purpose, need, beneficiaries

For private projects, state the purpose of the project. For public projects, state the purpose and in addition, explain why the project is needed and describe who will benefit from the project. This information assists reviewers in identifying appropriate mitigation. Without a clear idea of the project’s goals, it is difficult to

Additional Resources:

assess whether changes in process, scale or design that may be environmentally superior would also meet the goals.

**e & f. Future and Previous stages of another project**

These items identify past or future stages of the project and describe how the present EAW relates to prior or future review. If the answer to either is “yes,” it is possible that the project is related to other developments as a “phased action” or a “connected action” as defined by Minn. Rules 4410.0200, subpart 60 and 9c, respectively. The Rules require that all parts of these actions must be reviewed as a single project. The RGU should consult Minn. Rules 4410.1000, subpart 4 and 4410.2000, subpart 4, as well as Chapter 2 of the *Guide to Minnesota Environmental Review Rules* to ensure that the complete project has been reviewed in the EAW.

If the project is an expansion of an existing project, Minn. Rules 4410.4300, subpart 1 directs the RGU to review the project as inclusive of any construction which has occurred within the previous three years and has not been reviewed under a previously completed EAW or EIS. These cumulative expansions over the previous three years should be compared to the thresholds in Minn. Rules 4410.4300, and is generally referred to as the “three-year look-back rule.”

If the project is a residential project, relevant requirements are at Minn. Rules 4410.4300, subparts 19 and 19a and 4410.4400, subparts 14 and 14a. Also note that the certification at the end of the form requires the RGU to verify that it has complied with the requirements for reviewing the complete project.

For projects such as highways, streets, pipelines, utility lines, or systems where the proposed project is related to a large existing or planned network, the RGU can treat the present proposal as the total proposal or select only some of the future elements for present consideration in the threshold determination and EAW. These selections must be logical in relation to the design of the total system or network and must not be made merely to divide a large system into exempted segments. When review of the total project is separated under this subpart, the components or stages addressed in each EAW must include at least all components or stages for which permits or approvals are being sought from the RGU or other governmental units.” (Minn. Rules 4410.1000, Subp. 4). The key component is the logical relation to total system or network. Dividing a project into smaller exempted segments to avoid preparation of an EAW is not allowed under Minnesota Rules. The intent is that future stages would be subject to future environmental review. Mandatory categories for review apply.
Category Specific Guidance:

**Non-metallic Mineral Mining (Subp 12):** The site plan and description must include the boundaries, depths, buffer areas, access roads, fixed equipment locations, wells, ponds, discharge points, and any other significant features of the mine. The plan and schedule of development should be indicated. Proposed hours of operation should be indicated. The reclamation and end use plan should be discussed.

**Residential Development (Subp 19 and 19a):** The project description should include any infrastructure such as streets, permanent stormwater management structures, sewers, water mains or utility lines constructed to serve the residences. In addition, the impacts of any such infrastructure must be described here and addressed throughout the worksheet. The items Future and Previous stages of another project frequently apply to residential projects because projects are often built in stages. The proposer and RGU should be sure that rule provisions regarding “phased actions” are complied with as discussed in Chapter 2 of the Guide to Minnesota Environmental Review Rules.

**Highway projects (Subp 22):** The description should focus on the physical characteristics of the project rather than programmatic aspects, such as the reasons for the project, and should include information about construction methods and the schedule for construction. Information relating to other alternatives considered can be provided.

**Barge fleeting (Subp 23):** The project description should include any onshore support facilities. Address the compatibility of any onshore support facilities with shoreland, flood plain, or scenic river zoning.

**Marinas (Subp 25):** The project description must include all onshore ancillary facilities as well as the marina facility itself. Address the compatibility of the onshore facilities with shoreland, flood plain, or river zoning.

**Stream Diversion (Subp 26):** An overview of the project should be presented and how it will be constructed. Details of the construction should be presented at item 11.b.iv. If the stream is surrounded by designated shoreland, flood plain, wild or scenic river zones, discuss the project compatibility with the requirements of applicable zoning codes.

**Natural Areas (Subp 30):** Ensure the compatibility with the management plan for the natural area being affected.

**Communication Towers (Subp 33):** The description should include information on guy wires, ancillary facilities such as equipment sheds or fuel tanks, and access roads. Describe any measures taken to minimize impacts such as special lighting, modified design or choice of location.
7. Cover types

Estimates of the acres of land cover before and after the project should be provided. One important purpose of this information is to assess the project’s impact on wildlife habitat.

Site surveys or recent aerial photos are good sources of information. Additional GIS data sources include USGS Upper Midwest Gap Analysis Program (GAP) Cover Type, Minnesota Land Cover Classification System, and Land-Sat Land Use Land Cover. These data sources, as well as others are all available from the data catalog at the DNR Data Deli located at [http://deli.dnr.state.mn.us/data_catalog.html](http://deli.dnr.state.mn.us/data_catalog.html). Of course, the most useful type of information to use will depend on the location and nature of the project.

The total number of acres in the Before and After columns of the table should be equal. If the total number of acres is not equal for the pre-project and post-project conditions, explain why not in the space on the form below the table. In addition, be sure to provide descriptions for any acres listed under “other.” Because the cover type categories are broad, it is possible that cover types within a specific project may fall into two categories or there may be two cover types under one category that would seem to warrant a distinction. If this is the case the RGU should make decisions on the best way to complete the acres within the table and then provide additional clarification below the table in paragraph form.

Note that the cover type table does not require a distinction between wetland types, but there may be very good reasons for including this supplemental information below the table. One example is a case where a project isn’t going to remove wetland acres, but rather would change wetland type. This is information that is helpful to the RGU and reviewers, but is difficult to capture in the table. In identifying types of wetlands, use the US Fish and Wildlife Service’s Circular 39 guidelines. The table also makes a distinction between wetlands and deep water or streams. Deep water and streams are areas that have more than two meters of water during low water conditions. Dedicated stormwater detention ponds constructed in upland areas should not be designated as wetlands. Natural wetland areas that may have been used for stormwater storage in the past are to be designated as wetlands.

The “wooded/forest” category should be applied only to relatively undisturbed wooded areas. “Lawn/landscaping” is the appropriate classification for developments constructed in wooded areas, even if many of the trees are maintained. Similarly, the “brush/grassland” category applies to areas that are undisturbed or infrequently maintained. If an area is to be regularly mowed or maintained, even if in a rural setting, list it under “lawn/landscaping.”

---

**Category Specific Guidance:**

**Historical Places (Subp 31):** Describe if any demolition work will disturb or impact any vegetated areas around the property.
8. Permits and approvals required

When an EAW is required or ordered, no final decision to grant any governmental permit or approval (including financial assistance) can be made until either a decision has been made that no EIS is needed or until an EIS has been completed. See Minnesota Rules 4410.3100 or Chapter 2 of the Guide to Minnesota Environmental Review Rules.

List the permits, approvals, certifications, reviews and financing required or sought from all government agencies both prior to the beginning of the project and after. Include any necessary regional reviews and approvals from agencies. Though this is not an exhaustive list, typical agencies and permits to consider include:

<table>
<thead>
<tr>
<th>Agency</th>
<th>Permits and Approvals</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDNR</td>
<td>Work in Public Waters permit: <a href="http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html">http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html</a></td>
</tr>
<tr>
<td></td>
<td>Water Appropriations permit: <a href="http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html">http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html</a></td>
</tr>
<tr>
<td></td>
<td>License to Cross Public Land/Water: <a href="http://www.dnr.state.mn.us/permits/utility_crossing/index.html">http://www.dnr.state.mn.us/permits/utility_crossing/index.html</a></td>
</tr>
<tr>
<td></td>
<td>Aquatic Plant Management Permit: <a href="http://www.dnr.state.mn.us/eco/apm/index.html">http://www.dnr.state.mn.us/eco/apm/index.html</a></td>
</tr>
<tr>
<td></td>
<td>Threatened/Endangered Species Takings Permit: <a href="http://www.dnr.state.mn.us/eco/nhnrp/endangered_permits.html">http://www.dnr.state.mn.us/eco/nhnrp/endangered_permits.html</a></td>
</tr>
<tr>
<td>MDH</td>
<td>Food, Beverage, and Lodging licensure: <a href="http://www.health.state.mn.us/divs/eh/food/license/">http://www.health.state.mn.us/divs/eh/food/license/</a></td>
</tr>
<tr>
<td></td>
<td>Well sealing/abandonment: <a href="http://www.health.state.mn.us/divs/eh/wells/sealing/abandwel.html">http://www.health.state.mn.us/divs/eh/wells/sealing/abandwel.html</a></td>
</tr>
<tr>
<td></td>
<td>Well construction: <a href="http://www.health.state.mn.us/divs/eh/wells/construction/construct.html">http://www.health.state.mn.us/divs/eh/wells/construction/construct.html</a></td>
</tr>
<tr>
<td></td>
<td>Monitoring well permit: <a href="http://www.health.state.mn.us/divs/eh/wells/lwcinfo/mwpermit.html">http://www.health.state.mn.us/divs/eh/wells/lwcinfo/mwpermit.html</a></td>
</tr>
<tr>
<td></td>
<td>Health care facility licensure: <a href="http://www.health.state.mn.us/divs/fpc/index.html">http://www.health.state.mn.us/divs/fpc/index.html</a></td>
</tr>
<tr>
<td>Mn/DOT</td>
<td>Curb-cutting Permits: <a href="http://www.dot.state.mn.us/permits/">http://www.dot.state.mn.us/permits/</a></td>
</tr>
<tr>
<td></td>
<td>Section 10 Rivers and Harbors</td>
</tr>
<tr>
<td>Local Government Units</td>
<td>There are several local government entities that may require various permits or approvals such as local sewer hook-ups, building permits, conditional use permits, plats, etc. Typical entities to consider include:</td>
</tr>
<tr>
<td></td>
<td>• City</td>
</tr>
<tr>
<td></td>
<td>• Township</td>
</tr>
<tr>
<td></td>
<td>• County</td>
</tr>
</tbody>
</table>
Include approvals already obtained and any modifications of any existing permits. Useful information on environmental protection permits can be obtained from the Minnesota Small Business Assistance Office at: http://www.positivelyminnesota.com/Business/Starting_a_Business/Legal_Regulatory/Environmental_Protection_Programs.aspx

Any public funding applied for and granted must be listed, including Tax Increment Financing, public infrastructure constructed to assist the project, bond guarantees and other forms of public assistance or subsidies.

If a potential environmental impact will or can be addressed by conditions of any required permits or approvals, this should be discussed in the EAW under the appropriate EAW item. Within the appropriate EAW item, explain how potential impacts can be mitigated through permit and approval conditions.

In some cases there may be permits previously issued for activities on or near the project site that are relevant to the review of the proposed project. This is most likely where the proposed project is an expansion of an existing project, but could occur under other conditions as well. Examples of this might include a past dredging project permitted by the Army Corps of Engineers or the Minnesota DNR having placed soil on the proposed project site. These permits should be identified, including the permit number and issuing agency. This information can either be presented under this item or preferably under the items most relevant to the nature of the previously issued permit.
9. Land use

The information provided in this item should give a basic understanding of past, existing and proposed land use, plans, and zoning within and near the project area. This information will be used in other EAW items to understand potential environmental effects such as groundwater/soil contamination, historic properties, noise, odors, dust, and visual effects. The detailed discussion of these environmental effects should occur in the appropriate EAW item. It may be helpful to include a general discussion under this item and refer the reader to the EAW item that contains the detailed discussion.

a. Describe Existing Land Use, Plans, Zoning, Regulations

This sub-item (9.a.) requires a description of the existing land use, current land use plans and zoning, and any special designations—whether the site is used for that designation or not. Discussion of compatibility and potential environmental effects should not be included under this sub-item, but rather should be addressed in the following sub-item (9.b.).

i. Existing land use. This item should provide a basic understanding of the existing land uses—e.g. residential, commercial, industrial, parks, recreation areas, trails, prime or unique farmlands—of the site and areas adjacent to or nearby the proposed project site. Include areas where vulnerable populations live or visit, such as nursing homes, schools, day care centers, water resources, parks, etc. This information will be used to respond to other EAW items to assess any potential conflicts between the proposed project and existing surrounding land uses with environmental aspects that may require mitigation. Indicate the distance and direction to all residential areas or other sensitive receptors surrounding the site. A typical example would be a gravel operation proposed next to a residential area: dust and noise could cause significant conflicts with the residential land use and this conflict should be discussed under EAW Items 16 Air and 17 Noise.

Local government planning or building departments can be a source of information for identifying existing land uses. In the Twin Cities metropolitan area, the Metropolitan Council has an inventory of existing land uses. In many cases you may need to just identify the types of existing land uses that are near the project. Some specific land uses that you should be aware of and include in the description are:

- Prime or unique farm lands and agricultural preserves designations. Information on prime and unique farmlands is available from the Natural Resources Conservation Service. The local unit of government (county or city) often has information on any established agricultural preserves.
- Locations of existing parks, recreational areas or trails. This information may be obtained from the local unit’s planning and zoning or recreation office or from the DNR. Some local government units have designated greenways/corridors that should also be identified.
- Conservation lands. Typical land uses that fall in this category include Wildlife Management Areas (WMA), Waterfowl production areas, Scientific and Natural Areas (SNA), wildlife refuges, conservation easements, and potentially other federal, state, and local programs designed to conserve natural resources.

ii. Plans. Discuss whether the project is subject to any official governmental management plans adopted for the area. These could include a local comprehensive plan (land use, transportation, utilities or other plans), which may include specific plans for land use, infrastructure, parks, trails, natural resources, etc.; a local water plan; or management plans specific to resource areas under public management such as parks, watershed districts or rivers. Plans of all levels of government should be considered here: local, regional, state and federal. The local planning and zoning office is probably the best source of this kind of
information. If no such plans exist in the area, the EAW should so indicate. If there is a plan, but the project is not subject to the plan, the EAW should indicate why not.

These plans are typically prepared to address a broad array of issues from any number of projects that could occur within a specific area. One purpose of these plans is to minimize negative environmental effects from potential future conditions. If an individual project is compatible with a plan there may be specific measures or actions in that plan that are meant to mitigate potential cumulative effects. If this is the case, provide a discussion in response to Items 9b or 9c, which assess compatibility with nearby land uses, or Item 19 which discusses cumulative potential effects.

iii. **Zoning and other official controls.** Zoning is a regulatory measure to ensure compatible land use development. The local government unit with zoning authority can identify the zoning of the project area. Include the current zoning of the project area with a brief description of that zoning district. Determine if the proposed project is an allowed use, a conditional use, or currently not permitted within the zoning district. Other official controls that apply to the project’s potential environmental effects should also be described. Examples could be subdivision regulations or ordinances that are separate from the actual zoning ordinance.

The local planning and zoning office should be contacted regarding zoning ordinances that relate to the environment or use of natural resources. For example, shoreland, flood plain and wild or scenic river land use districts are protected by special zoning ordinances designed to protect the resources of such lands. The local planning and zoning office should be contacted regarding local shoreland and flood plain ordinances that may apply. The EAW should discuss whether the project fully complies with all these special zoning requirements. Wild, scenic, and recreational river districts and the Mississippi River Critical Area are special districts that contain additional protections for these resources. Contact the local planning and zoning office or the applicable DNR Regional or Area Hydrologist’s office regarding restrictions that apply along these rivers. There may be a specific plan or study that forms the basis of a special zoning ordinance or other protection measures. Such a plan or study should be noted here or in Item 9.a.ii.

- Land use permits such as conditional use permits may be required depending on the specific project and the applicable zoning ordinance. These permits should be identified in response to Item 8.

b. **Project Compatibility**
   The point of this question is to identify any potential conflicts between the project and the land uses, plans, and regulatory measures identified in sub-Item 9.a, and in particular, conflicts involving environmental aspects.

If the project is subject to plans or zoning ordinances related to the environment or use of natural resources, the EAW should identify the requirements relevant to the project and discuss how the project complies with the plans and ordinances. The RGU should consult with the government unit responsible for the implementation of the plan regarding provisions that relate to the project and about the consistency of the project with the plans and ordinances. Emphasis in the EAW should be given to any conflicts or incompatibilities between the project and plan or zoning provisions that relate to the environment or use of natural resources.

Note that a perceived land use conflict may or may not involve environmental matters. Minnesota Rules 4410.0200, Subpart 23, define “environment” as “physical conditions existing in the area that may be affect by a proposed project. It includes land, air, water, minerals, flora, fauna, ambient noise, energy resources, and man-made objects or natural features of historic, geologic or aesthetic significance”. This definition should be considered for the purposes of an EAW analysis. A public safety issue in and of itself is not necessarily an environmental effect. Analyses of environmental matters in an EAW may well bring to light non-
environmental issues that were not previously recognized and that can be addressed by other means. This may be a useful discovery, but is not the purpose of the EAW.

c. Identify mitigation
Mitigation measures may be needed if the proposed project conflicts with or is incompatible with plans and zoning requirements that involve environmental matters. Discuss mitigation of potential land use conflicts under the appropriate EAW item (i.e. Visual, Air, Noise, etc.). If any mitigation measures have been incorporated into the project to address land use compatibility, identify any regulatory authority that can require these mitigation measures as part of their permitting actions. Contact the local land use authority for regulatory authorities and potential mitigation measures.

Category Specific Guidance:

Non-Metallic Mineral Mining (Subp12): Sand and gravel mining is frequently viewed as a nuisance by nearby residents; therefore, discuss surrounding land uses, including distances to residences and measures to attempt to reduce nuisances. Also discuss how the ultimate end use of the mined area compares to the local unit’s future plans for the area and discuss the reclamation plan.

Residential Development (Subp 19 and 19a): Discuss the compatibility of the project with any applicable local comprehensive plan and indicate how any inconsistencies will be resolved.

Highway projects (Subp 22): For lengthy projects with a variety of adjoining land uses, provide a general overall description of the land uses and more detail for those areas where there may be conflicts or the land uses are more sensitive.

Barge Fleeting (Subp 23) Address this item with respect to nearby onshore lands. Also address the compatibility of the fleeting with any adopted governmental plans that apply to the river or shoreland.

Natural Areas (Subp 30): One of the primary concerns about a project reviewed under this mandatory category will be its compatibility with the management plan for the natural area being affected.

Sports or entertainment facilities (Subp 34): Particular attention should be paid to compatibility with surrounding land uses.
10. Geology, soils, topography/land forms

This item provides a basic understanding of geology and soils in the project area. This information will be used in other EAW items to understand potential environmental effects from groundwater contamination, erosion, or soil suitability for the proposed project. Other EAW items that may be more appropriate for detailed discussion on environmental effects include Item 11.b.ii. for erosion and Item 12 for groundwater contamination.

a. Geology

Describe the geologic features, including any geologic or landform features of special concern. Possible sources of information include: site surveys, soil surveys, topographic maps, county sanitation or health departments, the Minnesota Department of Health, USGS, the Minnesota Geological Survey - County Geologic Atlas, or other maps of state bedrock geology, surficial geologic map, or Karst features. The source of information about geologic features should be provided, such as whether geotechnical studies were done or if the information was taken from a geologic atlas.

Once the geologic features are described, discuss potential environmental effects on those features that may result from the project. If any special concern features are present at the site, the EAW should describe measures to prevent potential groundwater contamination or other problems related to such feature or other mitigation efforts the project proposes to address potential environmental effects.

b. Soils & topography

Describe the types of soils present using the Natural Resources Conservation Service (NRCS) classification system. Soil surveys showing this information are available from the county offices of the University of Minnesota Extension Service, and soil and water conservation districts. If several soil types exist on the site, a soils map can be helpful. The NRCS maintains an internet-based application called the Web Soil Survey. If this data is available in the project area, this web tool should be used to identify soils and any limitations of those soils.

Additional Resources:

- MNGS County geologic atlases: [http://www.mngs.umn.edu/county_atlas/countyatlas.htm](http://www.mngs.umn.edu/county_atlas/countyatlas.htm)
- Site-specific soil boring logs.

Discuss the soil suitability as it relates to project features such as erosion, stability, and strength. Soil series information can be used to identify physical properties, engineering features, and limitations. This information should be used to identify potential problem areas and identify measures to address those areas. Detailed discussion of erosion control, stormwater management and effects to water quality should be discussed in response to Item 11.b.ii. NOTE: If the project will grade or otherwise alter one or more acres, an NPDES Construction Stormwater permit is required from the MPCA.

Steep slopes of 12 percent or more and erosion prone soils should be described and shown on the site plan or on a separate grading plan.
If large amounts of soils will be excavated, the EAW should identify the types involved, quantities, to where they will be relocated and how they will be used.

If soil borings have been conducted, it may be necessary for the RGU to have this information, especially if the project may have potential to contaminate the soils or ground water, including projects involving use of on-site sewage treatment by septic tanks and drainfields.

Legislation in 2013 established a new mandatory category for silica sand projects. In addition to the EAW content already required under statute and rule, an environmental assessment worksheet for silica sand projects must include “a hydrogeologic investigation assessing potential groundwater and surface water effects and geologic conditions that could create an increased risk of potentially significant effects on groundwater and surface water.” There are interrelationships among geology, groundwater and surface water in some areas, particularly where karst conditions exist. Karst is typically found in the southeastern quarter of the state and should be carefully considered when siting a facility or stormwater ponds. EAWs for projects with karst conditions should also include information on shallow ground water, exposed bedrock, or karst conditions that include sinkholes or disappearing streams. It is important that information regarding geology and water in EAW Items 10 and 11 account for those interrelationships.

**Category Specific Guidance:**

*Highway projects (Subp 22):* For lengthy projects with a variety of adjoining land uses, provide a general overall description of the land uses and more detail for those areas where there may be conflicts or the land uses are more sensitive.

*Natural areas (Subp 30):* Answer if grading or other erosion-causing activities will occur.
11. Water Resources

This item is intended to address all water-related aspects of a proposed project, except groundwater contamination from solid or hazardous wastes or substances, which should be addressed in EAW Item 12.

a. Features

This sub-item is meant for a full description of all surface water and groundwater features in the vicinity of the project. This should include all known water features such as lakes, ponds, rivers, streams, wetlands, ditches, intermittent streams, drainageways, aquifers, springs, and seeps. This sub-item is only for description of the features. Sub-Item 11.b. should be used to discuss project related effects and potential mitigation.

i. Surface water. All surface water features should be described and identified on a map of the project area. Include information on any special designations, (e.g. trout streams/tributaries/lakes, wild/scenic/recreational, designated wildlife lakes, calcareous fens, restricted discharges, and prohibited discharges etc.), or water quality impairments. Include the Public Water Inventory number if the water resources are in the inventory.

Additional Resources:

- Public Waters Inventory Maps: [http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html)
- National Wetland Inventory data: [http://www.dnr.state.mn.us/maps/landview/index.html?layers=lakes+roads+bdry_munipy3](http://www.dnr.state.mn.us/maps/landview/index.html?layers=lakes+roads+bdry_munipy3)
- National Park Service: [http://www.nps.gov](http://www.nps.gov)
- Trout streams/lakes: [http://www.dnr.state.mn.us/fishing/trout_streams/index.html](http://www.dnr.state.mn.us/fishing/trout_streams/index.html)
- Designated Wildlife Lakes: [http://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html](http://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html)
- Watershed Assessment Tool: [http://www.dnr.state.mn.us/watershed_tool/index.html](http://www.dnr.state.mn.us/watershed_tool/index.html)

This item also requires the description of any receiving waters located within 1 mile of the project that have been designated as “impaired” by the MPCA. This information can be found at: [www.pca.state.mn.us/water/tmdl/tmdl-303dlist.html](http://www.pca.state.mn.us/water/tmdl/tmdl-303dlist.html). If a receiving water has been so designated, the EAW response must describe the nature of the impairment, the status of a Total Maximum Daily Load (TMDL) plan to address the impairment, and whether the project complies with the plan provisions.

Additional Resources:

- MPCA surface water web page: [http://www.pca.state.mn.us/enzqaflb](http://www.pca.state.mn.us/enzqaflb)
- MPCA Impaired waters web page: [http://www.pca.state.mn.us/xgx950](http://www.pca.state.mn.us/xgx950)
Wetlands that will potentially be affected need to be identified. A wetland delineation may be needed for the EAW if there is a large area of wetlands affected. The RGU must make the determination of whether or not the wetland effect is large enough to warrant a wetland delineation. If a wetland delineation has been completed or if wetland information is available, the wetlands must be classified according to U.S. Fish and Wildlife Service, Circular 39, *Wetlands of the United States*, located here: http://www.fws.gov/policy/660fw2.html.

**ii. Groundwater.** This item is meant for a full description of groundwater. Because groundwater is not easily observed, the response to this question needs to use information such as nearby well logs, regional aquifer studies, or other information sources that may or may not be readily available. The effort spent collecting and providing this information should be commensurate with the potential effects from the project. If there have been any aquifer tests or pumping tests, those should be described here.

To locate existing wells, the Minnesota Department of Health (MDH) recommends conducting a field well inventory on properties affected by the project. Special attention should be paid to areas where construction will take place and where any farmsteads, homes or industrial wells may have been located in the past, as well as along boundaries where wells may exist on adjacent properties. Locating existing wells is important to maintain distances between wells and sources of groundwater contamination.

The Unique Well Numbers can be obtained from the County Well Index maintained by the MDH and the Minnesota Geological Survey, which includes all wells constructed since 1975 and some wells constructed earlier. If no wells are believed to exist on the site, your response must indicate how this was determined; for example, by a field survey.

Existing wells cannot be buried during construction without first being properly sealed.

### Additional Resources:


All wells that will no longer be used must either be sealed by a licensed well contractor according to Minnesota Rules, Chapter 4725, or have a maintenance permit from MDH, or, in the case that there is a delegation agreement for local well regulation, from the local board of health. Currently, this includes Dakota, Blue Earth, Goodhue, LeSueur, Olmsted, Wabasha, Waseca, and Winona counties and the cities of Minneapolis and Bloomington.

Information on shallow groundwater can be particularly useful for some projects. (See above for guidance regarding Item 10.a. Geology for potential groundwater information sources.) In some cases, wetlands hydrology is supported by shallow groundwater. If a project is going to intercept, pump, or change shallow groundwater flow (including infiltration) and there are wetlands in the area, it will be important to understand and describe the shallow groundwater. Depending on the nature of the project and the location and type of wetlands, additional investigation and professional hydrogeological services may be needed.
b. Effects of Project Activities and Mitigation
The purpose of sub-Item 11.b. is to identify and discuss potential environmental effects on surface water and groundwater features identified in Item 11.a and mitigation of those effects.

i. Wastewater
For any project that generates wastewater, details of the sources, composition and amounts of these wastewater streams must be provided in the EAW. For normal domestic sewage generation such as toilet wastes or wash water from human occupancy, only the amounts need be given, calculated from the number of occupants at a rate of 100 gallons per person per day unless another figure is justified.

For industrial processes, the sources of all wastewater streams should be identified and a description should be given of how the various potential pollutants enter the stream or are generated within the stream. The anticipated chemical analysis of the various waste streams should be estimated, and the basis for the estimate should be indicated, such as measurements made at an existing similar plant.

Provide sufficient information about the nature of any proposed wastewater treatment system to demonstrate that it will be adequate to treat the wastewaters generated. The level of detail needed will depend on the nature of the wastewaters generated and the proposed system and the degree of treatment that must be achieved; where wastewaters or proposed treatment methods are non-routine, a higher level of detail demonstrating that the system will work will be necessary. For industrial wastewaters, it is advisable to consult with MPCA early in the EAW preparation process.

1) If wastewaters will be treated by an existing publicly owned treatment system, this response should address the adequacy of that system to handle the volume and composition of wastewaters from the project. Information about the system characteristics, existing loads and present treatment performance should be given. Anticipated improvements to handle the new wastes, including their scheduling, should be discussed. Any pretreatment of the wastewater before it is discharged into the public system should be discussed under this section, including the nature of the pre-treatment and the wastewater composition and quantity after pre-treatment. Any sludges or other materials removed from the wastewater during pre-treatment must be discussed under the appropriate sections of EAW Item 12.

2) Where the method proposed is on-site sewage treatment systems such as septic tanks and drainfields or similar soil absorption facilities, this response must address the suitability of the site conditions for the use of such systems, and should be focused on demonstrating that the systems will function adequately. Where there will be on-site systems on separate lots, the discussion should demonstrate that each system can be reasonably expected to function. Where site conditions require special methods to allow on-site systems to work properly, the proposed methods should be discussed, including information about how they will be employed. Note any local restrictions or prohibitions of certain types of on-site treatments systems, and any project details which accommodate these local restrictions.

Additional Resources regarding shallow groundwater:

- Site-Specific Well logs
- DNR’s observation well network: http://www.dnr.state.mn.us/waters/groundwater_section/obwell/locations.html
- Lake Level information: http://www.dnr.state.mn.us/climate/waterlevels/lakes/index.html
- MPCA groundwater web page: http://www.pca.state.mn.us/0agx947
3) This response must include identification of receiving waters for discharges, including tile lines, ditches, streams, lakes, or other surface or ground waters. This includes any downstream waters that may be noticeably influenced by the discharge, especially those more sensitive or more valuable than the waters receiving the direct discharge. An estimate of the impact of the discharge(s) on the quality of the receiving waters should be made. The level of sophistication of this analysis must be guided by the likely magnitude of the impact and the importance of the water body(ies) affected. Where it is clear on the basis of the amounts and quality of the discharge compared to the volume, quality and assimilative capacity of the receiving waters that only a minor degradation of water quality will occur, and no noticeable impairment of uses of the water would result, only a qualitative discussion is generally needed. Where noticeable impairment may occur, however, more quantitative assessment methods should be employed, and predictions should be made about whether any water quality standards will be violated.

In the event that a wastewater discharge may degrade a lake, a numerical nutrient budget analysis may be required. However, it is unlikely that any new discharges to any lake would be permitted by the MPCA. Any nutrient budget should be based on a generally accepted model of a lake’s response to increase in phosphorus loading or other critical nutrients if phosphorus is not limiting. The choice of a model should be based on available data, and its expected accuracy based on the likely magnitude of the impact, in addition to the time and costs of using the model. In other words, the greater the likely impact, the greater the need for a more sophisticated model. If insufficient data is available to allow the use of any numerical model, it is necessary to gather the minimally needed data unless the EAW can establish through other analysis that there is no reason to expect noticeable degradation. If the matter is left in doubt in the EAW, it may result in calls for an EIS and a more in-depth analysis.

If receiving water is impaired, identify if the wastewater will contribute to the condition or numeric impairment. If a TMDL has been completed, describe how the discharge relates to the load allocations. If an implementation plan has been developed, describe how the discharge relates to the plan.

ii. Stormwater. The intent of this question is to characterize the effect of the project on the amounts and the composition of stormwater runoff from the site and the techniques planned to minimize adverse impacts from stormwater quantity and quality. Specific erosion and sedimentation control measures for both during and after construction should be described.

If the proposer has not prepared definite plans for these measures, the requirements of the local governmental unit and the MPCA should be described and how those requirements mitigate the impacts. Projects that disturb more than one acre need to apply for and receive coverage under the MPCA Construction Stormwater General NPDES Permit.

Some site features such as highly erodible soils (identified in Item 10), steep slopes, and sensitive receiving waters will require special attention to avoid adverse environmental effects. The MPCA has identified increased Best Management Practices (BMPs) that are required to be used in areas discharging to and within one mile of designated Special or Impaired Waters. If applicable these BMPs should be identified and discussed. These BMPs are included as Appendix A of the Construction Stormwater General Permit. The permit and list of Special Waters and Impaired Waters can be accessed from the MPCA website.

Additional Resources:
- MPCA web page on Subsurface Sewage Treatment Systems: [http://www.pca.state.mn.us/udgxb09](http://www.pca.state.mn.us/udgxb09)
An estimate of the stormwater impact on the quality of receiving waters should be made. The level of sophistication of this analysis must be guided by the likely magnitude of the impact and the sensitivity of the water body(ies) affected. Where it is clear that only a minor degradation of water quality and negligible impairment of water use would result, only a general qualitative discussion is needed. Where noticeable impairment may occur, however, more quantitative assessment methods should be employed, and predictions should be made about whether any water quality standards will be violated. Factors to consider when making this decision include: amount of impervious surface proposed, degree and location of excavation activities, proposed activities that could result in exposure of contaminants to stormwater, water quality impairments—especially impairments for turbidity, nutrients, and aquatic life, and trout streams (including the potential for thermal impacts).

A stormwater discharge that may affect a lake is an example of a situation in which the RGU must exercise judgment about the extent of analysis needed. Generally regarded as sensitive and valued resources, the lake may require a numerical nutrient budget analysis to adequately characterize the extent of the potential impact. Any nutrient budget analysis performed should be based on a generally accepted model of a lake’s response to an increase in phosphorus loading or other critical nutrients if phosphorus is not the limiting factor. The choice of a model should be based on available data, and its expected accuracy based on the likely magnitude of the impact, in addition to the time and costs of using the model. In other words, the greater likelihood of the impact, the greater the need is for a more sophisticated model. If insufficient data is available to allow the use of any numerical model, it is necessary to gather the minimally needed data unless the EAW can establish through other analysis that there is no reason to expect noticeable degradation. If the matter is left in doubt in the EAW, it may result in requests for an EIS for the project and, associated with that, a more in-depth analysis.

The amount of detail provided about management or treatment methods should befit the significance of the quantities and quality of the runoff. Where it is clear or suspected that the stormwater runoff associated with the project would pose water quality problems if not adequately managed or treated, sufficient detail is needed so that reviewers can judge the adequacy of the proposed system. Locations, dimensions and design capacities of detention or retention basins should be given if they will be used to manage runoff. The EAW should discuss the conformance of the proposed system with any applicable requirements of the local unit of government and any watershed district with jurisdiction over the area, such as ensuring stormwater pipes are designed for larger storm events, and ensuring that projects that impact municipal storm and sewer pipes do not create or exacerbate potential overflow and contamination concerns due to connected storm and sewer pipes. If the project is subject to a Stormwater Pollution Prevention Plan (SWPPP), it should be discussed in the EAW.

iii. Water Appropriation. The EAW should describe any water use such as water supply, dust control, dewatering or pond testing, and give the source and the permit number if there is an existing appropriation. Distinguish between temporary construction water use and ongoing operational water use. Appropriation of water in excess of 10,000 gallons per day or one million gallons per year requires permits from the DNR Division of Waters. If a project requires an appropriation permit it is suggested that the proposer or RGU contact the applicable DNR regional or area hydrologist’s offices to determine what information should be provided. In cases of major appropriations (permitted water appropriations in excess of 100 million gallons/year), or where cumulative appropriations are great, it may be necessary to include a quantitative analysis of the impacts on ground water levels.
Environmental effects from water appropriation should focus on the ability of the water source to supply the needed water (drawdown) and the effects to surface water features that are dependent on groundwater. Groundwater appropriations need to consider their effect on groundwater dependent features such as calcareous fens, springs, seeps, and trout streams. These groundwater dependent features can be affected by water appropriations as far away as ten miles depending on the aquifer proposed for groundwater appropriation. Because of this potential, the proposer or RGU should contact the DNR to determine if a pump test should be conducted as part of the EAW data submittal.

Legislation in 2013 created new requirements for EAWs. When an EAW is required for a project with the potential to require a groundwater appropriation permit from the commissioner of natural resources, the EAW must include “an assessment of the water resources available for appropriation.” This subitem regarding water appropriation must describe how water availability was determined.

If a dewatering appropriation is proposed, include a description of proposed treatment of any dewatering discharge in response to EAW Item 11.b.i. Wastewater.

You must have a licensed well contractor and a permit from MDH or the local board of health with delegated authority. Before the construction of any new wells, including monitoring wells and dewatering wells, consult the Well Management Program of MDH for more information about wells and well construction requirements.

### Additional Resources:


If the project requires the creation, connection or a change to public water supply, it is important to identify wells that will be used as water sources. Plans for the creation, connection or changes to a public water supply may need to be reviewed and approved by MDH. Contact the department’s public water supply program for more information.

### iv. Surface Waters

#### a) Wetland alterations

Wetlands in Minnesota are regulated under state or federal permit programs. Therefore, proposed modifications of all wetlands should be discussed. Wetlands should be identified as either “public waters wetlands,” which are subject to DNR regulation, or wetlands regulated under the Minnesota Wetland Conservation Act.

### Additional Resources:

- Public Waters Permit Program information is available at DNR regional or area hydrologist offices or online at: [http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/requirements.html)

- Wetland Conservation Act (Minnesota Rules Chapter 8420) information is available from the county soil and water conservation district office or online at: [http://www.bwsr.state.mn.us/wetlands/regulation.html](http://www.bwsr.state.mn.us/wetlands/regulation.html)
Any modification to wetlands identified in Item 11.a. should be discussed, including direct effects such as draining, filling, excavating, dredging, or vegetation removal. Indirect effects such as alteration or changes in hydrologic regime also need to be discussed, including changes that would alter the type of vegetation or other characteristics of the wetland. Proposals to convert or use natural wetlands as stormwater management systems and effects of the stormwater on the function of the wetland should also be discussed.

Applicable federal and state wetland protection regulations require impacts to wetlands to be avoided and/or minimized. For proposed wetland impacts that are genuinely considered “unavoidable,” compensatory wetland mitigation, (replacement), is typically required. The response to this item should therefore identify the alternatives that were considered to impacting any wetlands. It should also explain the viability of locating the required compensatory mitigation for unavoidable wetland impacts within the same minor or major watershed. Also, if the proposed project will result in a net loss of wetlands within the same minor or major watershed, the EAW must explain the anticipated effects this will have to the host watershed (e.g., lost function and quality of those wetlands).

b) Other Surface Waters
Physical or hydrologic alteration of any surface water or its shoreline should be discussed in this question unless the hydrologic alteration is due to a water appropriation that was discussed in response to Item 11.d, or a wetland impact that was described just above in 11.iv.a). Examples of proposed activities that should be described here include such things as: placement of rip rap, in-channel work, in-water work, docks, water access, dewatering, dredging, culvert placement, and hydrologic modification. Distinguish between temporary construction effects and permanent changes.

Hydrologic modifications include all actions which alter the existing hydrologic regime, that is, rate of discharge into or out of a water body, frequency and extent of water level fluctuations, and interaction with groundwater. The description of the alteration should address the following: the construction process; volumes of dredged or fill material; the area to be affected; the timing and magnitudes of fluctuations in water surface elevations; spoils disposal sites; and any other relevant information such as geomorphology, limnology, ecology, timing of construction, and changes in surface water area.

Identify the specific in-water BMPs that will be employed during the project to prevent or reduce turbidity/sedimentation from discharging uncontrollably downstream (e.g., dredging activities or the installation/replacement of culverts or bridges in streams or rivers).

Work in public waters below the Ordinary High Water (OHW) level will require a Work in Public Waters permit. Information on permits required for alteration of, or construction in, aquatic areas may be obtained from DNR regional or area hydrologist offices.

Additional Resources:
- MPCA Wetlands/401 Certification web page is located here: [http://www.pca.state.mn.us/sbizb03](http://www.pca.state.mn.us/sbizb03)
Category Specific Guidance:

Residential development (Subp 19 and 19a): For projects along lakes or rivers, discuss the consistency of the project with the applicable shoreland, flood plain and special river management district ordinances, indicating how any inconsistencies will be resolved. Indicate whether the local ordinances have been officially approved by the DNR. For projects along lakes and rivers, address the impact of the project on water surface use. If on-site sewage systems will be used, discuss in Item 11.b.i in detail the suitability of the site conditions such as soils, terrain and lot sizes, and the potential for impacts on the ground water and surface waters, especially any lakes. The discussion should include information about local requirements for such systems.

Recreational development (Subp 20 and 20a): If on-site sewage systems will be used, discuss in detail the suitability of the site conditions – soils, terrain, lot sizes – and the potential for impacts on the ground water and surface waters, especially any lakes. The discussion should include information about local requirements for such systems. If effluent may impact a lake, a nutrient budget analysis should be included.

Airport projects (Subp 21): Discuss stormwater management and deicing management systems.

Barge fleeting (Subp 23): Discuss impacts of construction and operation on the benthic (bottom) and aquatic habitat. Address in detail the potential conflicts between the barges and other watercraft. Discuss the potential for water pollution from spills of any materials carried on or transferred to or from barges, and any mitigation measures to be used.

Marinas (Subp 25): If the project involves any dredging, details should be given about excavation, including construction methods; timing; volumes of dredged material; composition, with special attention to any contaminants which may be present; spoils disposal methods and location; and mitigation measures to minimize impacts of both dredging and spoils disposal, such as treatment of spoils site runoff. Disposal of dredge spoils may require an NPDES/SDS Dredged Disposal permit from the MPCA. Information should be obtained from the DNR or other agencies about existing watercraft use. The number and types of watercraft expected at the marina should be estimated, along with use characteristics: peak and average use, timing and length of season. In regard to over-crowding, provide at least an estimate of the number of acres of water surface per watercraft with and without the marina. Discuss the potential for water pollution from spills, runoff from the onshore facilities or any other sources, and any mitigation measures to be used.

Stream Diversion (Sub 26): Include a detailed explanation of how and when excavation will be done; excavation acreage and cubic yardage; where the spoils will be deposited; measures to be taken to protect the rest of the stream from sedimentation during construction; and measures to stabilize the new channel and spoils to prevent erosion after construction. Disposal of the dredged spoils may require an NPDES/SDS Dredged Disposal permit from the MPCA.

Wetlands and public waters (Subp 27): Describe in detail the physical changes to be made in the wetland or water body, including timing of work; methods of work; volumes, composition and placement of excavated materials or fill materials; and mitigation measures to prevent erosion and sedimentation.

Historical Places (Subp 31): For Item 11.a.ii, discuss if wells will be abandoned.

Sports or entertainment facilities (Subp 34): Discuss in detail surface water runoff issues and mitigations.

This item is divided into four sections: existing contamination, solid waste, hazardous materials, and hazardous wastes. Some of the project features described under this item may relate to items discussed in Items 10.a Geology, 10.b. Soils and Topography, and 11.a.ii. Groundwater.

a. Pre-project site conditions
Include information from the MPCA “What’s in My Neighborhood?” database. Include the result of a Phase I or Phase II Environmental Assessment, if one has been conducted.

Additional Resources:

- The MPCA mapping tool “What’s in My Neighborhood?” is located at the web page: http://www.pca.state.mn.us/udgx680
- The MPCA cleanup programs web page is located here: http://www.pca.state.mn.us/udgx7fa

b. Project Related Generation/Storage of Solid Waste
All types of solid wastes generated by the project that are not considered wastewaters, air emissions, or hazardous wastes should be identified within this section. This includes all forms of “solid wastes,” any sludges, any ashes from combustion, demolition wastes, construction wastes and asbestos. Estimates of the composition and quantities should be provided. For common types of wastes of fairly uniform composition, such as municipal solid waste, the composition need not be identified other than by the type of waste.

The method and location of disposal of all the solid wastes listed should be provided. This should include information demonstrating that the proposed method and location is environmentally acceptable. If special precautions will be taken to prevent problems, these should be described.

Discuss source separation, recycling, waste minimization and reduction assessment plans as appropriate.

c. Project Related Use/Storage of Hazardous Materials
List any chemicals or other substances that will be on the site for any purpose. The level of detail provided should be commensurate with the likelihood that the materials could enter the groundwater or surface water. Describe the risk associated with the materials and the quantities present or used.

The anticipated contents of all tanks should be specified. It may be useful to show the location of tanks on a site map or plan. If special precautions will be taken to prevent leaks or other problems, these should be indicated, including emergency response containment plans.

d. Project Related Generation/Storage of Hazardous Wastes
If hazardous wastes will be generated by the proposed project, include a chemical analysis of the waste along with how it was determined. Estimates of the composition and quantities should be given.

The method and location of storage and disposal of all the wastes should be provided. This should include information demonstrating that the proposed method and location is environmentally acceptable. If special precautions will be taken to prevent problems, these should be described.

Discuss source separation, recycling, hazardous waste minimization and reduction assessment plans as appropriate.
Category Specific Guidance:

Barge fleeting (Subp 23): Note any onshore tanks.

Marinas (Subp 25): Note any onshore tanks.

Historical Places (Subp 31): Address the disposal of demolition debris. Also discuss any storage tanks or wastes at the site which will require special handling for removal and disposal, including asbestos.
13. **Fish, wildlife, plant communities, and sensitive ecological resources (rare features)**

This item is divided into four sections, the first two sections are meant to describe fish, wildlife, plant communities, and sensitive ecological resources within or in close proximity to the site. The third section is meant to provide a discussion on how the project will affect these features. The fourth section is meant for identification of measures or mitigations that have been incorporated into the project to avoid or minimize effects to these features.

### a. Fish, wildlife, habitat, and vegetation

State and federally designated refuges, trout streams, and other areas dedicated to fish and wildlife habitat are well defined. Examples of designated habitat areas include Wildlife Management Areas, Waterfowl Production Areas, Wildlife Refuge Inventories, Reinvest in Minnesota (RIM) easements, wild rice lakes, migratory waterfowl feeding and resting lakes, Outstanding Resource Value Waters (ORVWs), and identified Regionally Significant Ecological Areas in the seven county Metro Area.

However, fish and wildlife habitat areas exist throughout the state and are not all specifically designated. Nearly all undeveloped land has some wildlife habitat value. The quality and value of the habitat depends on many factors including the degree of disturbance, the nature of the adjoining areas, and the area and type of vegetation or water resources present. The presence of habitats within the project area is to be identified here and any project-related effects described in response to EAW Item 13.c.

Questions about the presence and value of the habitat can be directed to regional offices of the DNR. Keep in mind, however, that it is the responsibility of the RGU to determine the nature and significance of any project-related impacts. It often is necessary to hire a specialist to conduct a field survey of the site. This is especially true if unusually valuable or extensive habitat may be impacted.

### Additional Resources:

- Regionally Significant Ecological Areas in the seven county Metro: [http://www.dnr.state.mn.us/rsea/map.html](http://www.dnr.state.mn.us/rsea/map.html)
- Wildlife Management Areas: [http://www.dnr.state.mn.us/wmas/index.html](http://www.dnr.state.mn.us/wmas/index.html)
- Trout Streams: [http://www.dnr.state.mn.us/fishing/trout_streams/index.html](http://www.dnr.state.mn.us/fishing/trout_streams/index.html)
- Reinvest in Minnesota (RIM) Conservation Easements: [http://maps.bwsr.state.mn.us/rimonline/](http://maps.bwsr.state.mn.us/rimonline/)
- GIS data for designated habitat areas can be downloaded at: [http://deli.dnr.state.mn.us/](http://deli.dnr.state.mn.us/)

Another information source for identifying important wildlife habitats is *Tomorrow’s Habitat for the Wild & Rare: an Action Plan for MN Wildlife*, DNR, 2006. This comprehensive wildlife conservation strategy can be used to identify the Ecological Classification System Subsection where the project is located. Information also can be found to assist identifying key habitats for wildlife conservation within that subsection.

### Additional Resources:

Determining the presence of key habitats should be done by direct observation and/or by using existing GIS data. Key habitats have not been mapped, but there are other GIS data sources that can assist in identifying potential key habitats. Native plant communities identified as part of the Minnesota County Biological Survey, (MBS), can be used to identify some key habitats. Native plant community data is available on the DNR data deli at.

**Additional Resources:**

- Information on native plant communities is available at [http://www.dnr.state.mn.us/npc/index.html](http://www.dnr.state.mn.us/npc/index.html) or at the DNR data deli at [http://deli.dnr.state.mn.us/](http://deli.dnr.state.mn.us/).

- A listing of key habitats to native plant communities is available at: [http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/key_habitat_by_subsection.pdf](http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/key_habitat_by_subsection.pdf)

In some cases land cover type data can be used to identify potential key habitats. GAP data and Metro Area Cover type data is available from the DNR data deli.

**b. Rare features**

This item refers to unique natural features or features of special significance, including state-listed endangered, threatened and special concern species; native plant communities that are rare statewide such as prairie remnants or virgin timber; locally rare habitats (regionally significant ecological areas); colonial waterbird nesting colonies; Sites of Biodiversity Significance; and high quality wetland complexes. The DNR Division of Ecological and Water Resources maintain the Natural Heritage Information System (NHIS), a collection of databases that provides the most comprehensive information on Minnesota’s rare natural features. The NHIS includes Rare Features Data, including MBS sites of Biodiversity Significance and MBS Native Plant Communities.

This information should be incorporated into the EAW, including the correspondence number for reference. If this information was obtained through a license agreement, include the license agreement number. The EAW should also state whether a habitat assessment or other survey work was conducted. Sensitive ecological resources that are not listed in the NHIS, but are known to occur on the project site, should also be identified and described in the EAW. If any MBS sites are within or adjacent to the project area, please provide this map to the DNR when requesting NHIS data. If rare species surveys are going to be completed, coordination for survey methods should occur with the DNR staff prior to the surveys. Potential impacts to identified rare features should be discussed separately in response to EAW Item 13.c.

**Additional Resources:**

- Minnesota’s List of Endangered, Threatened, And Special Concern Species is available at: [http://www.dnr.state.mn.us/ets/index.html](http://www.dnr.state.mn.us/ets/index.html)

- Information on how to obtain data from the Natural Heritage Information System (NHIS) is available at: [http://files.dnr.state.mn.us/eco/nhnrp/natural_heritage_data.pdf](http://files.dnr.state.mn.us/eco/nhnrp/natural_heritage_data.pdf)

- Minnesota Biological Surveys and Rare Species: [http://www.dnr.state.mn.us/eco/mcbs/maps.html](http://www.dnr.state.mn.us/eco/mcbs/maps.html)

- Rare species guide: [http://www.dnr.state.mn.us/rsg/index.html](http://www.dnr.state.mn.us/rsg/index.html)

- Sites of Biodiversity Significance: [http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html](http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)
c. Discuss project-related effects
This section should include a discussion of any effects to species such as habitat loss, changes in habitat, species avoidance, and fatalities. The presence and potential for the spread or introduction of invasive species should also be discussed in response to this item.

It is important to discuss any effects to fish, wildlife, and habitat in the context of the larger landscape or watershed scale. The project-related effects on important movement corridors, flyways, large intact habitats, nesting areas or habitat complexes will help assess the significance of any effects.

Any potential effects to state-listed threatened, endangered, or special concern species or rare features should be discussed separately. Because these features are rare, any effects have a greater potential for being deemed significant.

Additional Resources:

- DNR Information on Invasive Species: [http://www.dnr.state.mn.us/invasives/index.html](http://www.dnr.state.mn.us/invasives/index.html)

- Information regarding threatened and endangered species is available at: [http://www.dnr.state.mn.us/eco/nhnrp/endangered_permits.html](http://www.dnr.state.mn.us/eco/nhnrp/endangered_permits.html)

d. Mitigation measures
This section should identify any measures that are proposed to avoid, minimize, or mitigate potential effects to fish, wildlife, plant communities, and sensitive ecological resources. If the project size, orientation, or dimensions were adjusted to avoid or minimize effects to species or habitats, this should be identified. Other potential mitigation measures to consider include landscaping or revegetation with plant species of value to wildlife, retaining wooded travel corridors (especially along waterways), and construction or restoration of wetlands.
14. Historic properties

The following sources should be checked for information on any listed/designated historic properties in the project area. The response to the question should include a short description of each property and the reason it is important. Inclusion of photos of these properties may be helpful. Also note the locations of these properties on a map.

a. National Register of Historic Places (NRHP) The State Historic Preservation Office’s (SHPO) website lists properties on the NHRP. SHPO’s inventory files, which must be accessed in-person at the SHPO offices, provide information on properties which are listed in the NRHP. Types of properties include buildings, structures, sites, objects, and districts.

b. State Register of Historic Places (SRHP) The SRHP is published in Minnesota Statutes, section 138.664. The SHPO has information on these properties as well.

c. Local historic property designations. Many local governments have heritage preservation commissions. Many have adopted a heritage preservation ordinance that includes a process for local designation of historic properties (including districts). Contact the local government for information.

The SHPO can provide information about any known resources in the area and may be able to advise the RGU about the potential for undiscovered resources at the site. In cases where such resources are likely on the site, an archaeological survey may need to be completed and reflected in the EAW. An archaeological survey and/or a historical or architectural survey can provide a means to identify historic properties which may be present but which have not been previously identified or evaluated. These surveys may be required by federal, state, or local regulations or review processes, depending on the funding source and/or project review/approval process required for the project. The SHPO web site maintains consultant lists of archaeologists and historians who can complete these surveys.

Discuss any potential effects that the project may have on historic properties. Direct effects and indirect effects (such as visual, auditory, atmospheric, or changes in use) should be considered. Identify any proposed measures to avoid, reduce, and/or mitigate effects.

Additional Resources:

- The main SHPO website: www.mnhs.org/shpo/
- The Inventory Coordinator at the SHPO can be contacted for more information regarding archaeologists and historians: http://www.mnhs.org/shpo/contact.htm

Category Specific Guidance:

Natural areas (Subp 30): Describe historical or architectural property values, including any factors which led to its being placed on the National Register. Information should be obtained from the SHPO and any local historic preservation organizations. Explain any measures to be taken to preserve these values if the property is demolished, such as removing portion for preservation, photographing or documenting. Explain any alternatives to demolition also considered, such as restoration, reuses for another purpose or sale to another owner who would have preserved the property.
15. Visual

Scenic views or vistas may include spectacular viewing points along lakes, rivers or bluffs; virgin timber tracts; prairie remnants; geological features; waterfalls; specimen trees; or plots of wildflowers. Many are not officially designated or marked, but because of their local or statewide interest should be considered by the RGU. It may be helpful to refer back to information in EAW Item 9. Land use to inform potential visual effects to surrounding properties. Impacts on the visual quality or integrity of these resources should be addressed as well as the physical impacts.

Describe any non-routine impacts that may be due to the emission of light or a “visual nuisance” caused by the project during construction or operation. An example of an impact of a light emission is an intense light causing a glare problem for passing motorists. Examples of “visual nuisances” include lights on tall communication towers intruding on the visual integrity of a scenic vista, or a large water vapor plume from an exhaust stack or cooling tower.

Category Specific Guidance:

Communication towers (Subp 33): Visual impact of towers is frequently a concern, and is a legitimate environmental concern when it would detract from an otherwise noteworthy view or vista or when it would intrude on a “wilderness” type view or vista, such as from the Boundary Waters Canoe Area. If the project is near any scenic views or vistas or near an area known for a “wilderness” type of experience, note here and give a description of the potential visual impact on the resource in question. This should at least include an analysis of the “viewshed” of the tower.
16. Air

This item is divided into three sections: stationary source emissions, vehicle emissions, and dust/odors. The regulatory authorities for these three types of air emissions are different so measures to control or mitigate environmental effects may be different in each section.

a. Stationary source emissions

This response should cover all sources of air emissions other than traffic, odor sources and construction-phase dust. The most common sources of such emissions are boilers and industrial processes. The level of detail and the degree of sophistication of the analysis should be commensurate with the magnitude of the emissions and their likely impacts on air quality. Where emissions will be great or contain several or specific regulated air pollutants, quantitative estimates derived from generally accepted air quality models may be necessary.

Any hazardous or criteria air pollutants as well as greenhouse gases must be specifically addressed. Proposers are advised to contact the MPCA Air Quality staff to determine which specific air pollutants need to be included as part of the EAW. Judgment must be exercised in determining the level of information needed for the pollutants carbon dioxide, methane and nitrous oxide from the project in question.

This item includes fugitive dust except construction-phase dust, which is addressed in response to Item 16.c. Fugitive dust is defined as “particulate matter uncontaminated with industrial emissions that becomes airborne due either to the force of wind or man’s activity,” such as dust generated by traffic on unpaved roads or parking areas, or dust from storage piles. The locations of, and distances to, sensitive receptors should be given. Proposed mitigation measures should be identified.

Air emission sources frequently require air quality permits from the MPCA and applications for such permits may require extensive information. In these cases, information in the EAW may be based on information being developed for the air permit. Proposers are advised to consult with the MPCA Air Quality staff regarding air permit requirements prior to preparing the EAW data.

b. Vehicle emissions

The level of detail needed here depends on the magnitude of the traffic congestion due to the project as described in Item 18. When there is no reason to expect traffic congestion, or that existing congestion will not be noticeably worse due to the project, indicate that it will not cause any significant decrease in air quality. However, if EAW Item 18 indicates that the project will substantially worsen traffic conditions, an estimate of the air quality impact of this congestion must be prepared. In addition, any project with a parking capacity of 2,000 or more parking spaces may have to conduct a detailed air quality analysis. For transportation projects, in certain circumstances, a detailed carbon monoxide air quality modeling analysis may be required. The proposer is advised to consult with MPCA Air Quality staff regarding the need for this analysis.

c. Dust and Odors

This section is meant to address potential health-related conditions as well as nuisance conditions from dust and odors. The distance and relationship between the proposed project and potential receptors is an important aspect of assessing these types of environmental effects.

i. Dust. Wind-blown dust from construction, demolition, haul roads and other activities should be described here. Identify minimization or mitigation measures for any generation of dust that is greater than routinely expected during project construction or operation.

ii. Odors. Identify any strong or potentially offensive odors and identify the locations and distances
to sensitive receptors. Describe any mitigation measures used on the project site. Discuss both odors which have potential human health effects and also those which may not pose significant health risks but may result in a reduction or loss of quality of life to surrounding neighbors due to nuisance or annoyance conditions.

**Category Specific Guidance:**

**Non-metallic Mineral Mining (Subp 12):** If the mine will include facilities for the making of asphalt or concrete, information on air emissions should be included here, including fugitive dust from mining, stockpiles and unpaved haul roads.

**Recreational Development (Subp 20 and 20a):** Dust should be addressed if the access to the site is via unpaved roads. If the development is large, vehicle emissions and other air quality impacts should be defined due to traffic increases.

**Highway projects (Subp 22):** Attention should be paid regarding sensitive receptors and mitigation measures.

**Natural Areas (Subp 30):** Discuss demolition noise and dust and plans for mitigation.

**Sports or entertainment facilities (Subp 34):** Particular attention should be paid to vehicle emissions and related air quality impacts and numerical analysis of air quality will generally be necessary.
17. Noise

Any major noise should be described, including information on their levels (dBA) and hours of duration. However, construction noise need not be described unless the construction of the project will be unusually noisy (for example, the blasting of rock); prolonged; affect especially sensitive receptors (a hospital, for example); or otherwise can be expected to have unusual noise impacts during construction.

The locations of and distances to sensitive receptors should be given. For projects in the vicinity of major noise sources, such as highways, railroads or airports, noise levels should be estimated using generally accepted noise prediction models, regardless of whether the noise standards are legally enforceable with respect to the project. Mitigation measures should be identified, and their effects assessed.

Local ordinance requirements regarding noise should be reviewed and discussed, and any accommodations made by the project, any variances sought by the project, or other details related to noise issues should be discussed in this item.

Additional Resources:

- General information on Minnesota noise regulations can be found on the MPCA’s Noise Program website at: [http://www.pca.state.mn.us/iryp46b](http://www.pca.state.mn.us/iryp46b)
- For highway projects, additional guidance regarding noise analysis can be found on the Mn/DOT website at: [http://dotapp7.dot.state.mn.us/edms/download?docId=614361](http://dotapp7.dot.state.mn.us/edms/download?docId=614361)

Category Specific Guidance:

Non-metallic mineral mining (Subp 12): Give sources of noise, characteristics of noise and distances to receptors. Discuss measures to minimize these impacts; indicate the extent to which local permits can impose conditions to minimize impacts.

Recreational Development (Subp 20 and 20a): Describe noise that may be perceived by neighbors as a nuisance, as well as mitigation measures, such as limiting hours of noisy activities.

Airport Projects (Subp 21): Concerns over runway extensions often relate to additional noise from aircraft. The EAW should include a noise analysis determining the project’s potential to meet or exceed noise standards at surrounding land uses. Many airport projects are federally funded and therefore require preparation of a federal Environmental Assessment (EA). This EA may substitute for the EAW form, but additional noise information relating to state standards may be needed.

Sports or entertainment facilities (Subp 34): Noise from amplified music or public address systems should be described and numerical analysis of noise impacts should be included.
18. Transportation

The EAW must provide a reasonable estimate of the impacts on transportation and traffic associated with the proposed project. For projects with only minor traffic generation, it is not necessary to provide the maximum peak hour traffic generated. The trip generation rates used to estimate traffic, (such as trips per household,) and their sources should be identified. It is recommended that the *Institute of Transportation Engineers Trip Generation Manual* be used, unless other numbers are justified for the particular project.

The level of detail of the analysis should be commensurate to the amount of traffic generated and the existing level of traffic congestion. Therefore, the more likely the traffic impacts from the project will contribute to a growing transportation problem, the more detail that should be provided in the EAW. The analysis should consider not only the adjoining roads near the project site, but also other connecting roads that may be adversely impacted. One commonly accepted measure of congestion is the level-of-service and delay times. The EAW must also address the project’s potential impact on the regional transportation system.

If a traffic analysis is being prepared because of the requirements of the local unit of government, that analysis should also be used or included in the EAW, provided that it is based on generally accepted principles of traffic analysis. The RGU for the EAW should be consulted before the EAW analysis is prepared. If vehicular air quality impacts are assessed, as described in EAW Item 16.b, the vehicle air quality analysis method used in the EAW should be consistent with the assumptions of the traffic analysis, including mitigation.

Regardless of location, if the peak hour traffic generated by the project exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation’s Traffic Impact Study Guidance or a similar local guidance.

If the RGU is pursuing a traffic study, they may want to consider including crash data or other traffic safety issues, even though they may not be “environmental” under the definition included in Minnesota Rules 4410.0200 Subp. 23.

**Additional Resources:**

Category Specific Guidance:

Non-Metallic Mineral Mining (Subp 12): Numbers and routing of truck traffic to and from mines are common concerns for nearby residents.

Residential Development (Subp 19 and 19a): Larger residential projects of 250 units or more should provide detailed information on traffic generation from the project.

Recreational Development (Subp 20 and 20a): Provide information about potential traffic impacts and, if appropriate, indicate planned road improvements to accommodate traffic increases as residents near proposed recreational developments are frequently concerned about increases in traffic and effects on access roads.

Highway Projects (Supb 22): Proposers of highway projects should address anticipated traffic to be carried by the roadway. Also address project impacts on connecting roadways, including an analysis of how the project would affect congestion on roadways, and an identification of any other traffic improvements which may be necessary due to this project.

Marinas (Subp 25): Address traffic and parking including traffic flow into, out of and within the marina. Discuss whether the maneuvering of vehicles with boat trailers at the marina may interfere with normal traffic flow on adjoining roads.

Sports or entertainment facilities (Subp 34): Particular attention should be traffic generation and related impacts. Numerical analysis of traffic may be necessary.
19. Cumulative Potential Effects (CPE)

The EAW form requires an analysis of impacts that are not only those of the project under review but also other projects that could contribute similar effects, resulting in a “cumulative potential effect,” which will be referred to as “CPE” throughout the remainder of this section. The definition of CPE is found at Minn. Rules 4410.0200, Subp. 11a, and reads, in part, “Cumulative potential effects” means the effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects.” If the RGU is considering effects on the project or adaptive planning due to climate change, this information can be described either as part of the Cumulative Potential Effects analysis in response to this item or as part of the previous items. The following guidance should be followed by the project proposer, RGU, and any of their agents involved in completing an EAW form; however, the RGU must control decisions about what gets left out or included.

As noted on the EAW Form, CPE can be addressed under each of the previous items or CPE can be addressed in response to EAW Item 19. It is not necessary to address CPE in both locations on the form. However, the same information and level of assessment is needed regardless of where an RGU chooses to place the information in the EAW. If the RGU believes that the item-by-item responses have adequately presented this information, this item may be answered by stating that all necessary cumulative potential effects analysis information has been presented item-by-item (unless the RGU chooses to summarize information under Item 19).

a. Describe Geographic Scales and Timelines

For each environmental effect of the proposed project that may involve CPE, it must be determined if there are any other projects that need to be taken into account. These other projects would be those that may affect the same environmental resources covered by the EAW item as the project under review. One way to think about this is to ask if the “environmental footprints” of the projects overlap. (The definition of CPE refers to other projects in the “environmentally-relevant area.” The EQB staff believes that this area must be determined case-by-case, impact-by-impact; thus, generally it may be preferable to simply think in terms of overlapping footprints.) The definition of CPE specifically states that it makes no difference whether the proposer of the project under review has anything to do with other projects considered by CPE nor whether the RGU has any jurisdiction over other projects. The issue is strictly a technical one, a question of whether similar environmental impacts from multiple projects overlap. The RGU may also consider how small an impact must become before it no longer needs to be analyzed.

b. Past and Future Projects

The definition of CPE gives additional guidance for past and future projects. It states that past projects whose footprints overlap can be treated in terms of their aggregate effects, which in most cases will be the “existing conditions” with respect to the type of impact in question. Typically, there is no need to itemize past projects and their individual contributions; instead the contributions to an environmental impact should be considered as a whole.

For future projects, the CPE definition requires that a future project be considered if it is actually planned or if a basis of expectation for it has been laid. The definition specifies a two-part test in determining whether a project must be considered with five sources of pertinent information.

1. The first half of the test determines whether the future project is “reasonably likely to occur.” The definition lists the following as sources of information that should be scrutinized relative to that question:
   I. whether any applications for permits have been filed with any units of government. Note: This includes units of government other than the RGU and “permit” is a defined term in
II. whether detailed plans and specifications have been prepared regarding the future project;
III. whether the future development is indicated by any adopted comprehensive plans zoning, or other ordinances;
IV. historic or forecasted development trends, and
V. any other factors found to be relevant by the RGU, (for example, the status of funding for the project may be relevant).

The EQB staff believes that each of these sources of information is not intended to be a determining factor that by itself necessarily means that a project is or is not “reasonably likely to occur.” However, in some cases a single piece of information may be found to be definitive. In fact, sometimes the different information sources may contradict each other. For example, the adopted local comprehensive plan might not be consistent with the project as proposed, while other factors tend to predict that it is likely to occur, presumably after the local comprehensive plan is amended. In general, the RGU is advised to synthesize available information from all sources to determine the likelihood that the project in question will, in fact, occur.

2. The second half of the test determines whether “sufficiently detailed information is available about the project to contribute to the understanding of CPE.” Note: Minnesota Rules state that this part of the test is only applied if the first half is met. This half of the test reflects the fact that identifying CPE is not simply an academic exercise, but is a practical effort to predict potential environmental effects as accurately as possible. If in a given case it appears to the RGU that an identified future project is “reasonably likely to occur” but very little specific information is available about its potential impacts, then that future project fails this half of the test and is not considered to have a basis of expectation laid for it; thus, it would not be considered when CPE are evaluated. The same five sources of information as discussed above are to be used to answer the question of whether sufficiently detailed information is available.

In many cases, the RGU may need to consult with other units of government as part of the process of looking for other projects that need to be considered as part of the CPE analysis. It may be useful for the RGU to document any such inquiries to include in its record for the EAW.

c. Determining if CPE could potentially result in significant environmental effects

In order to give proper consideration to the role of CPE in making the EIS need decision, the RGU must have obtained the proper information in EAW preparation. Assuming the RGU has obtained sufficient information about the potential impacts from other past, present and future projects which need to be considered as part of the CPE analyses, Minnesota Rules 4410.0200 11a states that the RGU should examine the information about each of the types of possible CPE with respect to the following factors:

- Factor 1. Whether the cumulative potential effect is significant. This means that the RGU should decide if the sum total of the contributions from all the sources is significant. If the total impact is not significant, then the contribution from the project under review cannot be significant.

- Factor 2. Whether the contribution from the project is significant when viewed in connection with other contributions to the cumulative potential effect. If consideration of the first factor results in a determination that the sum total impact is significant, then the RGU must look to the significance of the contribution from the project under review, viewed in connection with the contributions from other sources.

- Factor 3. The degree to which the project complies with approved mitigation measures specifically designed to address the cumulative potential effect. This factor only applies if some governmental unit (or units) has previously developed and put into effect a plan or program of some sort whose purpose is to specifically mitigate the type of cumulative effect under consideration. Comprehensive land use or water plans can contain recommendations that are intended to be applied broadly for the
purpose of avoiding adverse CPE. Another example of such a plan would be a TMDL plan developed by the PCA for cumulative water pollution abatement for impaired waters. In the common situation where there is no plan, the RGU should make this clear in response to this factor. If there is a qualifying plan, then the question becomes whether the project under review will be in compliance with the specific mitigation prescribed in the plan.

- **Factor 4. The efforts of the proposer to minimize the contributions from the project.** If there is no plan in existence to mitigate a CPE but the proposer has made an effort to avoid or minimize the contribution from the project through design or mitigation, the RGU should take that effort into consideration in determining the significance of the contribution from the project to the cumulative potential effect. For example, has the proposer made only a token effort, or have state-of-the-art measures been incorporated into the analysis? Has the proposer been responsive to suggestions for mitigation from the RGU or from public comments? How do the efforts compare to those of similar projects?

---

**Category Specific Guidance:**

**Non-Metallic Mineral Mining (Subp 12):** If appropriate, discuss how the mine may be expanded in the future, or how the mine relates to past mining in the vicinity with respect to cumulative environmental impacts.

**Highway projects (Subp 22):** Describe the relationship of the present project to the existing highway network and to anticipated future roadways. **NOTE:** Review of highway networks – that is, how the whole is divided up for review purposes – is constrained by Minn. Rules 4410.1000, subp 4, which should be consulted prior to preparing the EAW. Chapter 2 of the Guide to Minnesota Environmental Review Rules also provides guidance on defining “the whole project.”

**Marinas (Subp 25):** Include other marina development up and down the river from the site.
20. Other potential environmental effects
This item is provided in case there are environmental issues and effects from the project which are not specifically discussed under any other items in the EAW. Describe the pre-project resources, the project-related environmental effects, and any proposed mitigation measures.

Category Specific Guidance:

Highway projects (Subp 22): Information may be included here about the alternatives considered in the project design; an alternative discussion location is item 6, need for and purpose of the project.

RGU Certification
The worksheet requires the signature of an authorized official of the RGU. The signature represents certification by the RGU that: (1) the information is complete and accurate; (2) the “complete” project is reviewed by the EAW; there are no aspects of the project such as future “phased actions” or other related “connected actions” that have not been taken into account in the EAW; and (3) the EAW has been properly distributed to the official distribution list, available from the EQB home page at http://www.eqb.state.mn.us/EnvRevGuidanceDocuments.htm, or by contacting the EQB staff. The EQB will not accept an EAW for publication of the notice of availability without an appropriate signature on the worksheet.

Category Specific Guidance:

Residential Development (Subp 19 and 19a): The RGU must use caution when certifying that a complete residential project has been reviewed. Residential projects are frequently developed in stages and the EQB rules have special provisions which apply to them. If the project proposer owns any additional contiguous land on which residential development would be allowable, the RGU must comply with the following EQB rule provisions before signing this certification: 4410.1000, subpart 4; 4410.2000, subpart 4; 4410.4300, subpart 19; and 4410.4400, subpart 14. Additional guidance can be found in Chapter 2 of the Guide to Minnesota Environmental Review Rules. If there is any uncertainty about these requirements, the RGU is advised to consult with the EQB staff as early in the EAW process as possible.

Highway Projects (Subp 22): Before signing, the RGU must verify that the review conforms to part 4410.1000, subpart 4, regarding the division of “network” projects into segments for purposes of review; also see discussion at item 29.
Glossary

Where noted, definitions can be found in Minnesota Statutes 116D and Minnesota Rules 4410.0200. Other definitions have been included based on the context of the document to provide guidance on the Environmental Review program.

**Alternative Urban Areawide Review**
A substitute review process based on review of development scenarios for an entire geographic area rather than for a specific project. (Minn. R. 4410.3610 Subp 1)

**Connected actions**
Two or more projects that are related, interdependent parts of a larger whole. (Minn. R. 4410.0200 Subp 9c)

**Construction**
Any activity that directly alters the environment, excluding surveying or mapping. (Minn. R. 4410.0200 Subp 10)

**Cumulative potential effects**
The effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects planned or for which a basis of expectation has been laid, regardless of who undertakes the projects or what jurisdictions have authority over the projects. Significant cumulative potential effects can result from individually minor projects taking place over a period of time. In making these determinations, the RGU must consider: whether applications for permits have been filed with any units of government; whether detailed project plans and specifications have been prepared; whether future development is indicated by adopted comprehensive plans or zoning or other ordinances; whether future development is indicated by historic or forecasted trends; and any other relevant factors. (Minn. R. 4410.0200 Subp 11a.)

**Day**
Either calendar or working day depending on the timeframe listed for a specific event. If the text lists 15 or fewer days, they are working days; calendar days are 16 or more days. The first day of any time period is not counted but the final day is counted. The last day of the time period ends with normal business hours, generally at 4:30 p.m. Working days exclude Saturdays, Sundays and legal state holidays. (Minn. R. 4410.0200 Subp 12)

**Discretionary review**
Environmental review ordered by any government unit, usually in response to a citizen petition, where review is not mandatory.

**Environmental Assessment Worksheet**
A document providing basic information about a project that may have the potential for significant environmental effects. The EAW is prepared by the Responsible Governmental Unit to determine whether an Environmental Impact Statement should be prepared. (Minn. R. 4410.0200 Subp 24)

**Environmental Impact Statement**
A thorough study of a project with potential for significant environmental impacts, including evaluation of alternatives and mitigation. (Minn. R. 4410.0200 Subp 26)

**Environmental Quality Board**
State agency that adopts environmental review rules, monitors their effectiveness and revises as appropriate; provides technical assistance to interpret and apply rules. (Minn. Stat. §116C.04)

**EQB Monitor**
Biweekly publication of the Environmental Quality Board, lists deadlines for comments on Environmental Assessment Worksheets, Environmental Impact Statements and other notices. (Adapted from Minn. R. 4405.0100 Subp 6)

**Expansion**
A facility’s capability to produce or operate beyond its existing capacity, excluding repairs or renovations that do not increase capacity. (Minn. R. 4410.0200 Subp. 28)

**Mandatory review**
Legally required review, established by the Environmental Quality Board through rules authorized by the Environmental Policy Act.

**Mitigation**
A. avoiding impacts altogether;
B. minimizing impacts by limiting the project;
C. rectifying impacts by repairing, rehabilitating, or
restoring the affected environment;
D. reducing or eliminating impacts by preservation and maintenance operations during the life of the project;
E. compensating for impacts by replacing or providing substitute resources or environments; or
F. reducing or avoiding impacts via pollution prevention. (Minn. R. 4410.0200 Subp 51)

**Mitigation plan**
An action plan developed in an Alternative Urban Areawide Review for how environmental effects will be avoided, including mitigation measures, legal and financial measures and institutional arrangements.

**Phased actions**
Two or more projects by the same proposer that will have environmental effects on the same geographic area and will occur sequentially over a limited time period. (Minn. R. 4410.0200 Subp 60)

**Responsible Governmental Unit**
Government unit responsible for environmental review, usually the unit with the greatest authority over the project as a whole. Using a standardized process, the RGU prepares an EAW or EIS when required by the rules. (Minn. R. 4410.0200 Subp 75)

**Scoping**
Process to identify what potential environmental impacts, alternatives and other issues will be addressed in the EIS.
Exhibit 6
August 26, 2019

Via electronic submission to www.regulations.gov
ATTN: Docket ID No. CEQ-2019-0002

Edward A. Boling
Associate Director for the National Environmental Policy Act
Council on Environmental Quality
730 Jackson Place, NW
Washington, DC 20503

Re: Draft National Environmental Policy Act Guidance on Consideration of
Docket No. CEQ-2019-0002

Dear Associate Director Boling:


CEQ’s Draft Guidance is inconsistent with the National Environmental Policy Act (“NEPA”), 42 U.S.C. § 4321 et seq., and should be withdrawn for several reasons. First, although the Draft Guidance focuses on greenhouse gas (“GHG”) emissions, it fails to address climate change and its impacts. NEPA does not permit, and CEQ may not direct, agencies to ignore the well-documented impacts of climate change in their environmental impact analyses. Second, the Draft Guidance undermines NEPA’s full-disclosure purpose and conflicts with NEPA’s requirements in multiple ways, including: by failing to provide clarity on how agencies should analyze indirect climate change impacts; by inadequately considering cumulative impacts; by improperly minimizing the analytical value of monetizing climate impacts and supporting an unbalanced approach to cost-benefit analysis; by discouraging analysis and mitigation of a project’s climate impacts; and by failing to direct federal agencies to consider climate adaptation and resiliency when analyzing a project’s environmental impacts and

mitigation for those impacts. In the States’ experience, a robust assessment of climate impacts is not only possible but is also critical to adequate review of environmental impacts under NEPA and its state analogues.

Rather than providing clarity, CEQ rejects the positions taken in its prior administrative guidance on the analysis of climate change impacts required under NEPA with an unsupported and outdated three-page document that does not take the threat of climate change seriously. In so doing, CEQ is creating additional legal risk for both federal agencies and project applicants. For all of these reasons, detailed below, we urge CEQ to abandon this Draft Guidance. In addition, we request that CEQ revise and readopt the previous “Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews” (“2016 Guidance”) issued in 2016 and withdrawn in 2017. If readopted, the 2016 Guidance should be updated consistent with current case law interpreting NEPA and strengthened to reflect the severe and pervasive threats from climate change.

I. THE CRITICAL IMPORTANCE OF ADDRESSING CLIMATE CHANGE

It is well accepted that human-caused or “anthropogenic” GHG emissions are driving climate change that endangers the public health and welfare. Global GHG emissions reached an all-time high in 2018, underscoring the need for more immediate and stronger action to address climate change. And global annual average temperatures have “increased by more than 1.2°F (0.65°C) for the period 1986-2016 relative to 1901-1960.” Moreover, recent international assessments of climate change and its impacts demonstrate the urgency and enormity of the situation. In October 2018, the leading international body of climate scientists—the Nobel-prize-winning Intergovernmental Panel on Climate Change (“IPCC”)—issued a report finding that, absent substantial GHG reductions by 2030 and net zero emissions by 2050, warming above

---

2 Because existing NEPA regulations do not specifically address GHG impacts analysis, CEQ’s Draft Guidance represents the only guidance on GHG analysis from the NEPA expert administrative agency.


1.5°C (2.7°F) from pre-industrial levels is likely and would have wide-ranging and devastating consequences.7

The federal government has also previously recognized the severe and growing threats posed by climate change. In 2017, thirteen federal agencies released the first volume of the Fourth National Climate Assessment (“Assessment”), concluding that “[c]hanges in the characteristics of extreme events are particularly important for human safety, infrastructure, agriculture, water quality and quantity, and natural ecosystems. Heavy rainfall is increasing in intensity and frequency across the United States and globally and is expected to continue to increase.”8 On November 23, 2018, the same group of thirteen federal agencies released the second volume of the Assessment, which thoroughly evaluates the harmful impacts of climate change that different regions of the country are experiencing and the projected risks climate change poses to our health, environment, economy, and national security.9 The Assessment reflects the work of more than 300 governmental and non-governmental experts, was externally peer-reviewed by a committee of the National Academies of Sciences, Engineering and Medicine, and underwent several rounds of technical and policy review by the federal agencies of the U.S. Global Change Research Program.10 The two volumes of the Assessment represent the federal government’s most up-to-date and comprehensive analysis of climate science and the impacts of climate change on the United States.11

The second volume of the Assessment cautions that “[i]n the absence of significant global mitigation action and regional adaptation efforts, rising temperatures, sea level rise, and changes in extreme events are expected to increasingly disrupt and damage critical infrastructure and property, labor productivity, and the vitality of our communities.”12 Further, “[w]hile mitigation and adaptation efforts have expanded substantially in the last four years, they do not yet approach the scale considered necessary to avoid substantial damages to the economy, environment, and human health over the coming decades.”13 Documenting many of the record-setting phenomena we have recently seen, including fires, floods, other extreme weather, and sea level rise, the second volume emphasizes the increasing vulnerability of our built environment as these phenomena become the new normal or even more extreme.14 Additional studies support these disturbing findings. For instance, a modeling analysis of 22 recent hurricanes by U.S.

---

8 Assessment, Volume I, supra note 6, at 10.
10 Id. at iii, 2.
12 Assessment, Volume II, supra note 9, at 25-32 (Summary Findings).
13 Id. at 26.
14 See, e.g., id. at 444, 669-1,308 (documenting regional impacts of climate change).
government scientists concluded that future hurricanes will have stronger maximum winds, move slower, and drop more precipitation.\footnote{Gutmann et al., Changes in Hurricanes from a 13-Yr. Convection-Permitting Pseudo-Global Warming Simulation, 31 J. CLIMATE 3,643 (Jan. 24, 2018) (abstract), \url{https://doi.org/10.1175/JCLI-D-17-0391.1}.}

The States are already facing these severe impacts of climate change.\footnote{A detailed summary of state-specific climate change impacts is set forth in the Comments of Attorneys General of New York, et al. on Proposed Rule: Emission Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units: Emission Guideline Implementing Regulations; New Source Review Program, Appendix A: Climate Change Impacts, Docket Id. No. EPA-HQ-OAR-2017-0355-24817 (Oct. 31, 2018), \url{https://www.regulations.gov/document?D=EPA-HQ-OAR-2017-0355-24817}.} In California, climate change is responsible for successive record-breaking fire seasons resulting in unprecedented loss of life and billions of dollars in damages and economic harm. The 2017 wildfire season killed dozens of people, destroyed thousands of homes, forced hundreds of thousands to evacuate, and burned more than half a million acres.\footnote{Lauren Tierney, The Grim Scope of 2017’s California Wildfire Season Is Now Clear. The Danger’s Not Over., WASH. POST (Jan. 4, 2018), \url{https://www.washingtonpost.com/graphics/2017/national/california-wildfires-comparison/}.} In August 2018, before the devastating Camp Fire that killed more than 80 people, California released a report suggesting that large wildfires (greater than 25,000 acres) could become 50\% more frequent by the end of the century if GHG emissions are not reduced.\footnote{Bedsworth, L. et al., 2018 Statewide Summary Report, California’s Fourth Climate Change Assessment at 9 (2018), \url{www.climateassessment.ca.gov}.} Climate change is expected to make longer and more severe wildfire seasons the new normal for California.\footnote{See California Department of Forestry and Fire Protection, California’s Forests and Rangelands: 2010 Assessment, Ch. 3-7 (2010), \url{https://frap.fire.ca.gov/media/3179/assessment2010.pdf}.} Besides the immediate threats they pose to life and property, wildfires significantly impair both air quality (via smoke and ash that can hospitalize residents) and water quality (via the erosion of hillsides stripped of their vegetation). California also weathered a historic five-year drought and a variety of other unprecedented phenomena increasingly harming the health and prosperity of Californians from all parts of the state.\footnote{See generally California Air Resources Board, California’s 2017 Climate Change Scoping Plan Update: The Strategy for Achieving California’s 2030 Greenhouse Gas Target, (Nov. 2017), \url{https://ww3.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf}.} Drought conditions beginning in 2012 left reservoirs across the state at record low levels, often no more than a quarter of their capacity. By 2015, the Sierra snowpack—critical to California’s water supply, tourism industry, and hydroelectric power—was the smallest in at least 500 years.\footnote{See NOAA, National Centers for Environmental Information, Multi-Century Evaluation of Sierra Nevada Snowpack, \url{https://www.ncdc.noaa.gov/news/multi-century-evaluation-sierra-nevada-snowpack}.} In the Central Valley, the drought cost California agriculture about $2.7 billion and more than 20,000 jobs in 2015 alone.\footnote{California’s 2017 Climate Change Scoping Plan Update, supra note 20, at 7.}

With over six-hundred miles of coastline and 2.2 million people living in shoreline towns and communities, Connecticut’s residents are extremely vulnerable to the impacts of climate events. Connecticut has already experienced significant damage to natural resources, homes, and
infrastructure from more frequent and more intense storms, which is consistent with scientists’ predictions of new weather patterns attributable to climate change.23 For example, in Connecticut alone, Hurricane Irene (2011) caused power outages affecting 754,000 citizens, and Superstorm Sandy (2012) forced a shutdown of Connecticut’s transportation system, causing power outages to 600,000 people and inflicting almost $2 billion in statewide damages.24 Superstorm Sandy forced evacuations of thousands of Connecticut residents, damaged roads and infrastructure, and took nine days for the affected utilities to restore power.25

As one of the most low-lying states in the nation, Delaware is particularly at risk from the harms of climate change, including sea level rise. For example, a 2012 Delaware Sea Level Rise Vulnerability Assessment found that sea level rise of only 0.5 meters would inundate 8% of the state’s land area.26 Areas inundated would include “transportation and port infrastructure, historic fishing villages, resort towns, agricultural fields, wastewater treatment facilities and vast stretches of wetlands and wildlife habitat of hemispheric importance.”27 The Assessment concluded that “every Delawarean is likely to be affected by sea level rise whether through increased costs of maintaining public infrastructure, decreased tax base, loss of recreational opportunities and wildlife habitat, or loss of community character.”28

As a densely populated area located at the confluence of two tidal rivers, the District of Columbia is particularly vulnerable to the effects of climate change including dangerous heat waves, flooding caused by rising tides and heavy rains, and severe weather. Nuisance flooding in riverfront areas has already increased by more than 300% according to the National Oceanic and Atmospheric Administration.29 The U.S. Army Corps of Engineers conservatively predicts up to 3.4 feet of additional sea level rise in the District by 2080.30 Heat emergencies are also projected to increase from 30 days per year (historic average) to 30-45 days by the 2050s, and to 40-75 days by the 2080s.31

27 Id.
28 Id.
30 Id.
31 Id. at A2.
In addition to threatening the lives of Illinois citizens, climate change is fundamentally altering the state’s farming industry and greatest environmental asset, Lake Michigan. The farming sector is particularly vulnerable. In spring 2019, record flooding delayed crop planting across the state, causing the U.S. Department of Agriculture to declare an agricultural disaster for the entire state. 32 Climate disruption also contributes to whipsawing water levels on Lake Michigan. In January 2013, the Lake Michigan’s water level fell to an all-time low. In 2015, the water level then climbed to its highest level since 1998. 33 These rapid changes harm commercial shipping, recreational boaters, wildlife, and beach-goers.

By 2100, Massachusetts is projected to experience between 4.0 and 7.6 feet of sea level rise relative to mean sea level from the year 2000, with up to 10.2 feet of sea level rise possible under a high emissions scenario. 34 Warmer temperatures, extended heat waves, increased frequency and extent of flooding, changing precipitation, and increasingly severe weather events are already significantly impacting public health, the environment, and agriculture in Massachusetts, causing significant property damage, and straining key infrastructure including transportation networks, wastewater treatment systems, drinking water sources, and energy infrastructure. 35

New York is experiencing dramatic increases in the frequency and intensity of extreme rain storms. 36 For example, devastating rainfall from Hurricane Irene in 2011 dropped more than 11 inches of rain in just 24 hours, causing catastrophic flooding, power outages, displacement and loss of life, and estimated damage totaling $1.3 billion. New York’s rate of sea level rise is much higher than the national average and could account for up to six feet of additional rise by 2100 if GHG emissions are not abated. Storm surge on top of high tide on top of sea level rise is a recipe for disaster for coastal New York. For example, the approximately 12 inches of sea level rise New York City has experienced since 1900 may have expanded Hurricane Sandy’s flood area in 2012 by about 25 square miles, flooding the homes of an additional 80,000 people.

in the New York City area alone.\textsuperscript{37} Air pollution in New York may also be worsening due to climate change. According to the Third National Assessment on Climate Change, a scenario in which greenhouse gases continue to increase would lead to higher ground-level ozone concentrations in the New York metropolitan region, driving up the number of ozone-related emergency room visits for asthma in the area by 7.3%—more than 50 additional ozone-related emergency room visits per year in the 2020s, compared to the 1990s.\textsuperscript{38} The New York City metropolitan area experienced elevated ozone pollution levels in the years 2015-2017, a period that included the hottest years on record.\textsuperscript{39}

In Pennsylvania, temperatures have already increased 1.8°F in the last century, and are projected to rise an additional 5.4°F by 2050. Pennsylvania has seen a related rise in precipitation, causing increased flooding and landslides that cost the Commonwealth an additional $125.7 million for infrastructure replacement in 2018 alone. Climate change is also worsening air quality, damaging crops, and increasing the prevalence of invasive species and insect-transmitted diseases.\textsuperscript{40}

Climate change will significantly adversely affect Washington’s public health and its coasts, mountains, and forests. The warming climate already is increasing ocean acidification,\textsuperscript{41} decreasing Washington’s snowpack,\textsuperscript{42} and threatening Washington’s forests and timber industry.\textsuperscript{43} With respect to public health, more frequent heat waves and more frequent and intense flooding may harm human health directly and may also exacerbate health risks from poor air quality and allergens.\textsuperscript{44} In addition, Washington is also experiencing decreasing winter mountain snowpack, and by the 2080s, snow pack is expected to decline 56-70%, impacting water availability for drinking, irrigation, hydropower, and salmon.\textsuperscript{45}

For these reasons, the States are particularly concerned that federal agencies thoroughly consider GHG emissions and the consequences of climate change in their NEPA review and take


\textsuperscript{40} PENN. DEP’T OF ENVTL. PROTECTION, \textit{Climate Change in PA}, \url{https://www.depgis.state.pa.us/ClimateChange/index.html} (last visited Aug. 22, 2019).


\textsuperscript{42} Id.

\textsuperscript{43} Id. at ES-4.

\textsuperscript{44} Id. at ES-4, ES-5.

\textsuperscript{45} Id. at ES-4, 6-1, 6-6, 6-11, 6-12.
a hard look at the full environmental impacts, including climate-related impacts, of any proposed actions.

II. NEPA AND THE COUNCIL ON ENVIRONMENTAL QUALITY

Congress enacted NEPA in 1969 to establish a national policy for the environment and to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of Americans. NEPA is “our basic national charter for protection of the environment.” NEPA’s goals are to ensure agencies consider environmental consequences of their proposed actions and “inform the public about their decision-making process.” Nearly every major federal action requires compliance with NEPA, which also requires consultation with other federal agencies possessing expertise on particular resources impacted by a project, with the aim to help develop more robust alternatives.

NEPA established CEQ within the Executive Office of the President to ensure that federal agencies meet their obligations under NEPA. CEQ reviews and approves federal agency NEPA procedures, approves alternative arrangements for compliance with NEPA in emergencies, and helps to resolve disputes between federal agencies and other governmental entities and members of the public. CEQ oversees NEPA implementation across the nation, principally through issuing regulations and guidance to implement NEPA’s procedural requirements and provide direction to both federal agencies and private project proponents.

Over the past forty years, CEQ’s regulations and guidance have shaped NEPA’s implementation and have become integral to the daily functioning and responsible decision-making of numerous federal and state agencies. CEQ’s guidance also helps provide legal certainty to both federal agencies and private project applicants. And circuit courts reviewing challenges to NEPA compliance often rely on CEQ’s guidance documents as “persuasive authority offering interpretive guidance regarding the meaning of NEPA and the implementing regulations.” Rather than implement or properly interpret the law, however, CEQ’s Draft Guidance undermines NEPA’s letter and spirit, sows confusion about consideration of climate change impacts under NEPA, increases uncertainty, and creates new legal risks for projects subject to NEPA.

48 Draft Guidance, supra note 1, at 30,097.
51 See, e.g., Wyoming v. U.S. Dep’t of Ag., 661 F.3d 1209, 1260 n.36 (10th Cir. 2011); New Mexico ex rel. Richardson v. Bureau of Land Mgmt., 565 F.3d 683, 705 n.25 (10th Cir. 2009); American Rivers v. F.E.R.C., 201 F.3d 1186, 1200-01 & n.21 (9th Cir. 1999).
III. CEQ Unlawfully and Arbitrarily Ignores the Effects of Climate Change in the Draft Guidance

CEQ’s 2016 Guidance offered clarity and consistency in how federal agencies should address climate change—including how climate change may alter an action’s environmental effects—in the environmental impact assessment process. Central to the prior guidance was the goal of identifying important interactions between climate change and environmental impacts from a proposed action. The 2016 Guidance appropriately focused on the environmental risks associated with climate change, recognizing the critical importance of climate change as a “fundamental environmental issue” whose effects “fall squarely within NEPA’s purview.” It also detailed the science on climate change, citing multiple international and federal government studies documenting the impacts of climate change. CEQ also emphasized the need to consider climate change and the evolving body of scientific information available to understand and identify a project’s affected environment.

The Draft Guidance unlawfully and arbitrarily ignores a growing body of scientific literature regarding climate change. Notably absent from the three-page Draft Guidance is any discussion of climate change and its effects. Proper assessment of the effects of GHG emissions requires a recognition—wholly absent in the Draft Guidance—that climate change presents an extremely challenging threat that must be addressed in NEPA analyses. Instead, the Draft Guidance offers only a cursory overview of the assessment of a project’s GHG emissions. And despite its nominal focus on GHG emissions, the Draft Guidance only refers to climate effects in stating that GHG emissions “may be used as a proxy for assessing potential climate effects” and that an agency may qualitatively discuss the effects of GHG emissions based on literature. These passing references do little to underscore the significance of GHG emissions in the context of climate change or to acknowledge the severe impacts that our States and cities are already facing today.

The Draft Guidance’s disregard for climate change is the latest in a series of the Trump Administration’s efforts to arbitrarily minimize or disregard the overwhelming scientific consensus that immediate and continual progress toward a near-zero GHG-emission economy by mid-century is necessary to avoid truly catastrophic climate change impacts. Indeed, CEQ’s

---

52 2016 Guidance, supra note 3, at 2.
53 Id. at 6-8.
54 Id. at 21.
55 Draft Guidance, supra note 1, at 30,098.
refusal to address climate impacts in the Draft Guidance is all the more troubling in light of the federal government’s own conclusions, detailed above, that climate change resulting from GHG emissions is already having a serious impact on communities throughout the country and that immediate action is necessary to avoid the most severe long-term consequences. In the face of these severe and well-documented climate change impacts, CEQ’s guidance should highlight rather than minimize the critical importance of addressing climate change and its impacts in NEPA analyses. The Draft Guidance unlawfully and arbitrarily ignores these impacts and encourages agencies to minimize the treatment of GHG emissions and climate effects during NEPA review of federal projects.

IV. CEQ’S DRAFT GUIDANCE SUBVERTS THE PURPOSE AND REQUIREMENTS OF NEPA

CEQ’s Draft Guidance undermines NEPA’s purpose to promote informed decision-making by disregarding the most pressing environmental challenge of our time: climate change. As the Supreme Court long ago emphasized, and as the Draft Guidance itself acknowledges, NEPA requires agencies to take a “hard look” at all environmental consequences—whether direct or indirect—of any proposed action on the environment. And that “hard look” requirement obligates agencies to carefully consider every significant environmental impact of a project, which must necessarily include examining a project’s contribution to climate change through its GHG emissions. NEPA’s regulations, too, expressly require consideration of indirect effects on air, water, and other natural systems, like those resulting from climate change. Inherent in NEPA and its implementing regulations is a “rule of

---

57 Assessment, Volume I, supra note 6, at 16 (“[B]ased on extensive evidence, … it is extremely likely that human activities, especially emissions of GHGs, are the dominant cause of the observed warming since the mid-20th century[.]”); see also Assessment, Volume II, supra note 9 at 1453; Daniel R. Coats, Statement for the Record: Worldwide Threat Assessment of the U.S. Intelligence Community at 23 (Jan. 29, 2019), https://www.hsdl.org/?view&did=820727, (“Global environmental and ecological degradation, as well as climate change, are likely to fuel competition for resources, economic distress, and social discontent through 2019 and beyond. Climate hazards such as extreme weather, higher temperatures, droughts, floods, wildfires, storms, sea level rise, soil degradation, and acidifying oceans are intensifying, threatening infrastructure, health, and water and food security. Irreversible damage to ecosystems and habitats will undermine the economic benefits they provide, worsened by air, soil, water, and marine pollution.”).

58 See Assessment, Volume II, supra note 9, at 26, 73, 1347 (reaffirming that climate change is human-caused, that continued growth in emissions will produce economic losses across all sectors, and that mitigation measures do not “yet approach the scale considered necessary to avoid substantial damages to the economy, environment and human health over the coming decades”).


61 See, e.g., WildEarth Guardians v. Jewell, 738 F.3d 298, 301 (D.C. Cir. 2013) (holding that agency took the requisite hard look at the effect of its decision to authorize the lease of public lands for coal mining operations on global climate change).

62 See 40 C.F.R. § 1508.8.
reason,” which ensures that agencies determine whether and how to prepare an Environmental Impact Statement (“EIS”) based on the usefulness to the decision-making process of any new potential information regarding such impacts.63

While NEPA does not mandate substantive outcomes, the requirement that federal agencies consider and publicly disclose the environmental consequences of a proposed action, including actions that contribute to climate change, has practical significance.64 Although NEPA does not necessarily mandate that federal agencies reduce GHG emissions related to a proposed action, a full evaluation of a proposed action’s GHG emissions and/or climate change impacts under NEPA affects agency activity by increasing awareness and allowing meaningful evaluation of alternative courses of action. And disclosure of GHG impacts provides states and the public with useful information that increases their ability to lobby agencies and Congress to move toward greener and sustainable options in federal actions.

The Draft Guidance moves in the wrong direction, muddying the waters on the analysis of climate change impacts under NEPA and creating new legal risks for actions subject to NEPA. As discussed in more detail below, the Draft Guidance conflicts with NEPA’s “hard look” mandate by: (1) failing to clarify how agencies analyze indirect climate change effects under NEPA; (2) improperly instructing agencies on cumulative impacts analysis; (3) encouraging agencies to forgo quantifying climate change impacts even though complex analysis and modeling of GHG impacts have been routinely performed by federal agencies since at least 2010; (4) discouraging a proper cost-benefit analysis; and (5) improperly indicating that evaluation of mitigation of GHG impacts is not required. In short, rather than informing agencies how to meaningfully analyze a project’s GHG emissions and climate change impacts,65 the Draft Guidance encourages agencies not to analyze a project’s likely climate change impacts and to avoid taking a “hard look” at climate-related impacts, in conflict with NEPA. As noted below,66 a growing body of case law demonstrates that, for many projects, CEQ’s instructions in the Draft Guidance on how to address climate change impacts under NEPA encourage agencies to disregard relevant environmental information and are thus contrary to the law and arbitrary and capricious.67

---

64 40 C.F.R. §§ 1501.5, 1501.6, 1500.5, 1508.7 (2019); see Robertson, 490 U.S. at 333 (“NEPA itself does not impose substantive duties mandating particular results, but simply prescribes the necessary process for preventing uninformed—rather than unwise—agency action”).
65 Compare 2016 Guidance, supra note 3, at 20-27.
66 See, e.g., WildEarth Guardians v. Zinke, 368 F. Supp. 3d 41, 68-71 (D.D.C. 2019); Ctr. for Biological Diversity v. Nat’l Highway Transportation Safety Admin., 538 F.3d 1172, 1198-1203 (9th Cir. 2008); see also Mid States Coal. for Progress v. Surface Transp. Bd., 345 F.3d 520, 532, 549-50 (8th Cir. 2003) (agencies must assess proposed action’s indirect effect on climate change when nature of effect is reasonably foreseeable, even if extent of that effect is not).
67 See Motor Vehicle Mfrs. Ass’n of the United States v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 43 (1983) (“under the ‘arbitrary and capricious’ standard ... the agency must examine the relevant data and articulate a satisfactory explanation for its action including a ‘rational connection between the facts found and the choice made’”).
A. CEQ’s Draft Guidance Does Not Clarify to What Extent Agencies Must Consider Indirect GHG Emissions

CEQ’s disregard for indirect GHG emissions conflicts with NEPA, its regulations, and case law. As noted above, an agency conducting review under NEPA must consider the project’s direct and indirect environmental effects.\(^{68}\) Indirect effects are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.”\(^{69}\) Federal courts have held that upstream and downstream GHG emissions are an indirect effect of agencies authorizing projects such as pipelines and mining.\(^{70}\) Where an agency could deny a project on the ground that it would be too harmful to the environment, the agency is the “legally relevant cause” of both the direct and indirect effects of that project.\(^{71}\) Thus, federal agencies are required to analyze indirect GHG emissions under NEPA.\(^{72}\)

The Draft Guidance, however, fails to clarify the extent to which agencies should consider GHG emissions from major federal actions. Instead, it employs broad language and general terms to significantly reduce the scope of environmental impacts that agencies should analyze under NEPA. Purporting to rely on the “rule of reason,” the Draft Guidance suggests that agencies “should analyze reasonably foreseeable environmental consequences of major federal actions, but should not consider those that are remote or speculative.”\(^{73}\) However, climate change harms are already occurring. Although there may be uncertainties in terms of additional types of harms and the magnitude of impacts, CEQ seems to ignore the very predicate that harms are happening now. And, rather than employ any “rule of reason,” the Draft Guidance attempts to limit agencies’ consideration of GHG emissions by not specifying the meaning of the terms or the analysis necessary for an agency to support such a determination.

Litigation challenging NEPA review by the Federal Energy Regulatory Commission (“FERC”) provides a useful example of the proper analysis of GHG emissions as indirect effects under NEPA. FERC, in particular, has struggled in its approach to analysis of climate effects of pipeline decisions under NEPA and the Natural Gas Act.\(^{74}\) Historically, FERC contended that

---

\(^{68}\) 40 C.F.R. § 1502.16.
\(^{69}\) 40 C.F.R. § 1508.8(b).
\(^{70}\) See, e.g., Sierra Club, 867 F.3d at 1374 (“greenhouse-gas emissions are an indirect effect of authorizing this [pipeline] project, which FERC could reasonably foresee”); San Juan Citizens Alliance v. U.S. Bureau of Land Mgmt., 326 F. Supp. 3d at 1244 (finding that combustion emissions were indirect effect of agency’s decision to extract those natural resources); Montana Envtl. Info. Ctr. v. U.S. Office of Surface Mining, No. CV 15-106-M-DWM, 2017 WL 5047901, *3 (stating that “effects of the estimated 23.16 million metric tons of greenhouse gas emissions the Mining Plan EA concluded would result from combustion of the coal that would be extracted from the Mine” are indirect effects from coal trains).
\(^{71}\) Sierra Club, 867 F.3d at 1373.
\(^{72}\) Id.
\(^{73}\) Draft Guidance, supra note 1, at 30,098.
\(^{74}\) In April 2018, FERC issued a Notice of Inquiry (NOI) aimed at reevaluating its previous approach to balancing the competing interests involved in pipeline projects, to which it invited comments (Certification of New Interstate Natural Gas Facilities Notice of Inquiry, 163 FERC ¶ 61,042 (2018)); see also Rich Glick & Matthew Christiansen, FERC and Climate Change, 40 ENERGY L. J. 1, 43 (2019)
upstream and downstream GHG emissions are not “reasonably foreseeable.” Based on this reasoning, FERC has taken the position that it need not analyze such emissions pursuant to NEPA, or factor them into its public convenience and necessity determinations under the Natural Gas Act. The court in Sierra Club v. FERC disagreed, holding that under NEPA, FERC must consider GHG emissions as indirect effects of a project. CEQ should provide clarity on the process of evaluating GHG emissions by instructing agencies to consider upstream and downstream GHG emissions as indirect effects of a project, as Sierra Club requires. Instead, the Draft Guidance directs agencies such as FERC to follow an approach inconsistent with NEPA and case law.

NEPA, CEQ’s implementing regulations, and federal court decisions thus make clear that agencies cannot shirk their NEPA obligations by simply claiming that GHG emissions are too speculative. Any NEPA reviews conducted pursuant to the Draft Guidance—and thus in conflict with decisions such as Sierra Club v. FERC—will be unlawful and subject to increased litigation. By failing to describe the factors triggering rigorous analysis of GHG impacts, the Draft Guidance fails to reduce uncertainty, invites speculation, and reduces clarity for agencies in assessing GHG emissions. Rather than making agencies’ NEPA reviews less robust and more vulnerable to challenge, CEQ should provide agencies with more meaningful guidance on how to analyze indirect GHG emissions.

(recommending that FERC should “meaningfully engage the issue and develop a framework for fully considering climate change in the section 7 process”).

75 See, e.g., New Market Project Rehearing Order, 163 FERC ¶ 61,128 at P 34.
76 Id. at P 43 (“We are not aware of any basis that indicates the Commission is required to consider environmental effects that are outside of our NEPA analysis of the proposed action in our determination of whether a project is in the public convenience and necessity under section 7(c).”).
77 Sierra Club, 867 F.3d at 1373-75.
78 See, e.g., id. at 1374 (holding that agency had not provided a satisfactory explanation for why quantification of indirect GHG emissions was not feasible and stating, “we understand that emission estimates would be largely influenced by assumptions rather than direct parameters about the project, but some educated assumptions are inevitable in the NEPA process” (internal quotation marks and citations omitted)); San Juan Citizens Alliance, 326 F. Supp.3d at 1241-44 (holding that BLM’s failure to quantify and analyze the impacts of downstream GHG emissions was arbitrary, despite the agency’s finding that impacts were “not feasible to predict with certainty”); see Allegheny Defense Project v. FERC, No. 17-1098, ___F.3d___, 2019 WL 3518835 at *8, (D.C. Cir. Aug. 2, 2019) (holding “NEPA required the Commission to consider both the direct and indirect environmental effects of the Project, and that, despite what the Commission argues, the downstream greenhouse-gas emissions are just such an indirect effect,” (citing Sierra Club v. FERC and 40 C.F.R. § 1502.16(b))); see generally Scientists’ Inst. For Pub. Info. Inc. v. U.S. Atomic Energy Comm’n, 481 F.2d 1079, 1092 (D.C. Cir. 1973) (“Reasonable forecasting and speculation is thus implicit in NEPA, and we must reject any attempt by agencies to shirk their responsibilities under NEPA by labeling any and all discussion of future environmental effects as ‘crystal ball inquiry.’”)).
B. Vague and Undefined Terms in the Draft Guidance Add Legal Risk and Encourage Agencies to Unlawfully Avoid Quantification of GHG Emissions

The Draft Guidance contains numerous ambiguous terms that, in effect, would encourage agencies to unlawfully cast aside their obligations under NEPA. In particular, the Draft Guidance directs agencies to “attempt to quantify a proposed action’s projected direct and reasonably foreseeable indirect GHG emissions when the amount of those emissions is substantial enough to warrant quantification, and when it is practicable to quantify them using available data and GHG quantification tools.” But the Draft Guidance fails to explain what constitutes “substantial” emissions or what factors determine whether quantification would be “practicable.” CEQ’s decision to add these ambiguous terms to the Draft Guidance conflicts directly with the more straightforward language of the 2016 Guidance, which directed agencies to “quantify…direct and indirect GHG emissions, taking into account available data and GHG quantification tools.” The Draft Guidance provides agencies leeway to create their own technical definitions and, in some cases, to avoid analyzing a project’s climate change impacts altogether. What is more, if different agencies adopt their own interpretations of the terms set forth in the Draft Guidance, it is likely that major inconsistencies will arise in the processes by which different agencies assess GHG impacts under NEPA.

The Draft Guidance also states that agencies “are not required to quantify effects where information necessary . . . is unavailable, not of high quality, or the complexity of identifying emissions would make quantification overly-speculative.” Here, too, the Draft Guidance fails to clarify what these terms mean or how they should be implemented, and the provision conflicts with both section 1502.22(b) of the NEPA implementing regulations regarding “Incomplete and Unavailable Information” and federal court decisions examining the scope of NEPA review. Specifically, section 1502.22(b) provides that where “the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because . . . the means to obtain it are not known,” the agency must still include in its EIS, among other items, “a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment” and “the agency’s evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.” Similarly, although agencies need not have “perfect foresight when considering indirect effects,” courts have rejected agency attempts to ignore an important aspect of a

79 Draft Guidance, supra note 1, at 30,098 (emphases added).
81 Draft Guidance, supra note 1, at 30,098.
82 40 C.F.R. § 1502.22(b).
83 See id.
84 See WildEarth Guardians v. United States Office of Surface Mining, Reclamation & Enf’t, 104 F. Supp. 3d 1208, 1230 (D. Colo. 2015), order vacated as moot, appeal dismissed, 652 F. App’x 717 (10th Cir. 2016).
problem by writing it off as too speculative\textsuperscript{85} or acting on incomplete information or assumptions.\textsuperscript{86}

The Draft Guidance also states that “when an agency determines that the tools, methods, or data inputs necessary to quantify a proposed action’s GHG emissions are not reasonably available, or it otherwise would not be practicable, the agency should [alternatively] include a qualitative analysis. . . .”\textsuperscript{87} Again, CEQ has failed to explain what these terms mean. This provision also presents an unlikely scenario because there are many tools available for quantification,\textsuperscript{88} including CEQ’s own compilation of GHG accounting tools, methodologies, and reports that it published for use by agencies engaged in emissions quantification.\textsuperscript{89} Moreover, federal agencies reviewing actions that are likely to have significant GHG emissions impacts such as pipelines, mining activities, and transportation projects have already implemented quantification at the environmental assessment and EIS stages of NEPA review and are thus familiar with the available data and methodologies.\textsuperscript{90} Absent clarification, CEQ’s use of

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{85}See id. at 1230-31; \textit{Mid States Coal. for Progress v. Surface Transp. Bd.}, 345 F.3d at 548-50 (rejecting agency’s argument that it need not consider air quality impacts of building national railroad to transport coal because the exact extent of impact was speculative).
\item \textsuperscript{86}\textit{WildEarth Guardians v. Bur. of Land Mgmt.}, 870 F.3d 1222, 1237-38 (10th Cir. 2017) (rejecting agency’s analysis of impacts from coal leasing on carbon emissions and climate change that relied on faulty economic assumption); see generally \textit{W. Watersheds Project v. Kraayenbrink}, 632 F.3d 472, 493 (9th Cir. 2011) (holding that agency violated NEPA when it failed to consider important aspect of problem by relying on data from only one-third of the rangeland in dispute and evaluating impacts without complete data); \textit{Churchill County v. Norton}, 276 F.3d 1060, 1072-73 (9th Cir. 2001) (stating that NEPA “emphasizes the importance of coherent and comprehensive up-front environmental analysis to ensure…that the agency will not act on incomplete information” (internal quotation marks and citations omitted)).
\item \textsuperscript{87}Draft Guidance, supra note 1, at 30,098 (emphases added).
\end{itemize}
\end{footnotesize}
ambiguous language encourages agencies to avoid quantification that can and should be done. The Draft Guidance is thereby inconsistent with NEPA and CEQ’s obligation to ensure that agencies comply with the statute.\textsuperscript{91}

As noted in the comments submitted in 2015 by the California Governor’s Office of Planning and Research (“OPR”) regarding the previous CEQ draft GHG guidance (referred to herein as the “2015 OPR Comments”), emissions from many projects are easily quantified using existing tools. The 2015 OPR Comments note that “[n]ational protocols for calculating greenhouse gas emissions are also readily available, such as the United States Community Protocol for Calculating Greenhouse Gas Emissions and the Local Government Operations Protocol.”\textsuperscript{92} California has long recognized that GHG quantification tools are widely available and reliable. Nearly a decade ago, during the process for amending the CEQA Guidelines to address GHG quantification, the California Natural Resources Agency noted that “quantification of GHG emissions is possible for a wide range of projects using currently available tools.”\textsuperscript{93} This is not unique to California; such tools are widely available to the federal government, in connection with federal projects, as well. For example, emission factors from construction equipment and other non-road engines have been readily available from EPA’s NONROAD model since the late 1990s, while EPA’s MOBILE6.1/6.2 model has included GHG emission factors since 2002. As OPR noted in its comments four years ago, the available tools have improved, and their use has become widespread.\textsuperscript{94} That is even more true today.

C. The Draft Guidance’s Direction Regarding Cumulative Impacts Does Not Comply With NEPA

The Draft Guidance’s instruction regarding cumulative impacts analysis also conflicts with NEPA. NEPA requires a lead agency to give a “hard look” at the cumulative impacts of a project, i.e., the “impact on the environment which results from the incremental impact of the

\textsuperscript{91} A survey conducted July 2012 through December 2014 found that of the 238 EISs surveyed, 214 (90%) contained some discussion of GHG emissions or climate change impacts, 172 (72%) discussed the GHG emissions associated with a proposed action, and 167 (70%) discussed how climate change may affect the proposed action. Jessica Wentz et al., Columbia Law School Sabin Ctr. For Climate Change Law, Survey of Climate Change Considerations In Federal Environmental Impact Statements, 2012-2014, at ii, 5, 11 (2016), \url{http://columbiaclimatelaw.com/files/2016/06/Wentz-et-al.-2016-02-Climate-Change-Considerations-in-Federal-EIS-2012-14.pdf}.

\textsuperscript{92} See Comments from the Governor’s Office of Planning and Research regarding the White House Council on Environmental Quality’s “Revised Draft Guidance on Greenhouse Gases and Climate Change” at 3 (Mar. 24, 2015) A copy of the 5 OPR Comments is attached as Exhibit 2 to this letter. See also California Air Resources Board, Local Government Operations Protocol for Greenhouse Gas Assessments, \url{https://ww3.arb.ca.gov/cc/protocols/localgov/localgov.htm} (last visited Aug. 23, 2019).


\textsuperscript{94} 2015 OPR Comments, supra note 92, at 4.
action when added to other past, present, and reasonably foreseeable future actions.” A cumulative impact “can result from individually minor but collectively significant actions taking place over a period of time.” The level of analysis required for NEPA’s “hard look” is project-specific, and the analysis must be sufficient to provide a meaningful basis for an agency to compare amongst alternatives and decide whether to undertake the action in question.

Several courts have upheld GHG cumulative impact analyses when they quantify both the project’s GHG emissions and sector-related regional emissions, and have found cumulative impact analyses to be insufficient when they do not. For example, in *WildEarth Guardians v. Zinke*, the United States District Court for the District of Columbia held that the U. S. Department of the Interior, Bureau of Land Management’s (BLM) environmental assessments for oil and gas leasing on federal land were insufficient because BLM failed to quantify the drilling-related GHG emissions from the leased parcels and failed to sufficiently compare them to regional and national emissions. The cumulative impacts analyses were insufficient because they did not provide “data-driven” comparisons of drilling-related GHG emissions resulting from the leases to regional and national GHG emissions. To satisfy NEPA, the court concluded that BLM should have quantified these comparisons and should have stated the cumulative effect of the decision with “reasonable specificity.”

In line with these requirements, the 2016 Guidance urged agencies to take an expansive view of cumulative impacts. It admonished that a “statement that emissions from a proposed Federal action represent only a small fraction of global emissions is essentially a statement about the nature of the climate change challenge, and is not an appropriate basis for deciding whether or to what extent to consider climate change impacts under NEPA.” And “[a]gencies should

---

95 40 C.F.R. § 1508.7 (2019); *Fritiofson v. Alexander*, 772 F.2d 1225, 1247 (5th Cir. 1985).
96 40 C.F.R. § 1508.7.
97 See Nat. Res. Defense Council, Inc. v. Hodel, 865 F.2d 288, 299 (D.C. Cir. 1988) (EIS must analyze the combined effects of the actions in sufficient detail to be “useful to a decisionmaker in deciding whether, or how, to alter the program to lessen cumulative environmental impacts.”).
98 See, e.g., *Citizens for a Healthy Cmty. v. Bur. of Land Mgmt.*, 49 ELR 20,044 (D. Colo. March 27, 2019) (upholding BLM’s cumulative impact analysis of GHG emissions for master development plan for unit in Colorado basin because BLM looked at statewide emissions levels from coal-fired power plant for comparative assessment, performed regional cumulative impacts analysis of future mineral development in region, and quantified emissions expected from developments on land in question); *San Juan Citizens Alliance*, 326 F. Supp. 3d at 1240-41, 1248 (finding cumulative impacts analysis of GHG emissions from leasing of federal lands insufficient “facile conclusion” because it made qualitative comparison between “very small” increase in GHG emissions from leasing and regional and global emissions); see also *Ctr. for Biological Diversity v. Nat’l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1180, 1216 (9th Cir. 2008); *Coal. for Healthy Ports v. U.S. Coast Guard*, 2015 U.S. Dist. LEXIS 159090 (S.D.N.Y. Nov. 24, 2015) (generally upholding cumulative impacts analysis of bridge project because it included “detailed, quantitative information”).
99 *WildEarth Guardians*, 368 F. Supp. 3d at 51, 63.
100 *Id.* at 77.
101 *Id.*
not limit themselves to calculating a proposed action’s emissions as a percentage of sector, nationwide, or global emissions in deciding whether or to what extent to consider climate change impacts under NEPA.\textsuperscript{103} The 2016 Guidance also directed agencies to “discuss relevant approved federal, regional, state, tribal, or local plans, policies, or laws for GHG emissions reductions or climate adaption to make clear whether a proposed project’s GHG emissions are consistent with such plans or laws.”\textsuperscript{104}

The Draft Guidance, by contrast, does not provide clarity on how agencies should perform cumulative impacts analyses for projects that implicate climate change, again inviting agencies to shirk their responsibilities to consider GHG effects. Instead, the Draft Guidance suggests that agencies may meet NEPA’s cumulative impact analysis requirement by comparing a project’s GHG emissions to local, regional, national, or sector-wide emissions estimates and providing a qualitative summary discussion of the effects of GHG emissions.\textsuperscript{105} But this analysis of cumulative impacts would be insufficient for many projects, especially those involving fossil fuel leasing or transportation infrastructure, because NEPA’s “hard look” requires a thorough analysis of cumulative GHG emissions and a more specific discussion of impacts and mitigation. The Draft Guidance thus ignores NEPA’s requirement to analyze a project’s cumulative effects when combined with other past, present, and reasonably foreseeable future federal actions.

As it did in the 2016 Guidance, CEQ should instruct agencies to thoroughly analyze a project’s incremental impact on climate change. Specifically, CEQ should revise the Draft Guidance to instruct agencies to quantify cumulative impacts from GHG emissions, to consider a project’s consistency with plans and policies to reduce GHG emissions, and to consider mitigation measures for cumulative impacts from GHG emissions.\textsuperscript{106}

D. CEQ’s Draft Guidance Improperly Supports an Unbalanced Approach to Cost-Benefit Analysis

CEQ’s Draft Guidance also encourages improper assessment of climate costs of federal agency actions. Specifically, CEQ’s Draft Guidance directs agencies that they do not need to monetize or quantify climate impacts even if they quantify employment or other socio-economic impacts of a project.\textsuperscript{107} As courts have concluded, such a one-sided approach to monetizing project impacts lacks legal or rational support.\textsuperscript{108}
Although NEPA does not require a federal agency to conduct a cost-benefit analysis,\(^{109}\) where an agency chooses to quantify the benefits of a proposed action, it must also quantify the costs of that action when a tool is available to do so.\(^{110}\) For GHG emissions, the “social cost of carbon” provides such a tool. The former federal Interagency Working Group on Social Cost of Greenhouse Gases (“IWG”) developed the social cost of carbon “through an interagency process committed to ensuring that the [social cost of carbon] estimates reflect the best available science and methodologies” for monetizing long-term damage caused by increased carbon dioxide emissions.\(^{111}\) As CEQ noted in its 2016 Guidance, the social cost of carbon is a useful, available tool during NEPA review for agencies and the public to understand the potential climate impacts of a proposed federal action.\(^{112}\)

In a reversal from the 2016 Guidance, the Draft Guidance now rejects the social cost of carbon or any other cost metric as a tool for monetizing climate impacts under NEPA.\(^{113}\) It instructs agencies that they “need not weigh the effects of the various alternatives in NEPA in a monetary cost-benefit analysis using any monetized Social Cost of Carbon estimates.”\(^{114}\) CEQ then states that “[t]here may be some effects that are more capable of monetization or quantification, such as employment or other socio-economic impacts …. Monetization or quantification of some aspects of an agency’s analysis does not require that all effects, including potential effects of GHG emissions, be quantified.”\(^{115}\) The message is clear: monetize benefits, such as employment, but do not monetize the climate costs. In other words, the Draft Guidance wrongly directs agencies that they may monetize some aspects of their analysis, such as employment or other socio-economic impacts, without quantifying the costs from climate impacts of the action.\(^{116}\)

But courts have taken agencies to task for following the one-sided approach CEQ is suggesting here—monetizing the benefits of a project while failing to use the social cost of

---

\(^{109}\) 40 C.F.R. § 1502.23.

\(^{110}\) See Columbia Basin Land Prot. Ass’n v. Schlesinger, 643 F.2d 585, 595 (9th Cir. 1981) (NEPA’s “policy of full disclosure applies equally to the economic and technological benefits of a project as to its environmental costs. If full disclosure were applied only to the environmental costs, the purposes of mandating a balancing analysis would be defeated.”); Mont. Envtl. Info. Ctr v. U.S. Office of Surface Mining, 274 F. Supp. 3d 1074, 1095–99 (D. Mont. 2017) (agency arbitrarily failed to consider costs of GHG emissions from coal combustion when agency quantified socioeconomic benefits of coal mining).


\(^{112}\) 2016 Guidance, supra note 3, at 33 n.86 (stating that social cost of carbon “provides a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review”).

\(^{113}\) Draft Guidance, supra note 1, at 30,098.

\(^{114}\) Id.

\(^{115}\) Id. at 30,099.

\(^{116}\) Id.
carbon tool to monetize the climate costs—because it impairs an agency’s ability to make an informed decision.\(^{117}\) In *High Country*, for example, the court faulted the U.S. Forest Service for refusing to use social cost of carbon estimates: “[e]ven though NEPA does not require a cost-benefit analysis, it was nonetheless arbitrary and capricious to quantify the benefits of the lease modifications and then explain that a similar analysis of the costs was impossible when such an analysis was in fact possible [using the social cost of carbon tool].”\(^{118}\)

Nor can CEQ’s proffered rationale save its unlawful approach. In particular, CEQ dismisses the social cost of carbon on the basis that the IWG developed the tool for evaluation of regulatory actions and not for socio-economic analysis under NEPA.\(^{119}\) CEQ cannot reasonably dismiss this tool on the basis that it was not created for the precise purpose of aiding NEPA review. Such reasoning is nonsensical: it would allow agencies to dismiss a whole host of reports, tools, and methods—including some of the GHG accounting tools identified on CEQ’s own website—on the basis that they were not created specifically for the NEPA process,\(^{120}\) in violation of NEPA’s purpose of driving informed decision-making. Indeed, in *High Country*, the court rejected this exact argument, observing that it did not “explain why these agencies believed the protocol was inaccurate or not useful in this instance.”\(^{121}\) The court recognized that even if the IWG did not design the social cost of carbon specifically for the NEPA process, the tool could still provide useful information for the NEPA decision-making process, particularly where an agency decides to quantify benefits of a project. Further, even if the social cost of carbon were not an appropriate tool for the NEPA process (it is), CEQ does not—because it cannot—explain why agencies could not use a different climate impact metric.

Consistent with NEPA, CEQ should revise the Draft Guidance to recommend a balanced approach that quantifies both the costs—including the social cost of carbon—and the benefits of proposed actions to ensure that federal agencies and the public have all necessary information about the potential environmental consequences of federal actions.\(^{122}\) In 2016, CEQ stated the social cost of carbon “provides a harmonized, interagency metric that can give decision makers and the public useful information for their NEPA review.”\(^{123}\) Now, three years later, CEQ appears to have changed its mind, but fails to provide a reasoned basis for this change.\(^{124}\)

\(^{117}\) See Ctr. for Biological Diversity, 538 F.3d at 1198; Columbia Basin Land Prot. Ass’n, 643 F.2d at 595; Mont. Envtl. Info. Ctr., 274 F. Supp. 3d at 1095–99.

\(^{118}\) *High Country Conservation Advocates*, 52 F. Supp. 3d at 1191.

\(^{119}\) Draft Guidance, *supra* note 1, at 30,099.


\(^{121}\) 52 F. Supp. 3d at 1192.

\(^{122}\) 42 U.S.C. § 4331.

\(^{123}\) 2016 Guidance, *supra* note 3, at 33 n.86.

E. CEQ’s Draft Guidance Impermissibly Discourages Consideration of Required Mitigation Measures

The Draft Guidance also conflicts with NEPA by discouraging the mitigation and exploration of reasonable alternatives to reduce climate change impacts. Regarding mitigation, the Draft Guidance flatly concludes: “NEPA does not require agencies to adopt mitigation measures.” While it is true that NEPA does not require agencies to adopt mitigation measures, courts interpret NEPA’s “hard look” requirement as requiring agencies to evaluate mitigation measures for a project that may impact the environment. The Draft Guidance fails to recognize that, while agencies are not required to adopt mitigation measures, they must include a discussion of “appropriate mitigation measures not already included in the proposed action or alternative” where a proposed action may impact the environment. Instead, CEQ’s Draft Guidance steers federal agencies away from a thorough assessment of mitigation measures for a proposed project that may significantly impact climate change.

NEPA requires federal agencies to consider possible mitigation strategies for a federal action at multiple points throughout the NEPA analysis: in defining the scope of the EIS, in discussing alternatives to the proposed action and consequences of that action, and in explaining its ultimate decision. Courts have held that “mere lists of mitigation measures are insufficient” to satisfy NEPA. Instead, courts look at whether an agency has provided “an assessment of whether the proposed mitigation measures can be effective . . . [and] whether anticipated environmental impacts can be avoided.” As the Supreme Court has explained, omission of a “reasonably complete discussion of possible mitigation measures” undermines the action-forcing purpose of NEPA because it would prevent agencies and the public from fully evaluating the severity of the proposed action.

The Draft Guidance encourages federal agencies to forgo consideration of mitigation measures addressing climate change impacts of the action. The resulting EIS may not present the agency, or the public, with a comprehensive understanding of the project’s overall environmental impacts. If an agency were to ignore mitigation measures to address GHG impacts, it likely would be unable to evaluate fully the impacts of a proposed action or an alternative, and thus would fail to fulfill the purpose of NEPA. By steering agencies away from

---

125 Draft Guidance, supra note 1, at 30,098 (emphasis added).
126 Neighbors of Cuddy Mountain v. U.S. Forest Service, 137 F. 3d 1372, 1380 (9th Cir. 1998) (a mere listing of mitigation measures does not supply the reasoned analysis that NEPA requires).
127 40 C.F.R. § 1502.14(f) (emphasis added).
128 Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 352 (1989); see also 40 C.F.R. §§ 1508.25(b), 1502.14(f), 1502.16(h), 1505.2(e).
130 S. Fork Band Council of Western Shoshone of Nevada v. U.S. Dept. of Interior, 588 F.3d 718, 727 (9th Cir. 2009); High Sierra Hikers Ass’n v. Dept. of Interior, 848 F. Supp. 2d 1036, 1054 (N.D. Cal. 2012) (“[a]n essential component of a reasonably complete mitigation discussion is an assessment of whether the proposed mitigation measures can be effective”).
131 Robertson, 490 U.S. at 352.
a comprehensive discussion of mitigation measures for a proposed agency action, the Draft Guidance undermines the action-forcing function of NEPA and, consequently, conflicts with the general purpose and requirements of NEPA.

Moreover, the Draft Guidance’s suggestion that an agency need not consider potential mitigation measures could undercut the efficacy of an agency’s cost-benefit analysis regarding a particular action’s GHG emissions. The Ninth Circuit, for instance, overturned an agency’s NEPA analysis that failed to consider the monetary benefit of mitigating GHG emissions, stating that the mitigation of those emissions was “the most significant benefit” of the more stringent regulatory alternative to the agency’s proposed action.\textsuperscript{132}

The Draft Guidance’s statement that NEPA does not require adoption of mitigation measures for climate change impacts is ill-advised and improper. Where a proposed project has climate change impacts, a robust analysis of mitigation measures from GHG emissions is required. CEQ should so instruct in any final guidance.

F. CEQ’s Draft Guidance Should Direct Agencies to Consider Climate Adaptation and Resiliency

Increasing resiliency to a changing climate is a critically important challenge for many communities, yet the Draft Guidance does not even mention climate adaptation or resiliency. As discussed above, our States, cities, and localities are already experiencing climate change, and its effects will continue to worsen. To protect residents, infrastructure, and industries, states must adapt to address these impacts. Climate adaptation is a form of risk management that allows governments, utilities, businesses, and individuals to reduce the risk associated with a changing climate.\textsuperscript{133} Climate resiliency improves a community’s ability to weather the effects of climate change.\textsuperscript{134} Because of the monumental costs associated with the effects of climate change, many climate adaptation measures are cost-effective. As the second volume of the Assessment found, “[p]roactive adaptation initiatives—including changes to policies, business operations, capital investments, and other steps—yield benefits in excess of their costs in the near term, as well as over the long term.”\textsuperscript{135} Since the effects of climate change are not felt evenly across society, proactive adaptation measures ensure that our most vulnerable residents—including low-income

\textsuperscript{132} Center for Biological Diversity, 538 F.3d at 1199.
\textsuperscript{134} The U.S. Climate Resilience Toolkit defines “resilience” as: “The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.” U.S. Climate Resilience Toolkit, Glossary, supra note 133.
\textsuperscript{135} Assessment, Volume II, supra note 9, at 1322.
communities and communities of color—avoid bearing the brunt of the effects of climate change.  

Consideration of future adaptation and resiliency comports with NEPA’s mandates. As discussed above, NEPA and its implementing regulations require consideration of a changing climate because when preparing an EIS, agencies must describe the affected environment, including by projecting into the future in order to analyze an action’s environmental impacts and compare reasonable alternatives. Because the climate is changing rapidly, the projections into the future (the future environment with the action, without the action, and reasonable alternatives) will often need to factor in the effects of climate change, including the ways a changing climate may alter the action. Accordingly, numerous courts have held that agencies acted arbitrarily and capriciously by failing to consider future conditions when analyzing the action’s environmental impacts.

The 2016 Guidance thus properly included a detailed discussion of how agencies must account for the impacts of climate change during NEPA reviews. The 2016 Guidance directs agencies to consider “the ways in which a changing climate may impact the proposed action and any alternative actions . . . “ Under the 2016 Guidance, agencies should describe the projected future state of the environment (i.e., the no action alternative) based on “authoritative climate change reports” and look at the expected life of the proposed action and its effects. Agencies should consider how climate change makes a resource, ecosystem, or human community susceptible to environmental impacts. As the 2016 Guidance notes, such considerations fall “squarely within the scope of NEPA.” It directs that this analysis should “inform decisions on whether to proceed with, and how to design, the proposed action to

137 40 C.F.R. § 1502.15 (2019) (defining affected environment as “the environment of the area(s) to be affected or created by the alternatives under consideration”); see Jessica Wentz, Planning for the Effects of Climate Change on Natural Resources, 47 ENVTL. L. REV. 10220, 10222-23 (2017) (describing how NEPA and regulations require incorporation of climate change into analysis of action’s environmental impacts).
138 See, e.g., California ex. Rel. Imperial Country Air Pollution Control Dist. v. U.S. Dep’t of the Interior, 767 F.3d 781 (9th Cir. 2014) (upholding EIS that analyzed effects of water transfer agreements on Salton Sea in southern California, in part, because it properly incorporated future conditions when establishing “no action” alternative); American Canoe Ass’n v. White, 277 F. Supp. 2d 1244 (N.D. Ala. 2003) (cumulative impact analysis for dam project was insufficient because it failed to consider future conditions of project); AquAlliance v. U.S. Bureau of Reclamation, 287 F. Supp. 3d 969, 1032 (E.D. Cal. 2018) (NEPA cumulative impact analysis in EIS analyzing water transfer program was insufficient because it failed to incorporate available information about likely change to future conditions due to climate change).
139 2016 Guidance, supra note 3, at 20-27.
140 Id. at 9.
141 Id. at 20-21.
142 Id. at 21.
eliminate or mitigate impacts . . .”\textsuperscript{143} The 2016 Guidance provides useful direction on how, under NEPA, agencies should address the effects of climate change on the project and its impacts.

In sharp contrast to the 2016 Guidance, and despite the importance of climate adaptation and climate resiliency in project planning and environmental analysis, the Draft Guidance is virtually silent on the subject. In terms of analyzing the effects of a changing climate on the proposed action and the action’s impacts, the Draft Guidance only ambiguously advises that, “[w]hen relevant, agencies should consider whether the proposed action would be affected by foreseeable changes to the affected environment under a reasonable scenario”—again without defining those terms.\textsuperscript{144} The States thus urge CEQ to readopt the 2016 Guidance’s discussion of climate impacts to account for adaptation and resiliency efforts.

Moreover, providing guidance directing federal agencies to address climate adaptation and resiliency in NEPA reviews would aid coordination among federal approval and planning processes and, as detailed below, with state and local agencies. CEQ regulations encourage agencies to integrate the NEPA process with other processes at the earliest possible time.\textsuperscript{145} CEQ strongly encourages coordination of NEPA review with other federal approvals and planning processes, and with state and local agencies.\textsuperscript{146} Since many federal agencies, state agencies, and local partners have laws, regulations, and policies that require them to address climate risk during planning and project development, robust NEPA guidance directing similar considerations will encourage consistency and ease such coordination. For example, U.S. Army Corps of Engineers policy requires it to integrate “climate change preparedness and resilience planning and actions in all activities,” and the National Park Service’s Coastal Adaptation Strategies Handbook provides policy and decision-making guidelines for addressing climate change impacts on vulnerable park resources.\textsuperscript{147} The States accordingly request that any final guidance that CEQ issues on consideration of GHG emissions in NEPA reviews robustly addresses climate adaptation and resiliency.

\textsuperscript{143} Id.
\textsuperscript{144} Draft Guidance, supra note 1, at 30,098.
\textsuperscript{145} 40 C.F.R. § 1501.2.
V. **CEQ’S DRAFT GUIDANCE SHOULD ENSURE CONSISTENCY BETWEEN NEPA AND STATE ENVIRONMENTAL ANALYSES**

The States have a wealth of experience implementing state environmental review statutes and ensuring coordination between NEPA and its state analogues. In developing the Draft Guidance, CEQ should consider ways to ensure that this coordination is as streamlined and smooth as possible. Moreover, CEQ should look to our States for guidance on quantification of GHG emissions and assessment of climate impacts.

First, coordination between state and federal environmental reviews is a critical component of planning for major projects. CEQ should revise the Draft Guidance to encourage agencies to coordinate analysis under NEPA with state environmental reviews that require analysis and mitigation of climate change impacts, such as the California Environmental Quality Act. NEPA coordination with state environmental review laws would thus be improved by robust guidance encouraging federal agencies to likewise incorporate climate resiliency and adaptation in NEPA review. Federal and state environmental review processes can be coordinated for projects requiring both federal and state action.\(^{148}\) The regulations implementing New York State’s environmental review law require an environmental impact statement to identify and discuss measures to avoid or reduce both an action’s impacts on climate change and associated impacts due to the effects of climate change such as sea level rise and flooding.\(^{149}\) The Washington State Department of Transportation (“WSDOT”) requires all WSDOT projects subject to NEPA and state environmental review to follow its *Guidance - Project-Level Greenhouse Gas Evaluations under NEPA and SEPA* and directs projects to consider climate change impacts and ways to improve the resilience of transportation assets.\(^{150}\) Given these requirements, NEPA and state-level analysis can best be coordinated if NEPA reviews also address these important considerations.

Second, CEQ should look to states for guidance on quantitative GHG and climate change analyses under NEPA. As discussed in Section IV.B above, California agencies have been quantifying GHG emissions and assessing climate change impacts associated with projects since at least 2006. As noted in California’s 2015 OPR Comments submitted regarding the previous CEQ draft GHG guidance, emissions from many projects are easily quantified using existing

---

\(^{148}\) See, e.g., 6 N.Y.C.R.R. § 617.15 (as long as NEPA EIS is sufficient for findings required, state and local agencies may rely on NEPA EIS to meet their requirements under New York State environmental review); Mass. Gen. Laws. c. 30, § 62G (allowing submission of NEPA EIS in lieu of state environmental impact report); 301 Code Mass. Regs. § 11.09(c) (authorizing special review procedures including coordination with other permitting agencies and consolidation of federal and state review processes).

\(^{149}\) 6 N.Y.C.R.R. § 617.9(b)(5)(iii)(i).

tools. OPR noted that “quantification of GHG emissions is possible for a wide range of projects using currently available tools.”151 This is not unique to California; such tools are widely available to the federal government, in connection with federal projects, as well. Indeed, the available tools have improved, and their use has become widespread.152

States also provide useful guideposts in considering climate impacts generally. For example, Massachusetts law requires that for all administrative approvals and decisions, the agency, department, board, commission, or authority “consider reasonably foreseeable climate change impacts, including additional GHG emissions, and effects, such as predicted sea level rise.”153 In New York, state law requires consideration of future physical climate risk due to sea level rise, storm surge and flooding for a number of specified permitting and funding decisions.154 California’s Sea Level Rise guidance provides methodology for state and local governments to analyze and assess the risks associated with sea level rise, and to incorporate sea level rise into their planning, permitting, and investment decisions.155

VI. CEQ SHOULD WITHDRAW THE DRAFT GUIDANCE AND ADOPT AN UPDATED VERSION OF THE 2016 GUIDANCE

For the reasons articulated above, CEQ’s Draft Guidance inadequately advises federal agencies on the assessment of GHG emissions and the climate change impacts of projects during NEPA review. The Draft Guidance avoids addressing climate change and its impacts, fails to clarify the proper analysis of indirect climate change effects, confuses and weakens GHG quantification requirements, minimizes the consideration of cumulative impacts and other components of a proper NEPA analysis, improperly supports an unbalanced approach to cost-benefit analysis, discourages consideration of mitigation and alternatives to reduce climate impacts, and fails even to mention consideration of measures to improve climate adaptation and resiliency. The result is a document that conflicts with the statutory requirements of NEPA and does not further NEPA’s purposes of promoting informed decision-making and identifying environmental impacts. Instead, the Draft Guidance largely identifies opportunities for—and indeed appears to encourage—agencies to avoid adequately assessing GHG emissions and climate impacts of proposed projects.

Rather than pursue this inadequate and unlawful approach to analyzing GHG emissions and climate impacts, CEQ should withdraw its Draft Guidance. The States urge CEQ instead to

152 2015 OPR Comments, supra note 92, at 4.
adopt an updated version of the 2016 Guidance that fully complies with NEPA and current caselaw and acknowledges and reflects the uniquely catastrophic threat of climate change. The 2016 Guidance reflects years of analysis as well as thoughtful recommendations offered by numerous stakeholders, and relies on longstanding NEPA principles.\textsuperscript{156} Ensuring robust analysis of greenhouse gas emissions and climate impacts of federal projects is essential for informing decisionmakers and the public of the potential environmental impacts. NEPA demands this transparent and comprehensive process.

\textsuperscript{156} 2016 Guidance, \textit{supra} note 3, at 2 & n.4.
If we can provide additional information that would be helpful in considering these comments, or if you wish to discuss with us any issue raised above, please do not hesitate to contact the undersigned.

Respectfully submitted,

Dated: August 26, 2019

FOR THE STATE OF CALIFORNIA

XAVIER BECERRA
Attorney General

By: /s/ Sarah E. Morrison

SARAH E. MORRISON
Supervising Deputy Attorney General
JAMIE JEFFERSON
JULIA K. FORGIE
Deputy Attorneys General
California Department of Justice
300 South Spring Street, Suite 1702
Los Angeles, CA 90013
Tel. (213) 269-6328
Sarah.Morrison@doj.ca.gov
Jamie.Jefferson@doj.ca.gov
Julia.Forgie@doj.ca.gov

FOR THE STATE OF COLORADO

PHILIP J. WEISER
Attorney General

By: /s/ Amy W. Beatie

AMY W. BEATIE
Deputy Attorney General
Natural Resources and Environment Section
Colorado Attorney General’s Office
1300 Broadway, 7th Floor
Denver, Colorado 80203
720-508-6295
Amy.Beatie@coag.gov
FOR THE STATE OF NEW JERSEY

GURBIR S. GREWAL
Attorney General

By: /s/ Aaron A. Love

AARON A. LOVE
Deputy Attorney General
New Jersey Division of Law
R.J. Hughes Justice Complex
25 Market Street, PO Box 093
Trenton, NJ 08625-0093
(609) 376-2762
Aaron.Love@law.njoag.gov

FOR THE STATE OF NEW MEXICO

HECTOR H. BALDERAS
Attorney General

By: /s/ Anne E. Minard

ANNE MINARD
Special Assistant Attorney General
BILL GRANTHAM
Assistant Attorney General
State of New Mexico Office of the Attorney General
Consumer & Environmental Protection Division
408 Galisteo Street
Santa Fe, NM 87501
505-490-4045
505-717-3520
AMinard@nmag.gov
WGrantham@nmag.gov

FOR THE STATE OF NEW YORK

LETITIA JAMES
Attorney General

By: /s/ Claiborne Walthall

MICHAEL J. MYERS
Senior Counsel
CLAIBORNE E. WALTHALL
Assistant Attorney General
Environmental Protection Bureau
New York State Attorney General
The Capitol
Albany, NY 12224
(518) 776-2380
Claiborne.Walthall@ag.ny.gov

FOR THE STATE OF NORTH CAROLINA

JOSHUA H. STEIN
Attorney General

By: /s/ Asher Spiller

ASHER SPILLER
Assistant Attorney General
North Carolina Department of Justice
114 W. Edenton Street
Raleigh, NC 27603
(919) 716-6977
Aspiller@ncdoj.gov
FOR THE STATE OF WASHINGTON

ROBERT W. FERGUSON
Attorney General

By: /s/ Aurora R. Janke

WILLIAM R. SHERMAN
Assistant Attorney General
AURORA R. JANKE
Special Assistant Attorney General
Counsel for Environmental Protection
800 5th Ave Suite 2000, TB-14
Seattle, WA 98104-3188
(206) 442-4485
bill.sherman@atg.wa.gov
aurora.janke@atg.wa.gov
Exhibit 7
March 24, 2015

Thank you for the opportunity to review and provide comments on the White House Council on Environmental Quality’s “Revised Draft Guidance on Greenhouse Gases and Climate Change,” hereafter referred to as the “Guidance.” The Guidance provides suggestions and information to public agencies addressing climate change in environmental documents prepared pursuant to the National Environmental Policy Act, or NEPA. Like NEPA, California’s Environmental Quality Act, commonly referred to as CEQA, also requires public agencies to study the potential environmental consequences of proposed projects. Over the past decade, California public agencies have developed rich experience and expertise analyzing climate change in environmental documents pursuant to CEQA. Approximately five years ago, this office developed regulations that explicitly require analysis of greenhouse gas emissions in CEQA documents. Since then, robust analytical tools have been made available that significantly reduce the time and effort needed to analyze climate change impacts of projects. Our understanding of the feasibility and effectiveness of a wide variety of mitigation measures has also dramatically increased.

Initially, we strongly agree that NEPA plainly requires covered agencies to consider the effects, including cumulative effects, of their proposed projects if they may be significant, and that the effects of climate change upon those projects must also be taken into account. NEPA’s broad analytic scope, with which federal agencies must comply “to the fullest extent possible,” clearly encompasses these climate change-related issues, as the federal courts have repeatedly held.1

We commend the Council for its efforts to further improve the quality and consistency of NEPA analysis in this area.

The Guidance makes important strides in improving nationwide practice in analyzing climate change impacts of proposed projects. The following comments provide California’s perspective on these issues, which is informed by our own experience integrating climate change into CEQA analyses. They are intended to strengthen the Guidance for eventual use on a nation-wide scale.

**The Guidance Provides Needed Advice on Addressing Climate Change**

The Guidance appropriately recommends that agencies analyze not only the project's contribution of greenhouse gas emissions, but also the project's potential to exacerbate effects caused by climate change. California's Natural Resources Agency provides similar direction in regulations requiring the analysis of climate change in documents prepared pursuant to CEQA.

---

Section 15126.2 of the CEQA Guidelines states, in part, that an "EIR should evaluate any potentially significant impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazards areas." In its Final Statement of Reasons, which describes the purpose of the regulations, the Natural Resources Agency explained: "that section contemplates hazards which the presence of a project could exacerbate (i.e., potential upset of hazardous materials in a flood, increased need for firefighting services, etc.)." (Final Statement of Reasons, at page 43.)

As noted in detail at page 15 of the Guidance, tools are already available to do this type of analysis. For example, California worked together with stakeholders to develop tools and resources that could support such analysis. The “Cal-Adapt” website, for example, illustrates impacts of climate change across California using best available science. The Climate Resilience Toolkit was largely modeled after Cal-Adapt and has been referred to as the “Cal-Adapt for the nation”. These resources have been helpful in analyzing climate change impacts in California. Similarly, the Climate Resilience Toolkit could perform this role at the national level. The Climate Resilience Toolkit also has a decision support component, which was inspired by California’s Adaptation Planning Guide. As with the Adaptation Planning Guide, a narrative could be added to the Climate Resilience Toolkit which highlights its appropriate use under NEPA.

The Guidance Can Be Improved in Several Respects

While the Guidance offers much important information and advice, it can be improved. The following offers several specific suggestions for improvement.

The Suggested "Reference Point" May Confuse Public Agencies, and So CEQ Should Delete It From the Guidance.

The Guidance discourages public agencies from providing a quantitative analysis of greenhouse gas emissions if project emissions fall below a “reference point” of 25,000 metric tons CO2e per year, unless quantification “is easily accomplished.” (Guidance, at page 18.) This directive in the Guidance may create more problems than it solves. First, as the Guidance correctly indicates, emissions can be easily quantified for most projects, and consistent with NEPA’s information disclosure purposes, agencies should make a good faith effort to analyze and disclose such emissions. Second, quantification of emissions serves an important purpose of

---

2 The regulations implementing CEQA are known as the CEQA Guidelines. They are contained in sections 15000 and following in Title 14 of the California Code of Regulations.

3 The Final Statement of Reasons is available online at [http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf](http://resources.ca.gov/ceqa/docs/Final_Statement_of_Reasons.pdf)

4 The Cal-Adapt website is available online at [www.cal-adapt.org](http://www.cal-adapt.org)

5 Available online at [www.climate.gov/toolkit](http://www.climate.gov/toolkit)
demonstrating where emissions reductions may be easily achieved. Third, application of the reference point might prevent the disclosure of information needed to conduct an adequate cumulative impacts analysis. Finally, the suggested reference is much larger than the quantity of emissions that might be considered to be significant in California. To remedy these concerns, we recommend that the discussion of the “reference point” be removed from the Guidance. These points are discussed in greater detail below.

**Emissions from many projects are easily quantified using existing tools.**

The Guidance correctly advises that "GHG estimation tools have become widely available, and are already in broad use...." (Guidance, at page 15.) This is certainly true in California. The California Air Pollution Control Officers Association (CAPCOA), for example, has pioneered several important guides, including “CEQA & Climate Change,” which includes options for quantifying and evaluating the significance of greenhouse gas emissions, “Model Policies for Greenhouse Gas Emissions in General Plans,” and “Quantifying Greenhouse Gas Mitigation Measures.” National protocols for calculating greenhouse gas emissions are also readily available, such as the United States Community Protocol for Calculating Greenhouse Gas Emissions and the Local Government Operations Protocol. Numerous national and international groups and governments participated in the development of these two protocols. California also helped fund the development of the Clearpath suite of software tools to address greenhouse gas emissions through the State Energy Efficiency Collaborative. These tools are in use statewide but were also used as the basis for a national scale resource called Clearpath. The California Air Resources Board has published an extensive list of quantification tools on its “Cool California” website which could be used in a NEPA analysis. Lastly, for project level emissions there are numerous tools available, though the California Emissions Estimator Model, commonly known as CalEEMod, is widely used throughout California to quantify emissions. In part because of the ready availability of estimation tools, California generally requires lead agencies to quantify emissions as part of their CEQA analysis. (CEQA Guidelines § 15064.4 ("A

---


10 [http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm](http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm)

11 [http://californiaseec.org/software-tools](http://californiaseec.org/software-tools)


13 [www.coolcalifornia.org](http://www.coolcalifornia.org)

14 [www.caleemod.com](http://www.caleemod.com). CalEEMod was developed and is maintained by CAPCOA to support the needs of all air districts in the state.
lead agency should make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project.

In adopting this rule, the California Natural Resources Agency found that:

quantification of GHG emissions is possible for a wide range of projects using currently available tools. Modeling capabilities have improved to allow quantification of emissions from various sources and at various geographic scales. (Office of Planning and Research, CEQA and Climate Change: Addressing Climate Change Through the California Environmental Quality Act Review, Attachment 2: Technical Resources/Modeling Tools to Estimate GHG Emissions (June 2008); CAPCOA White Paper, at pp. 59-78.) Moreover, one of the models that can be used in a GHG analysis, URBEMIS, is already widely used in CEQA air quality analyses. (CAPCOA White Paper, at p. 59.)

(Final Statement of Reasons, at page 21.) In the five years since California adopted its regulations, tools have been improved and their use has become widespread.

**Not Only Are Most Project Emissions Easily Quantified, but Doing So Provides Agencies and the Public with Valuable Information Regarding Ways to Reduce Project Emissions.**

CEQA generally requires quantification of greenhouse gas emissions not only because it is usually relatively easy to do so, but also because quantification reveals ways to feasibly reduce those emissions. Again, in adopting its regulations, the California Natural Resources Agency found that:

[Q]uantification indicates to the lead agency, and the public, whether emissions reductions are possible, and if so, from which sources. Thus, [for example,] if quantification reveals that a substantial portion of a project’s emissions result from energy use, a lead agency may consider whether design changes could reduce the project’s energy demand.

(Final Statement of Reasons, at page 21.) For similar reasons, project emissions should usually be quantified in NEPA analyses. In fact, such quantification is key to satisfying NEPA’s public disclosure policies, and to understanding what level of mitigation is required. (See, e.g., 40 CFR 1500.1(c) ("The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment"); 1500.2 (d)-(e) ("Federal agencies shall to the fullest extent possible: ... [e]ncourage and facilitate public involvement in decisions which affect the quality of the human environment [and] [u]se the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment"); see also 40 CFR 1502.16 (requiring environmental impact statements to discuss “[m]eans to mitigate adverse environmental impacts....").)

**The Guidance’s Focus on the Relative Quantity of Project Emissions May Obscure Consideration of Cumulative Impacts.**

The Guidance correctly notes that climate change impacts "are exacerbated by a series of smaller decisions.

(Guidance, at page 9.) The Guidance's discussion of "proportionality" and the 25,000 metric ton “reference point,” however, suggests that smaller quantities of emissions are not relevant to a NEPA analysis.
NEPA, however, requires analysis of cumulative impacts. Particularly relevant in the context of climate change, the CEQ regulations state "the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality." (40 CFR 1508.27 (emphasis added).) Further, when considering the significance of an effect, an agency should consider "[w]hether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment." (Id. (emphasis added).)

Agencies might read the Guidance's discussion of a "reference point" to mean that emissions below that point need not be considered, or even disclosed. As a result, neither the agency nor the public would be able to consider the effect of the proposed project in light of the severity of the climate change problem, or other related sources of emissions. Such potential cumulative effects are exactly what NEPA requires agencies to consider.

Finally, the Guidance includes a confusing sentence on page 11 that states: "CEQ does not expect that an EIS would be required based on cumulative impacts of GHG emissions alone." This is misleading, since climate change is an inherently cumulative impact, and it is extremely unlikely that the direct emissions from any single project would have a demonstrable effect on the global climate. Therefore, this sentence should be removed from the Guidance.

**California Agencies Have Found Incremental Contributions of Greenhouse Gas Emissions Considerably Lower than 25,000 CO2e to be Potentially Significant.**

Like NEPA, CEQA leaves the ultimate conclusion regarding the significance of a project's impacts to the lead agency, considering the context of the project and its circumstances. Nevertheless, some California agencies have developed "thresholds of significance" that identify levels of greenhouse gas emissions that might normally be considered significant. The Bay Area Air Quality Management District, for example, developed "thresholds of significance" indicating that emissions of 10,000 metric tons per year are considered cumulatively significant for certain industrial projects, and that emissions as low as 1,100 tons for certain land use projects may be significant. (BAAQMD, "California Environmental Quality Act Air Quality Guidelines," Revised May 2011, at page 2-4.) Other California cities, counties, and air

---

15 Cumulative impacts are also a key consideration under CEQA. A California court, in one of the seminal cases addressing cumulative impacts under CEQA, observed:

"One of the most important environmental lessons evident from past experience is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant, assuming threatening dimensions only when considered in light of the other sources with which they interact. Perhaps the best example is air pollution, where thousands of relatively small sources of pollution cause a serious environmental health problem.

"CEQA has responded to this problem of incremental environmental degradation by requiring analysis of cumulative impacts."

*(Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal. App. 3d 692, 720.)

districts have reviewed projects using similar bright-line significance thresholds, typically in the 10,000 metric ton per year range. Thus, even as a reference point, 25,000 tons is a very large quantity of emissions.

To Avoid the Problems Described Above, the Guidance Should Encourage Public Agencies to Calculate and Disclose Project Emissions and Delete the Discussion of the 25,000 Ton “Reference Point”.

For the reasons described above, instead of discouraging disclosure of emissions below a reference point, CEQ should consider revising the Guidance to require a good-faith effort, where possible, to disclose a project’s greenhouse gas emissions. Specifically, CEQ should delete the discussion of the 25,000 ton reference point. Doing so will not pose an undue burden on agencies, as the Guidance already advises that quantification should be done when methods to do so are readily available, and indicates that many quantification tools are already in broad use.

The Guidance Should Include Information Describing the Magnitude of Emissions Reductions That Will Be Needed to Avoid the Worst Effects of Climate Change.

The Guidance correctly advises that that projected climate change will adversely affect public health and welfare. (Guidance, at page 7.) While the Guidance also notes that agencies should consider their projects’ incremental additions of greenhouse gas emissions, the Guidance does not indicate when such incremental additions might be significant. To help agencies make that determination, CEQ should consider providing additional information regarding the magnitude of emissions reductions that will be needed to avoid the worst effects of climate change. In particular, the recent U.S. National Climate Assessment reports that greenhouse gas concentrations in the atmosphere are already far above historic levels, and are associated with dangerous changes to the climate now occurring. The Report also emphasizes that an emission reduction trajectory consistent with or below the “B1” trajectory projected by the Intergovernmental Panel on Climate Change would “reduce the risk of some of the worst impacts of climate change,” though it would not fully mitigate them without further reductions.17 Agencies should be aware of these reduction levels as they consider their NEPA analyses.

Similarly, California’s Scoping Plan, which maps out the state’s effort to reduce greenhouse gas emissions, also provides relevant information. For example, it reports:

To prevent exceeding 450 ppm CO2e, developed countries must substantially reduce their emissions in the near term. The 2008 World Energy Outlook suggests that Organisation for Economic Co-operation and Development (OECD) countries must reduce emissions by about 40 percent below 2006 levels by 2030.18 The Union of Concerned Scientists has suggested a 2030 emissions target for the United States of 56 percent below 2005 levels (44 percent below 1990 levels).19 A governmental study from the Netherlands finds that Europe would have to reduce emissions by 47 percent below 1990 levels and the United States would have to reduce emissions by 37 percent below 1990 levels by 2030. The International Energy Agency comes to a similar conclusion, finding that the United States would have to reduce emissions by about 38

percent below 1990 levels by 2030. Note that percent reductions by 2030 depend on the assumed overall trajectory of emissions, including the amount after 2030.

(Scoping Plan Update, at page 13.) In sum, the research indicates that steep reductions in emissions are needed in the near future. Providing such information in the Guidance would assist lead agencies in determining whether a particular increment of emissions should be treated as significant in a NEPA analysis.

Conclusion
The Guidance provides useful information that should assist lead agencies in analyzing climate change in documents prepared pursuant to NEPA. It can be improved, however, as suggested above. Please do not hesitate to contact us if we can be of any assistance.

Sincerely,

Ken Alex
Director, Governor’s Office of Planning and Research
Senior Advisor, Office of California Governor Edmund G. Brown, Jr.
Exhibit 8
Greenhouse gas emissions in Minnesota: 1990-2016

Biennial report to the Legislature tracking the state’s contribution to emissions contributing to climate change.
Legislative charge

Minn. Stat. § 216H.02 Greenhouse gas emissions control.
Subd. 1. Greenhouse gas emissions-reduction goal. It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050. The levels shall be reviewed based on the climate change action plan study.

Minn. Stat. § 216H.07 Emissions-reduction attainment; policy development process.
Subd. 3. Biennial report. (a) By January 15 of each odd-numbered year, the commissioners of commerce and the Pollution Control Agency shall jointly report to the chairs and ranking minority members of the legislative committees with primary policy jurisdiction over energy and environmental issues the most recent and best available evidence identifying the level of reductions already achieved and the level necessary to achieve the reductions timetable in section 216H.02. (b) The report must be in easily understood nontechnical terms.

Authors
Anne Claflin
Fawkes Steinwand

Contributors/acknowledgements
Peter Ciborowski
Christopher Davis (Department of Commerce)
Michelle Gransee (Department of Commerce)
Marcus Grubbs (Department of Administration)
Laura Millberg
Katie Pratt (Environmental Quality Board)
Steve Rakow (Department of Commerce)
Amanda Jarrett Smith

Editing and graphic design
Editor: Ralph Pribble
Graphic design: Paul Andre, Anne Claflin
Administrative: Barb Olafson

Estimated cost of preparing this report (as required by Minn. Stat. § 3.197)

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total staff time: 160 hrs.</td>
<td>$5,660</td>
</tr>
<tr>
<td>Production/duplication</td>
<td>$20</td>
</tr>
<tr>
<td>Total</td>
<td>$5,680</td>
</tr>
</tbody>
</table>

The MPCA is reducing printing and mailing costs by using the Internet to distribute reports and information to wider audience. Visit www.pca.state.mn.us for more information.

MPCA reports are printed on 100% post-consumer recycled content paper manufactured without chlorine or chlorine derivatives.
Contents

Summary: Report to the Legislature .................................................................2
Introduction ....................................................................................................3
  Greenhouse gas emissions in Minnesota ....................................................3
Tracking Minnesota’s emission reduction progress ........................................4
  Missing our first milestone: 2015 emissions .............................................5
  Changing economy, changing emissions ....................................................6
  Greenhouse gas emission intensity .............................................................10
Moving forward: What else are we doing? ....................................................11
  Reducing state government emissions .......................................................11
  Participating in national and international climate change initiatives ..........11
  Greening up our energy generation .........................................................12
  Paving the way for cleaner transportation ...............................................13
  Developing policies that encourage us to adapt to a changing climate ....14
The takeaway .................................................................................................15
Appendix: Methodology ..............................................................................16
Summary: Report to the Legislature

The primary driver behind Minnesota’s rapidly changing climate is the emissions of greenhouse gases (GHGs). This report summarizes what we know about the role of GHGs in Minnesota and what the Minnesota Pollution Control Agency (MPCA), Department of Commerce, and other state agencies are doing to track and reduce GHG emissions, comply with relevant state and federal laws, and prepare for the coming impacts of a changing climate.

Key points:

- While Minnesota’s overall GHG emissions declined 12% relative to 2005 levels, we missed the Next Generation Energy Act’s goal of a 15% emissions reduction by 2015.

- Emissions from electricity used by Minnesotans are down by about 29% since 2005. This means the electricity generation sector has met the Act’s 2015 goal, and has nearly reached the 2025 emissions reduction goal. Moreover, Minnesota’s utilities have committed to additional coal plant closures that will further reduce GHG emissions from this sector in the future.

- Transportation is now the largest source of GHG emissions in Minnesota. This sector will require ongoing, focused effort to reduce emissions to the levels necessary to meet statutory goals.

- Growth in our forests contributed to the sequestration of carbon and reduced total GHG emissions. If this growth can be sustained over long periods of time, Minnesota’s forest resources can help us achieve our emission reduction goals.

- Agricultural nutrient management is the largest source of nitrous oxide (N₂O) emissions, but many best management practices that protect water quality from nutrients and sediment also can help reduce GHG emissions.
Introduction

According to the Minnesota Climatology Office, our state’s climate is changing rapidly, and these changes – driven largely by human activities that cause emissions of greenhouse gases – are affecting our health, well-being, ways of life, and natural resources. State agencies are working to protect Minnesotans facing these challenges, and are helping to lead and shape the national conversation about the impacts of climate change and ways we can adapt.

Tracking GHG emissions and understanding their sources are important ways the MPCA helps Minnesotans navigate our changing climate. Collecting and analyzing data helps identify opportunities and challenges for reducing GHG emissions. The Minnesota Department of Commerce protects the public interest by ensuring that energy resources are reliable, affordable, and increasingly clean. Understanding Minnesota’s GHG emissions and emission sources helps Minnesotans mitigate and adapt to a changing climate.

To learn more about climate change in Minnesota and what the MPCA is doing to track GHG emissions, visit our website at https://www.pca.state.mn.us/air/climate-change-minnesota.

Greenhouse gas emissions in Minnesota

GHGs are gases that warm the atmosphere and surface of the planet. Human activity has been increasing the amount of GHGs in the atmosphere, leading to changes in the earth’s climate. The primary GHGs are carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), sulfur hexafluoride (SF6), and two classes of compounds called hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Figure 1 shows the relative proportions of GHG emissions in Minnesota in 2016.

CO2 is the most abundant GHG and has had the largest effect on our climate. Other GHGs are emitted in smaller amounts, but can trap heat more effectively than CO2, and some stay in our atmosphere for a very long time. "Global warming potential" is a relative measure of how much heat a GHG traps in the atmosphere. Because we need to compare these different emissions and pollutants, we use the effect of CO2 on our climate as a common reference. In this report, emissions are reported as “CO2-equivalent” (CO2-e) tons, meaning emissions are stated in terms that reflect their global warming potential.
GHGs come from a variety of sources:

- Fossil fuel combustion is responsible for most CO₂ emissions in the U.S. The majority of fossil fuels used today are for generating electricity and fueling vehicles.
- Animal agriculture is responsible for the majority of methane (CH₄) emissions. Methane also is emitted from the anaerobic decomposition of organic material.
- Over 50% percent of nitrous oxide (N₂O) emissions are caused by agricultural nutrient management practices.
- The majority of HFC emissions are from their use in refrigerants, such as in air conditioning, in both vehicles and buildings.
- PFCs and SF₆ only account for a small portion of GHG emissions and are emitted as the result of technical applications, like semiconductor manufacturing and electricity transmission.

In Minnesota, CO₂ emissions account for about 73% of total emissions, while methane and nitrous oxide each account for about 13%.

## Tracking Minnesota’s emission reduction progress

In 2007, the Legislature passed the Next Generation Energy Act (NGEA), which set interim and long-term goals for the reduction of GHG emissions in the state. Figure 2 shows the goals, establishing a 2050 reduction of 80% below the 2005 baseline.

Figure 2. Next Generation Energy Act (2007) greenhouse gas emissions reduction goals. These goals are codified in Minn. Stat. § 216H.02.

---

1 Data revisions and changes in methodology can cause the baseline to change, but continuity is provided when making relative year-to-year emissions comparisons.
Missing our first milestone: 2015 emissions

Although mitigation actions have prevented an increase in GHG emissions, Minnesota did not reach the NGEA’s 2015 emissions reduction goal of 15% relative to the 2005 baseline. Across all sectors, GHG emissions fell by about 5% from 2005 to 2015; without actions taken within the state, GHG emissions would have risen over that time. This decrease was driven primarily by steep declines in GHG emissions from electricity generation.

Table 1 shows Minnesota’s progress in reducing emissions from 2005 through 2016, while Figure 3 shows how emissions have changed during that time.

Table 1. Actual GHG emissions in Minnesota compared to GHG emissions reduction goals set in the Next Generation Energy Act (2007), 2005-2016.

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual emissions (million tons CO2-e)</th>
<th>Actual percent decrease from baseline*</th>
<th>Emissions goal (million tons CO2-e)</th>
<th>Goal percent decrease from baseline*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>174.6</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2015</td>
<td>165.6</td>
<td>5</td>
<td>148.4</td>
<td>15</td>
</tr>
<tr>
<td>2016</td>
<td>154.2</td>
<td>12</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

*Emissions reduction goals in the act are based on actual emissions in Minnesota for the year 2005. Thus, the baseline for reduction is equal to 174.6 million tons CO2-e.

Figure 3. Minnesota’s GHG emissions, 1990-2016, compared to the 2015 and 2025 goals of the Next Generation Energy Act. Although emissions are decreasing, we did not meet the 2015 emissions reduction goal.
Changing economy, changing emissions

Despite missing the NGEA’s 2015 interim goal, Minnesota is making progress in many areas. This section discusses GHG emissions changes across seven economic sectors in Minnesota: transportation, electricity generation, agriculture and forestry, industrial, residential, commercial, and waste.

Figure 4 compares GHG emissions in each of the seven economic sectors from 2005 to 2016.

Figure 4. Minnesota’s GHG emissions from economic sectors, 2005-2016. The dark line in the column for the electricity generation sector represents the division between emissions from electricity generated in Minnesota (below the line) and emissions from imported electricity (above the line).
Transportation

Emissions in the transportation sector include on-road vehicles, airplanes and other aviation equipment, trains, leaky vehicle air conditioning units, and natural gas transmission pipelines. More than 70% of emissions from the transportation sector come from light-duty trucks, passenger vehicles, and medium to heavy-duty trucks. GHG emissions from transportation have decreased by 8% since 2005, and account for about one quarter of the GHG emissions in Minnesota. In 2016, emissions from transportation and electricity generation were about the same. Since emissions from electricity that is generated in Minnesota have been reduced over time and are expected to decrease further, transportation is now the largest source of GHG emissions generated within the borders of Minnesota.

Our personal choices have an impact on emissions. On-road vehicles are the largest category of greenhouse gas emissions within the transportation sector. Federal regulations have resulted in newer vehicle models that are generally more fuel-efficient and therefore produce fewer GHG emissions than older, similar vehicles. However, at the same time Minnesotans are choosing to drive larger, less-efficient and more-polluting vehicles instead of smaller, more-efficient cars. Minnesotans are also driving more miles in those larger vehicles. While federal fuel efficiency standards are putting downward pressure on vehicle GHG emissions, the trend towards larger vehicles and more miles traveled is preventing more significant emissions reductions in this sector. The increased emissions from driving larger vehicles more miles offset reductions otherwise achieved by newer, fuel-efficient vehicles.

The state can support greater GHG reductions from transportation while ensuring that Minnesotans have access to varied transportation options. State government is doing its part by using hybrid or fully electric vehicles and supporting community actions to use alternative transportation. Read more in the “Moving forward” section about what we are doing to help meet the NGEA goals.

Electricity generation

GHG emissions from electricity generation are mostly the result of fuel combustion used to generate electricity consumed by Minnesotans, including electricity generated outside of Minnesota. Other sources include methane from coal storage and hydroelectric reservoirs, CO₂ from flue-gas desulfurization, and SF₆ from electricity transmission and distribution.

Historically, the electricity sector has been the largest source of GHG emissions in Minnesota; in 2016, however, emissions from electricity generation and transportation were about the same. Emissions from the electricity sector have declined 29% since 2005. The decrease is largely due to reductions in the amount of coal burned to generate electricity and increased use of renewable energy.

2 Comparisons between sectors depend on the categories and boundaries chosen and on the methods used to estimate emissions. See the appendix for further discussion of methods.
Our total GHG emissions from electricity generation include emissions from electricity generated outside of our state borders, but which we use here. We can also look at just the GHG emissions from electricity generated at facilities within the state. Emissions from in-state generation fell 24% from 2005 to 2016. The amount of electricity that we generate in Minnesota increased at a faster rate than the total amount of electricity Minnesotans consume, which reduces the amount we estimate as imported.

In reality, electricity freely flows across boundaries; we created an accounting framework, based on available data, which takes responsibility for emissions from in-state facilities and in-state consumption of electricity generated elsewhere. In Minnesota and surrounding states, however, coal is being replaced by renewable wind and solar energy, along with natural gas. Recent decisions in utilities’ integrated resource plans will reduce GHG emissions from this sector further.

**Agriculture and forestry**

Emissions sources in the agriculture and land use sector include livestock, animal feedlots, manure, fertilizer, crop cultivation practices, anaerobic decomposition of organic material, and related fuel combustion of off-road implements like tractors and combines. Carbon also is sequestered in forest regrowth, which is captured in the emissions from this sector.

Compared to the 2005 baseline, emissions from the agriculture and forestry sector have decreased about 12%, but emissions have been highly variable between 2005 and 2016. The largest source of N₂O emissions is nutrient management, which includes fertilizer use, nitrogen fixation, mineralization, and runoff. N₂O emissions from crop agriculture increased by about 12% from 2005 to 2016.

We can achieve reductions from this sector by improving best management practices, as many BMPs for nutrient use and sedimentation also act to decrease GHG emissions. Some of the more promising practices for reducing GHGs from agriculture include improved efficiency of nitrogen use (through optimized fertilizer application rates, timing, and placement), conservation cover, riparian buffers and related vegetative filter strips and field borders, and cover crops.

Animal agriculture is the largest source of methane emissions, specifically from manure management and cattle digestion. Methane emissions from animal agriculture increased by about 8% from 2005 to 2016. Our lakes, rivers, and reservoirs are another large source of methane emissions, from the breakdown of biological materials in sediments.

Carbon is sequestered in our forests as they grow. Although there is not a stable or predictable trend, the carbon stored in Minnesota’s forests between 2005 and 2016 increased, which then offset GHG emissions from other agricultural activities.

**Industrial**

Emissions sources in the industrial sector include fuel combustion, taconite processing, petroleum refining, magnesium casting, lead recycling, peat mining, industrial wastewater treatment, solvent use, and the manufacture of steel, glass, insulating foam, and semiconductors.

Since 2005, emissions from this sector have increased by about 3 million tons CO₂-e; in 2016, emissions were about 17% above the baseline.

Growing Minnesota forests are contributing to significant carbon sequestration. If we can sustain stand growth, our forest resources can help us reach our emissions reduction goals.
There has been an overall increase in energy used in the industrial sector since 2005, but industrial energy use has decreased from its peak in 2014. Within the total energy trends, coal use has continued to decline steadily. Natural gas use has increased since 2005, but has remained relatively stable since 2010, peaking in 2014.

CO₂-e emissions data for individual sources with MPCA air permits are available on our website, at https://www.pca.state.mn.us/air/permitted-facility-air-emissions-data.

**Residential**

Emissions sources in this sector include fuel combustion for heating and in-home appliances, like water heaters or clothes dryers, and from other sources, including fertilizer use, product use, food additives, and refrigerant leakage from air conditioners and refrigerators. Emissions from electricity use are all included in the electricity generation sector rather than divided between consumers in each sector.

Since 2005, emissions from the residential sector have increased by about 0.9 million tons CO₂-e; in 2016, emissions were about 11% above the 2005 baseline.

Carbon is also stored in wood construction materials for periods long enough that carbon is effectively removed from the atmosphere, reducing total emissions.

**Commercial**

Emissions sources in this sector include fuel combustion, solvent use, and medical N₂O emissions. Institutional emissions are counted in this sector, as well. Commercial-sector emissions have shown an increase of just 1% above the 2005 baseline in Minnesota.

**Waste**

Emissions sources in the waste sector include energy use in waste processing, incinerator fuels and waste incineration, and methane from landfill gas and wastewater treatment. Carbon is also stored, or sequestered from the atmosphere, as wood waste in demolition and construction landfills, which offsets emissions.

Compared to the 2005 baseline, GHG emissions from waste have decreased by about 6%. This is a change from 2014, when waste emissions were greater than they were in 2005.

The MPCA has been working to address methane emissions as the administrator of the state’s closed landfill program.
Greenhouse gas emission intensity

As Minnesota’s economy and population grow, our GHG emissions have declined, which shows that we can support healthy communities and ecosystems, as well as a strong economy. These trends indicate we can continue to curb GHG emissions, while still growing and thriving.

Measuring the amount of GHG emissions compared to other economic trends is one way to understand how GHG emissions relate to our economy. Trends show that Minnesota has begun to disconnect our economic growth from our GHG emissions. Minnesota’s gross state product has grown since 1997, while GHG emissions have remained relatively flat. What this means is that our state economy can grow without increasing GHG emissions. In fact, Minnesota’s experience shows that strong economic growth occurs at the same time that we are reducing GHG emissions. Figure 5a shows this relationship.

Minnesota’s experience shows that we can grow our population while reducing our per capita GHG emissions. While the population in Minnesota is increasing, and is projected to continue increasing, there is a net decrease in how much each individual on average is emitting. Figure 5b shows this relationship.

Figure 5a (left). Minnesota’s GHG emissions per dollar gross state product (GSP), 1997-2016.
Figure 5b (right). Minnesota’s GHG emissions, per capita, 1997-2016.
Moving forward: What else are we doing?

Here are some ways that the MPCA and the Minnesota Department of Commerce are working with other state agencies, Minnesota businesses, and other state and national partners to further reduce GHG emissions in Minnesota.

Reducing state government emissions

The Office of Enterprise Sustainability is providing leadership to all state agencies in efforts to curb GHG emissions. So far, these efforts, including expanding the use of EVs and installation of solar panels, have reduced state government emissions by about 17% from 2005 to 2017.

These efforts were initiated by Governor Mark Dayton’s Executive Order 17-12, which directs state agencies to reduce waste, conserve energy, and save money. One of the objectives of the executive order was to reduce GHG emissions created during day-to-day enterprise operations. State agencies came together to identify reduction strategies, including reducing fuel consumption in state vehicles, reducing energy consumption in buildings, and implementing existing renewable energy policies.

Due to these efforts, state government is over halfway to the order’s goal of 30% reduction by 2025, with half of the decrease coming from electricity savings, reduced square footage of workspaces, and on-site renewable energy generation across state agency offices. Future initiatives include transitioning many light-duty fleet vehicles to electric, exploring the use of more biofuels in medium- and heavy-duty vehicles, implementing a building retro-commissioning program to conserve energy, and installing solar panels at state office and workspace locations.

For more information about how state government has reduced GHGs, check out the Office of Enterprise Sustainability’s 2017 report, at https://mn.gov/admin/assets/2018%20annual%20report_web_tcm36-355173.pdf.

Participating in national and international climate change initiatives

Minnesota is a member of various national and international coalitions working to reduce GHG emissions and move forward with actions to mitigate climate change. In 2015, Minnesota joined the Under2 Coalition, an international group comprising over 200 state, regional, and national governments committed to keeping global temperature increases to under 2 degrees Celsius. The coalition aims to find pathways for “deep decarbonization,” innovative policy solutions, and systems to improve emissions reporting and policy development. More information can be found at https://www.under2coalition.org/.

In 2017, Minnesota also joined the U.S. Climate Alliance, a bipartisan group of state governors committed to reducing GHG emissions consistent with the goals of the United Nations Paris Agreement. As a member of the alliance, Minnesota agrees to implement policies that advance the goals of the Paris Agreement, track and report progress to the global community, and accelerate new and existing policies to reduce carbon pollution. More information can be found at https://www.usclimatealliance.org/.
Most recently, in September 2018, Minnesota joined the Powering Past Coal Alliance, an international group of state, regional, and national governments, businesses, and organizations dedicated to advancing the transition of power generation away from coal. Members of this alliance believe that moving away from coal power generation is necessary to promote clean air, healthy communities, sustainable economic growth, and a safe climate. As a part of this alliance, Minnesota is committed to work with our utility partners to move towards a future of renewable energy generation and to reduce our reliance on coal. More information can be found at https://poweringpastcoal.org/.

**Greening up our energy generation**

Minnesota has made great progress toward a clean energy future by substantially reducing GHG emissions from electricity generation. Local utilities continue to close coal plants and replace that power generation with a mix of renewables backed by natural gas. Minnesota's work on clean energy shows we can reduce GHG emissions cost-effectively while our economy continues to grow.

The electricity generation sector’s steep reductions in GHG emissions in Minnesota have resulted from policies to reduce demand for electricity and shift generation to cleaner energy sources. These policies worked in tandem with market forces that make many renewable resources more cost-effective than coal facilities. Efficiency projects are often the most cost-effective way to reduce GHG emissions from electricity generation, so they were the first area where Minnesota focused reduction efforts, requiring utilities to invest in energy efficiency for homes and businesses. Utilities have taken advantage of market developments as well: technology improvements and federal tax policies that have lowered the cost of wind and solar energy development, the continued low price of natural gas, and electricity consumers' growing preference for “green” energy.

Over the past two decades, Minnesota adopted several requirements for electricity generation and renewable energy:

- In 2001, the Legislature allowed utilities to charge customers for the cost of air pollution-reduction projects. This law has encouraged utilities to replace coal generation with gas and wind.
- In 2007, the Legislature adopted the state Renewable Energy Standard (RES) that created renewable energy requirements for all utilities operating in Minnesota. By 2025, the RES requires that a weighted 27% of all retail electricity sales in Minnesota come from renewable energy sources. Minnesota’s utilities are on track to meet this requirement.
- Also in 2007, the state implemented electric utility requirements to reduce 1.5% of retail sales through programs that target the users of electricity, building on previous successful efficiency programs.
- In 2013, the Legislature adopted a solar energy standard for the state’s investor-owned utilities that requires that, by the end of 2020, at least 1.5% of total retail sales are generated by solar energy.
Additionally, several electricity generating facilities, especially those powered by coal, have either recently been retired or are planned to be retired soon. The planned retirements are listed in Table 2.

Table 2. Planned in-state electricity generating unit retirements for Minnesota utilities.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Fuel type</th>
<th>Size</th>
<th>Retirement date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minnesota Power</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boswell Energy Center 1</td>
<td>Coal</td>
<td>67 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Boswell Energy Center 2</td>
<td>Coal</td>
<td>67 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Taconite Harbor Energy Center unit 2</td>
<td>Coal</td>
<td>76 MW</td>
<td>2020</td>
</tr>
<tr>
<td>Taconite Harbor Energy Center unit 3</td>
<td>Coal</td>
<td>83 MW</td>
<td>2020</td>
</tr>
<tr>
<td>Silver Bay Power: 2 units</td>
<td>Coal</td>
<td>130 MW</td>
<td>2021</td>
</tr>
<tr>
<td>Otter Tail Power Company</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoot Lake Combustion Turbine units</td>
<td>Coal</td>
<td>141 MW</td>
<td>2020</td>
</tr>
<tr>
<td>Great River Energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stanton Station (North Dakota)</td>
<td>Coal</td>
<td>187 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Xcel Energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benson Power Biomass Plant</td>
<td>Biomass</td>
<td>55 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Sherburne County 1</td>
<td>Coal</td>
<td>680 MW</td>
<td>2026</td>
</tr>
<tr>
<td>Sherburne County 2</td>
<td>Coal</td>
<td>682 MW</td>
<td>2023</td>
</tr>
</tbody>
</table>

Paving the way for cleaner transportation

Minnesota state agencies, local governments, non-profits, and electric utilities are working to accelerate electric vehicle (EV) adoption in Minnesota by educating Minnesotans about the benefits of EVs and leading and supporting initiatives to build out EV charging infrastructure across the state. The state’s ongoing transition away from coal to renewable energy is amplifying the benefits of EVs, which can take advantage of GHG emission reductions in the power sector. Special electricity rates for EV owners can encourage Minnesotans to charge their EVs at night, which provides benefits to the power grid.

Minnesota is receiving $47 million under the national Volkswagen settlement, and is targeting 15% (the maximum allowed by the settlement) of our Phase I funds to begin building a statewide network of EV charging stations. This will help expand the reach of EVs and reduce barriers to their adoption. More information about how Minnesota is using VW settlement funds can be found at www.pca.state.mn.us/vw.

In addition to promoting electrification, the MPCA serves as an advisor and technical resource for a wide range of other transportation planning and funding efforts across the state. Transportation planning can
have a big impact on vehicle emissions by promoting investment in infrastructure that supports alternative modes of transportation, like public transit, walking, and biking. We work with partners to encourage land-use planning that provides opportunities for people to live within walking or biking distance of the places they need to get to every day, and to promote the use of public transit.

Developing policies that encourage us to adapt to a changing climate

Many Minnesota state agency programs and policies relating to climate change focus on reducing GHG emissions. Adapting to a changing climate, on the other hand, involves developing and implementing strategies, initiatives, and measures to help us prepare for and address the impacts of climate change.

In its 2017 report, “Adapting to Climate Change in Minnesota,” the Interagency Climate Adaptation Team recommended six priority action steps where state government could be of most help:

1. Build greater resilience to extreme precipitation.
2. Identify opportunities to strengthen the health and resilience of vulnerable populations to climate effects through cooperation with local governments.
3. Increase focus on preserving natural and restored ecosystems and habitat to increase resilience of wildlife and native plants.
4. Strengthen agricultural water-management efforts to increase resilience to climate change impacts.
5. Increase focus on managing climate impacts in cities, towns, and other population centers.

The MPCA is implementing several of the above recommendations throughout our work. In 2018, we adopted a new cross-agency strategic goal focusing on climate adaptation efforts, and we are creating an information dashboard to display our climate adaptation data. We also are working with community partners to incorporate resilience into planning and infrastructure, identify and reduce risks for climate-vulnerable populations, and implement adaptation best practices. To learn more about the MPCA’s climate adaptation efforts, visit https://www.pca.state.mn.us/air/adapting-changing-climate.

The Minnesota Department of Health is working with the MCPA and other state agencies to deal with the effects of climate change on human health. The goal of the Minnesota Climate and Health Program is to help us understand the impacts of climate change, and to educate local public health resources and the public about potential health risks. More information on MDH’s Minnesota Climate and Health Program can be found at http://www.health.state.mn.us/divs/climatechange/.
The takeaway

Minnesota has made important progress in reducing GHG emissions, but there is more work to be done to achieve the goals of the Next Generation Energy Act. Significant GHG reductions from the electricity generation sector have driven overall emission trends downward since 2005, aided by smaller improvements in some sectors. These changes show that clean energy laws and programs can and do reduce GHG emissions, but we need to accelerate the pace of progress.

Emissions from Minnesota’s electricity generation sector will continue to decrease, as renewable sources account for greater amounts of the energy produced and used here. In order to achieve our GHG emissions reduction goals, however, we will need to further reduce emissions from what is now our largest source of in-state emissions, transportation. Supporting and promoting the use of EVs, supporting the use of cleaner transportation fuels (such as biofuels), encouraging the use of public and multimodal transportation, and mindful transportation planning are crucial elements in decreasing GHGs from transportation.

Minnesota has been and will remain a leader in GHG emission trends, but without continued support and additional effort, we are not likely to achieve the goals of the Next Generation Energy Act.
Appendix: Methodology

Greenhouse gas emission inventory

A technical support document published in 2012 with the emissions report for 1970-2008 provides a more detailed discussion on the calculation methodology and is available at https://www.pca.state.mn.us/air/greenhouse-gas-emissions-minnesota-0.

Only emissions that occur within the geographical borders of the state are estimated, with two exceptions – net imports of electricity into the state to meet Minnesota demand and emissions from the combustion of aviation fuel purchased in Minnesota, but not necessarily combusted within Minnesota air space.

GHG inventory protocols require that evaluation of state-level GHG emissions take into account photosynthetically-removed CO₂ stored in biomass in forests, landfills, and structures. Carbon storage and emissions from forest soils and agricultural soils are tracked separately from the emissions inventory because it is difficult to estimate specific sources within the larger estimate of carbon flux. Storage of carbon in forest regrowth is incorporated into the agriculture and forestry sector using a discounted storage term of 25 years. Long-term storage of carbon in residential structures and demolition and construction landfills is included in statewide GHG emission totals because it is more certain that the materials will remain as carbon stores for a long time.

Emissions are estimated for all years from 1970 to 2016, though presented here in an abbreviated timeline. With a few exceptions, the methods used to develop these estimates are derived from the following sources:


Updates to methodology and data sources

Except for changes within the agriculture and forestry sector, the methods used to develop the emission estimates are largely unchanged from previous reports. The methodological changes made since the last report were made to improve estimation of total emissions. To assure consistency, these changes were applied to all prior inventory years, when possible, including the baseline year of 2005. Revised data used as inputs for estimation were updated when available.

Significant changes were made to estimates of emissions from agriculture and forestry. The methods used to estimate N₂O from agricultural soils were updated to include present scientific understanding.
and inventory practice based on an inventory framework from the IPCC (2006). New or revised N₂O emission sources include: dry deposition, crop residues from cultivated acres and grasslands, mineralization on cropland and grassland, and asymbiotic nitrogen fixation. The emission factor for pastured histosols was also updated.

Emissions of CO₂ from cultivation and pasturing of histosols were recalculated using state-level information provided by the EPA.

Sources of methane were added to the agriculture and forestry sector to account for the production of methane in lakes, rivers, streams, and reservoirs.

Forest regrowth was added as a source of carbon sequestration. Given the many unknowns about the future of our forests, we estimate a higher probability that carbon stored in the forest will remain there for about 25 years. We have adjusted our inventory estimates to account for that understanding.

Prior to the 2017 Biennial Greenhouse Gas Emissions report, emissions from the transportation sector had been estimated using fuel sales, with the emissions allocated to different modes of transportation using vehicle population, vehicle miles traveled, fuel efficiency, and other fleet statistics. The EPA has developed and improved their motor vehicle emissions simulator (MOVES) to estimate greenhouse gas emissions as well as criteria air pollutants. This model was used to estimate Minnesota’s transportation GHG emissions beginning in the last report and covers 2005-2016. The MOVES model uses the same types of fleet statistics, but estimates energy and fuel consumption as model outputs.

**Uncertainty of estimates**

The MPCA developed its GHG Emission Inventory system with the following in mind: the long record of emissions covering periods of years to decades; a consistent time series of estimates; best international and US practices; high level of data disaggregation; and timeliness. Reflecting these principles, this GHG inventory is:

- **Complete:** This inventory accounts for and reports on Minnesota GHG emission sources and activities within the chosen inventory boundary, as described in the MPCA’s GHG Inventory Technical Support Document. Not all emissions and sinks are included in the statewide total. In some cases, methods have not been developed or data do not exist to support an estimate.

- **Consistent:** The MPCA uses consistent methodologies to allow for meaningful comparisons of emissions over time. Changes to the methods are documented and reported.

- **Transparent:** The MPCA administers the production of the GHG inventory to address all relevant issues in a factual and coherent manner, and to maintain a clear audit trail. Relevant assumptions are disclosed with appropriate references to the accounting and calculation methodologies and data sources used.

- **Accurate:** The MPCA administers the GHG inventory to ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, and as far as the MPCA can judge, uncertainties are reduced as far as practicable.

With this report, the MPCA is providing a qualitative discussion of the uncertainty of emission estimates. Uncertainties around the precision and accuracy of estimates arise and the acknowledgement of uncertainty is not intended to invalidate the estimates. The uncertainties in the reported greenhouse gas estimates are reduced as far as is practical. In future inventories, the MPCA may provide quantitative uncertainty analysis.
This report summarizes GHG emissions by economic sectors, meaning that emissions estimates are the sum of emissions from activities within the sector. Many methodologies and data sources are used to estimate emissions from each activity within a sector. Some of the methods for generating the estimates are very detailed and are the result of site-specific measurements for both activity and emissions, while some are based entirely on the use of a model with only general data to characterize the source of emissions.

As a result, it is not accurate to assign a single quality rating to the entire economic sector estimate at this time. Within each sector, the confidence in data quality can vary. Generally, the more regulated activities have high-quality activity and emission data.

On the whole, fossil fuel use and emissions are very well understood, especially when aggregated to state totals. For example, the quantity of natural gas used in the state leaves little uncertainty, but there is some uncertainty in distributing its use among sectors. Fossil fuel combustion from stationary sources, such as power plants, creates about 50% of our GHG emissions. These emissions are estimated using highly reliable methods, like continuous emissions monitors in place for other regulatory reporting requirements, by mass balance calculations, or by factor calculation from fuel consumption.

All transportation emissions account for about 25% of our GHG emissions. Emissions from on-road transportation are estimated using the MOVES model, which depends on vehicle population data and vehicle miles traveled, rather than fuel data. There is some uncertainty from data inputs and from the underlying equations and assumptions of the model.

The MPCA has undertaken improvement projects which reduce uncertainties to the extent that is practical and where data allows. Comparisons can be made across time because of the consistent revision of the inventory. Conclusions about reaching Minnesota’s GHG reduction goals can be drawn from the inventory when its limits are understood.
Exhibit 9
Greenhouse gas reduction potential of agricultural best management practices

This technical report provides a description of the methodologies used to estimate greenhouse gas emissions reduction potential from 21 practices related to changing land use, cropping practices, and nutrient reduction.
Authors
Peter Ciborowski, Principal Author

Contributors/acknowledgements
Leslie Hunter-Larson, MPCA Librarian

We are grateful to the following people who reviewed the study and provided comments:

Marco Graziani, Minnesota Pollution Control Agency
Gregory Johnson, Minnesota Pollution Control Agency
Dave Wall, Minnesota Pollution Control Agency
Suzanne Rhees, Minnesota Board of Soil and Water
Dan Shaw, Minnesota Board of Soil and Water
Peter Gillitzer, Minnesota Department of Agriculture
Brad Redlin, Minnesota Department of Agriculture
Amanda Kueper, Minnesota Department of Natural Resources
Joseph Fargione, Nature Conservancy
Jessica Gutknecht, University of Minnesota
Amy Swan, Colorado State University
Tom Wirth, US Environmental Protection Agency

Editing and graphic design
Risikat Adesaogun
Jennifer Holstad
Barb Olafson

Minnesota Pollution Control Agency
520 Lafayette Road North  |  Saint Paul, MN  55155-4194  |
651-296-6300  |  800-657-3864  |  Or use your preferred relay service.  |  info.pca@state.mn.us
This report is available in alternative formats upon request, and online at www.pca.state.mn.us.

Document number: p-gen4-19
Table of contents

Table of contents .................................................................................................................................................. i
List of Tables ......................................................................................................................................................... iii
Executive summary .................................................................................................................................................. v
Agriculture and climate change in Minnesota ...................................................................................................... v
What do we know? .............................................................................................................................................. v
What does it mean for Minnesota? ......................................................................................................................... v
What impact can agricultural best practices make? ............................................................................................... vi
Agricultural best Practices: Terms to know ........................................................................................................... viii
A. Introduction and summary ................................................................................................................................. 1
II. Methodology ..................................................................................................................................................... 6
III. Results .............................................................................................................................................................. 18
IV. Detailed results and discussion ....................................................................................................................... 22
C. Shelterbelts and hedgerows ............................................................................................................................... 38
D. Field borders, contour buffer strips, vegetative barriers, herbaceous wind barriers ..................................... 43
E. Grassland riparian buffers .................................................................................................................................. 45
F. Forested and multispecies riparian buffers ....................................................................................................... 51
G. Winter cover crop/Catch crop ............................................................................................................................ 57
H. No-till tillage ....................................................................................................................................................... 64
I. Reduced tillage .................................................................................................................................................... 75
J. No till: Reduced tillage counterfactual ............................................................................................................... 80
K. Cropland to hayland conversion ....................................................................................................................... 83
L. Perennial grass added to annual crop rotation ................................................................................................ 88
M. Corn-soybean rotation in place of continuous corn ....................................................................................... 92
V. Practices for which only preliminary estimates are available ........................................................................ 97
Appendix A. Constructed and restored wetlands ............................................................................................... 100
Appendix B. Biochar ............................................................................................................................................ 102
Appendix C. Split fertilizer application ............................................................................................................... 104
Appendix D. Subsurface fertilizer placement .................................................................................................... 105
Appendix E. Spring fertilizer placement ........................................................................................................... 106
Appendix F. Controlled release fertilizers ........................................................................................................ 107
Appendix G. Nitrification and urease inhibitors ................................................................................................. 108
Appendix H. Emissions-avoided from 15% reduction in nitrogen fertilizer use ........................................... 109
Endnotes ......................................................................................................................................................... 109
Database bibliography .................................................................................................................................. 125
Database references for practices for which only preliminary results are available .............................. 197
List of Tables

Table 1. Agricultural practices examined in this study ................................................................. 3
Table 2. Estimated annual greenhouse gas-avoidance from agricultural practices (CO₂-equivalent short tons per 100,000 acres per year) ................................................................. 5
Table 3. Sources of emissions-avoidance or increase for agricultural practices ....................... 9
Table 4. Calculative basis for emissions-avoided or emissions-increase estimates: indirect N₂O, urea and liming CO₂, GHGs from fuel use and agricultural chemical manufacture .................................. 16
Table 5. Fuel use changes by agricultural or land-use practice .................................................. 17
Table 6. Assumed changes in fertilizer and agricultural chemicals use by agricultural or land-use practice

............................................................................................................................................. 17
Table 7. Emissions-avoided from agricultural practices (short CO₂-e tons per 100,000 acres per year) ... 19
Table 8 Emissions-avoided from agricultural practices (short CO₂-e tons per 100,000 acres per year) a .. 21
Table 9. Land retirement/Long-term idling - Grassland restoration: Emissions-avoided ............. 24
Table 10. Published estimates of greenhouse gas-avoidance from cropland idling in unmanaged grassland a .................................................................................................................. 25
Table 11. Descriptive statistics: Land retirement/Long-term idling - Grassland restoration, carbon sequestration in soils and biomass .................................................................................. 28
Table 12. Descriptive statistics: Land retirement/Long-term idling - Grassland restoration, N₂O ....... 30
Table 13. Descriptive statistics: Land retirement/Long-term idling - Grassland restoration, CH₄ .......... 31
Table 14. Land retirement/Long-term idling - Afforestation: Emissions-avoided ....................... 32
Table 15. Descriptive statistics: Land retirement/Long-term idling - Afforestation, carbon sequestration in soils and biomass .......................................................... 35
Table 16. Descriptive statistics: Land retirement/Long-term idling - Afforestation, N₂O ............... 37
Table 17. Descriptive statistics: Land retirement/Long-term idling - Afforestation, CH₄ ............... 38
Table 18. Shelterbelts and hedgerows: Emissions-avoided .......................................................... 40
Table 19. Descriptive statistics: Shelterbelts and hedgerows - carbon sequestration in soils and biomass ....................................................................................................................... 42
Table 20. Descriptive statistics: Shelterbelts and hedgerows - N₂O ............................................. 42
Table 21. Descriptive statistics: Shelterbelts and hedgerows - CH₄ ........................................... 43
Table 22. Field borders, contour buffer strips, vegetative barriers, herbaceous wind barriers: Emissions-avoided a .................................................................................................................. 44
Table 23. Grassland riparian buffers: Emissions-avoided a ......................................................... 46
Table 24. Descriptive statistics: Grassland riparian buffers - carbon sequestration in soils and biomass .48
Table 25. Descriptive statistics: Grassland riparian buffers - N₂O ............................................. 50
Table 26. Descriptive statistics: Grassland riparian buffers - CH₄ ................................................ 51
Table 27. Forested and multispecies riparian buffers: Emissions-avoided .................................... 52
Table 28. Descriptive statistics: Forested riparian buffers and multispecies buffers - carbon sequestration in soils and biomass ............................................................ 54
Table 29. Descriptive statistics: Forested and multispecies riparian buffers - N₂O .................................................. 55
Table 30. Descriptive statistics: Forested and multispecies riparian buffers - CH₄ .................................................. 56
Table 31. Winter cover crops/Catch crops: Emissions-avoided ................................................................. 58
Table 32. Published estimates of greenhouse gas-avoidance from cover crop use a ........................................ 59
Table 33. Descriptive statistics: Winter cover crops/Catch crops - carbon sequestration in soils .......... 61
Table 34. Descriptive statistics: Winter cover crops/Catch crops - N₂O .......................................................... 63
Table 35. Descriptive statistics: Winter cover crops/Catch crops - CH₄ ......................................................... 64
Table 36. No-till tillage: Emissions-avoided a ............................................................................................... 66
Table 37. Published studies of the integrated impacts of no-till practice on greenhouse gases from all sources of emissions-avoidance a ........................................................................................................... 67
Table 38. Descriptive statistics: No-till tillage–carbon sequestration in soils a ............................................. 70
Table 39. Descriptive statistics: No-till tillage - N₂O a ...................................................................................... 74
Table 40. Descriptive statistics: No-till tillage - CH₄ a ...................................................................................... 75
Table 41. Reduced tillage: Emissions-avoided a .............................................................................................. 76
Table 42. Descriptive statistics: Reduced tillage - carbon sequestration in soils a ........................................ 78
Table 43. Descriptive statistics: Reduced tillage - N₂O a ................................................................................ 79
Table 44. Descriptive statistics: Reduced tillage - CH₄ a ................................................................................ 80
Table 45. No-till tillage: Emissions-avoided a ............................................................................................... 81
Table 46. Descriptive statistics: No-till tillage - carbon sequestration in soils a ............................................. 82
Table 47. Descriptive statistics: No-till tillage - N₂O a ...................................................................................... 84
Table 48. Cropland to hayland: Emissions-avoided ...................................................................................... 85
Table 49. Change in total greenhouse gases from conversion of cropland to hayland rotation a ............. 85
Table 50. Descriptive statistics: Cropland to hayland - carbon sequestration in soils ........................................ 87
Table 51. Descriptive statistics: Cropland to hayland - N₂O ..................................................................... 88
Table 52. Add a perennial grass to crop rotation: Emissions-avoided .......................................................... 89
Table 53. Descriptive statistics: Add a perennial grass or alfalfa to crop rotation – carbon sequestration in soils ........................................................................................................................................... 91
Table 54. Descriptive Statistics: Add a perennial grass or alfalfa to crop rotation - N₂O ......................... 92
Table 55. Corn-soybean rotation replacing continuous corn: Emissions-avoided ........................................... 93
Table 56. Change in total greenhouse gases from conversion from continuous corn to corn-soybean rotation a ................................................................................................................................................. 94
Table 57. Descriptive statistics: Corn-soybean rotation replacing continuous corn - carbon sequestration in soils ........................................................................................................................................... 95
Table 58. Descriptive statistics: Corn-soybean rotation replacing continuous corn - N₂O ..................... 97
Executive summary

Agriculture and climate change in Minnesota

Climate change is a worldwide problem that is already affecting Minnesota. In the coming decades, Minnesota may experience warmer temperatures and wetter weather due to climate change. To reduce the impacts of climate change, Minnesota has set a goal to reduce greenhouse gas emissions by 80% by 2050, but we are behind schedule.

Agriculture accounts for approximately one-quarter of Minnesota’s greenhouse gas emissions, so strategies to reduce emissions from this sector are critical to reaching statewide goals. In addition to greenhouse gas reduction benefits, some strategies may help farmers maintain soil health and reduce erosion which will help them adapt to warmer and wetter climate conditions. A new technical report estimates the impact of 21 different agriculture best practices on greenhouse gas emissions.

What do we know?

Many Minnesota farmers already implement best management practices like planting shelterbelt trees and reducing tilling to protect soil health and water quality. Agriculture creates greenhouse gas emissions, but through best practices, it can reduce emissions or even remove greenhouse gases from the atmosphere and be part of our climate solution.

This report quantifies the climate co-benefits of certain agricultural practices based on existing research. The report estimates greenhouse gas reductions for 21 agricultural best management practices. The emission reductions per acre range are small, but implementing best management practices across the 20 million acres of Minnesota cropland could reduce overall agriculture emissions by 5-10%.

What does it mean for Minnesota?

Agricultural practices that protect our water and our soil can also help reduce greenhouse gas emissions and protect our climate. This report provides evidence for practices that have the strongest climate co-benefits. Minnesota should support farmers with funding and technical assistance to implement these
practices. Widespread implementation of these practices will be good for farmers, good for Minnesota’s water quality, and good for the global environment.

Early adopters of these practices are already making a difference. Water and soil conservation programs from the Board of Water and Soil Resources have reduced cropland agriculture emissions by 600,000 tons per year, approximately 1% of cropland emissions. This report could help focus future work to achieve water quality, soil health, and greenhouse gas reduction goals statewide.

What impact can agricultural best practices make?

Some agricultural practices are more effective than others at reducing greenhouse gases. Practices that take land out of agricultural production have the highest reductions per acre, but may not be widely implemented. Cropping and fertilizer changes may achieve smaller emission reductions per acre, but could be implemented on millions of acres while maintaining or improving agricultural production. Four practices are highlighted below.

**Riparian Grass Buffers**

Riparian grass buffers are already required for lakes, rivers, streams, and public ditches in Minnesota. Grass buffers help filter out phosphorous, nitrogen and sediment and protect water quality. This report estimates that riparian grass buffers reduce greenhouse gas emissions by 0.77 tons/acre.

**Cover Crops**

Cover crops are planted in the fall after harvest and grow slowly through the winter. The crops capture excess soil nutrients and are plowed under in the spring. The most common cover crop in Minnesota is cereal rye. Winter cover cropping can reduce greenhouse gas emissions by 0.20 tons/acre.
Biochar

Biochar is charcoal produced from crop residues. When placed in soil, it can improve soil fertility and reduce greenhouse gas emissions by 1.23 tons/acre. Biochar is a relatively new technique with limited field research, so this estimate is preliminary and will be updated as more research is available.

For more information:

Frank Kohlasch
Environmental Analysis & Outcomes Division Manager
Frank.Kohlasch@state.mn.us

Peter Ciborowski
Principal Study Author
Peter.Ciborowski@state.mn.us
Agricultural best Practices: Terms to know

**Biochar**: charcoal produced through low-temperature pyrolysis from crop residues and its placement in cropland soils to improve soil fertility and essential soil properties.

**Constructed/restored wetlands**: Constructed and restored wetlands intercept the flow of nutrients and sediments from croplands to water bodies.

*Constructed wetlands* are engineered wetlands constructed on former croplands to intercept the flow of nutrients and sediments from croplands to lakes, rivers and streams.

*Restored wetlands* are drained wetlands that have been hydrologically restored, typically by blocking drainage ditches or disconnecting drainage piping. Like constructed wetlands, restored wetlands act to intercept the flow of nutrients and sediments from croplands to water bodies.

**Controlled release fertilizer**: urea fertilizer coated with polymers that delay the onset of urea hydrolysis until later in the crop season, thereby delaying availability of nitrogen to the plant until the time of greatest crop nutrient need.

**Corn-soybean rotation replacing continuous corn**: conversion from corn monoculture to corn and soybeans in a two-year rotation.

**Cropland idling in restored grassland**: conversion of upland cropland to unmanaged grassland, without harvest removals or grazing, usually through a long-term or short-term easement.

**Cropland idling in trees**: conversion of upland cropland to forested acres, without harvest removals or grazing, usually through a long-term or short-term easement.

**Cropland to hayland conversion**: conversion of upland or lowland cropland to alfalfa, other hay or perennial grassland leys for forage production.

**Field borders, contour buffer strips, vegetative and herbaceous barriers**: Buffers are used to intercept nutrients and sediments and reduce wind erosion of soils.

*Field borders* are strips of permanent vegetation placed at field edges.

*Contour buffer strips and vegetative barriers* are intra-field strips of permanent vegetation that follow the contour of the land, particularly the contour of sloping hills. Farmers often alternate contour buffer strips with strips of annual row crops.

*Herbaceous wind barriers* are narrow strips of perennial or annual grass placed across the path of prevailing winds.

**Forested riparian and multispecies buffers**: vegetated strips along streams and rivers that are planted to trees or trees, bushes and grass in combination and act to intercept agricultural nutrients and sediments in surface run-off. Multispecies buffers include, from stream edge to farm field, tall stature trees, medium stature bushes and perennial grasses.

**Grassland riparian buffers**: vegetated strips along streams and rivers that are planted to perennial grasses and act to intercept agricultural nutrients and sediments in surface run-off.

**Nitrification and urease inhibitors**: chemicals added to ammonia and urea-based fertilizers to delay the conversion in soils of urea to ammonium (urease inhibitors) and ammonium to nitrate (nitrification
inhibitors), thereby delaying the availability of nitrogen until it is needed by the crop. In well-aerated soils, nitrification is the principal process through which nitrous oxide is produced in soils.

**No-till tillage**: tillage practice in which cropland soil is left undisturbed, before and during planting and after harvest. Seeding is done through direct drilling. Weeds are controlled with herbicides. Crop residues are left on the soil surface to decompose. For purposes of analysis, in this study, the effects of no-till are evaluated against either conventional tillage with moldboard plow or reduced tillage.

**Perennial grass added to annual crop rotation**: in a crop rotation with one or more annual crops, one to three years of alfalfa, other hay or grass leys added to the rotation to build soil organic carbon and to improve other soil physical characteristics.

**Reduced tillage**: Tillage practice that avoids full soil inversion, but still results in some disturbance and some soil mixing. Variants of reduced tillage include: chisel till, ridge till, mulch till, sweep till, disk tillage, and subsoiling.

Conservation tillage, in which a certain percentage of crop residue is left on the soil surface, is a variant of reduced tillage. For purposes of analysis, in this study, reduced tillage is anything that does not fall into the categories of: conventional tillage with moldboard plow and no-till.

**Shelterbelts/hedgerows**: tall and medium stature trees and shrubs in a linear array at the edges of agricultural fields, typically two or three threes deep, perpendicular to prevailing winds to provide shelter.

**Split fertilizer application**: application of cropland fertilizers in two or three treatments spaced to make nutrient available at the time of greatest crop nutrient need. This is *in lieu* of single application of nitrogen fertilizer at, before, or immediately after planting.

**Spring fertilizer application**: application of nitrogen fertilizer in early or later spring, *in lieu* of fall applications. To make use of available free time in the fall, some crop producers apply fertilizer in the fall months in advance of the next cropping season.

**Subsurface placement of nitrogen fertilizer**: shallow or deep placement of nitrogen fertilizer, through either incorporation, injection, or nesting, near the crop root zone. This can be done in bands or, in the case of incorporation, evenly across the field. This is *in lieu* of surface broadcast or surface spraying of fertilizer.

**Winter cover crop/catch crop**: an intercrop that typically is established in the fall after cash crop harvest to take-up or scavenge excess soil nutrients. Cover crops grows slowly in cold climates and typically are plowed under in the spring. Cereal rye is the most commonly used cover crop in the US Midwest.

**Fifteen percent fertilizer use reduction**: starting with average per acre nitrogen fertilizer use, a 15 percent reduction in annual per acre applications.
A. Introduction and summary

Climate change, forced by accumulating atmospheric greenhouse gases (GHGs), is a widely recognized environmental problem. The state of Minnesota has statutory greenhouse gas emission reduction goals of 15 percent from 2005 levels by 2015, 30 percent from 2005 levels by 2025, and 80 percent by 2050. The state did not meet its 2015 goal.²

Based on the most recent emission inventory totals, GHG emissions from agriculture, forestry and land-use comprise 22 percent of state-level emissions. About two-thirds of these are produced from cropland soils, from nitrate leached from croplands to the state’s surface waters, or from petroleum-based fuels combusted in farm equipment during crop production. The scientific literature is replete with suggestions that, with improved agricultural practices, emissions from agricultural cropland sources can be reduced.

In this report, we review the greenhouse gas emission reduction potential of 13 agricultural best management practices designed to slow rates of soil erosion and reduce the movement of nutrients from cropland to groundwater and surface water and sediments from cropland to surface water. A further eight practices are reviewed for their effectiveness in mitigating GHGs on a preliminary basis. Our intent in either instance is to determine the effectiveness, if any, of the GHG reduction co-benefits of these 21 practices.

We used a conventional lifecycle framework for estimating the emissions-avoidance potential of the 21 practices evaluated here, on a final or preliminary basis. Emissions-avoidance was estimated for all direct cropland sources of GHGs, as well as indirect cropland sources, emissions from fuel use in cropland farm equipment, and emissions from the manufacture of fertilizers, other agricultural chemicals and fuels used in crop production. Total avoided-emissions are the sum of avoided-emissions from all sources. These were calculated in carbon dioxide-equivalent (CO₂-equivalent) short tons per 100,000 acres per year. Given some specific practice, they represent the estimated annual emissions-avoidance in the present that result from the implementation of that practice. So long as the practice remains in place, these estimated co-benefits should persist at roughly this level for at least 20 years, the window of time that we used to develop this analysis. Most field and modeling studies of GHG avoidance are conducted within roughly a 20-year window of time (2 to 20 years).³

Greenhouse gases emitted to the atmosphere during crop production include nitrous oxide (N₂O) and carbon dioxide (CO₂). N₂O is produced in fertilized and tilled cropland rich in ammonium (NH₄⁺), nitrate (NO₃⁻), and organic nitrogen. Tillage and fertilization with synthetic nitrogen and manure act to stimulate the microbial production of nitrous oxide in soils and its subsequent emission. N₂O can be produced in

³ In practice, physical changes in soils may, with time, reduce the rate at which certain agricultural and conservation practices impinge on GHG emissions. For instance, with many best agricultural practices, cropland soils saturate with respect to soil organic carbon, slowing with time the rate at which they remove CO₂ from the atmosphere. But this usually occurs only after 20 to 25 years from the initiation of those practices. (Marland et al., 2003; West and Six, 2007) For some practices like cropland conversion to permanent grassland, soils begin to saturate with respect to soil organic carbon only after 40 to 50 years after conversion. (Poeplau et al., 2011) Less is known about soil emissions of N₂O and CH₄ (or soil CH₄ oxidation), besides some initial indications that, with time, cropped soils under no-tillage practice may become progressively lower emitters of N₂O. (Six et al., 2004)
surface water from nitrate leached from cropland. Nitrous oxide also can be produced microbially in soils downwind of fertilizer application as a result of ammonia (NH₃) volatilization and deposition.

CO₂ is produced during tillage-induced oxidation of soil organic matter, again through microbial action, and also during fuel use in farm equipment used in crop production. Small amounts of carbon dioxide are emitted during urea fertilizer hydrolysis and the use of crushed limestone to raise soil pH levels.

Carbon dioxide also can be removed from the atmosphere and stored in cropland soils and plant biomass. During photosynthesis, CO₂ is removed from the atmosphere and fixed in plant biomass and, in the form of root biomass and crop residues, some of this makes its way to and is retained in soils. During the removal of CO₂ from the atmosphere, cropland soils and plant biomass act as negative emissions sources.

Most well-drained cropland soils oxidize atmospheric methane (CH₄). In this, again, they act as negative emission sources.

Finally, carbon dioxide and methane are both produced in large amounts during the manufacture of nitrogen fertilizers, as well as other fertilizers, herbicides and insecticides, and agricultural fuels. Nitrous oxide also is produced. Large amounts of CO₂ are released in processes that convert CH₄ in natural gas to ammonia-based fertilizer by replacing CH₄ carbon with nitrogen, with waste CO₂ vented to the atmosphere as a pollutant. Most of this occurs out-of-state.

The list of practices that we reviewed is shown in Table 1, along with the Natural Resources Conservation Service (NRCS) practice standard number for each. Practices for which we provide only preliminary results are listed at the bottom. Some practices involve the idling of cropland in conservation plantings like unmanaged grasses or trees or the conversion of cropland to a cropland-supporting role in the form of riparian buffers, shelterbelts, field borders, in-field vegetative barriers and related land-uses. Of the practices that fall into this category, the analysis was completed on six. Preliminary results are available for constructed and restored wetlands. These are shown in Table A.1 in Appendix A.

Six of the practices that were reviewed involve tillage and cropping change. Under these practices, cropland remains in production.

Nutrient reduction practices for which only preliminary results are available comprise the last category of practices. While not strictly speaking a nutrient reduction practice, biochar does generally act to improve nutrient use efficiency, in addition to enhancing other soil qualities.

We define the emissions-avoidance potential of these practices as the difference, on 100,000 acres, of emissions under each practice and average cropland emissions. In many cases, this difference was calculated using the estimated percentage change in emissions with each practice from baseline emission levels or, in the case of biogenic carbon sequestration, the absolute change in sequestration on an area basis (per acre, per hectare or per square meter basis). Estimates of the change in emissions with each practice, again either percentage changes or changes in absolute units, were taken from the scientific literature. In the case of some practices, no estimates were available. For these practices, estimates of average rates of emission in absolute units were developed from the scientific literature and, in combination with estimates of average cropland emission rates, were used to develop practice-based estimates of emissions-avoidance.
In developing these estimates, most attention was paid to emissions-avoided from soils, either in terms of avoided (or increased) emissions of N\textsubscript{2}O or CH\textsubscript{4} or biogenic carbon sequestration. Emissions from fuel use in crop production are small, as are emissions in the form of CO\textsubscript{2} from the use of urea fertilizer or crushed limestone. The same is true for indirect N\textsubscript{2}O emissions from leached nitrate or NH\textsubscript{3} volatilization and downwind deposition.

Table 1. Agricultural practices examined in this study

<table>
<thead>
<tr>
<th>Practice</th>
<th>NRCS Conservation Practice Standard</th>
<th>Principal GHG Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Retirement/Long-term Idling: Grassland Restoration</td>
<td>327</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Land Retirement/Long-term Idling: Afforestation</td>
<td>327</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Shelterbelts, Hedgegrowths</td>
<td>380, 422</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Field Borders, Contour Buffer Strips, Vegetated Barriers, Herbaceous Wind barriers</td>
<td>386, 601, 332, 603</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Grassland Riparian Buffers</td>
<td>390</td>
<td>N\textsubscript{2}O, CH\textsubscript{4}, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Forested and Multispecies Riparian Buffers</td>
<td>391</td>
<td>CH\textsubscript{4}, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Constructed and Restored Wetlands</td>
<td>656, 657</td>
<td>CH\textsubscript{4}, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>No-Till Tillage</td>
<td>329</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration, fuel use)</td>
</tr>
<tr>
<td>Reduced Tillage</td>
<td>345</td>
<td>CO\textsubscript{2} (carbon sequestration, fuel use)</td>
</tr>
<tr>
<td>No-Till Tillage-reduced tillage counterfactual</td>
<td>329</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Winter Cover Crops/Catch Crops</td>
<td>340</td>
<td>CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Cropland to Hayland</td>
<td>328</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Add a Perennial Grass to Crop Rotation</td>
<td>328</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>Corn-Soybean Rotation Relacing Continuous Corn</td>
<td>NA</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
<tr>
<td>15% Fertilizer Use Reduction</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Split Fertilizer Application</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Nitrification and Urease Inhibitors</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Controlled Release Fertilizers</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Subsurface Fertilizer Placement</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Spring Fertilizer Application</td>
<td>590</td>
<td>N\textsubscript{2}O</td>
</tr>
<tr>
<td>Biochar</td>
<td>NA</td>
<td>N\textsubscript{2}O, CO\textsubscript{2} (carbon sequestration)</td>
</tr>
</tbody>
</table>

In the case of the out-of-state manufacture of agricultural chemicals and fuels, it is conventional to estimate emissions using simplified methods based on national-level emission factors per unit of fertilizer, herbicide, insecticide or fuel output. (Eagle et al., 2012; Liebig et al., 2019; Mosier et al., 2006; Sainju et al., 2014). In the case of each of these sources, a simplified method was applied to estimate emission-avoidance, again following conventional practice. In the case of avoided indirect emissions...
from nitrate leached from cropland, we deferred to the analysis on nitrate control found in the Minnesota Pollution Control Agency (MPCA), *Minnesota Nutrient Reduction Strategy*. (MPCA, 2014)

For emissions-avoided from cropland soils, we compiled a database of results for practices for which we have final results from 1,248 published scientific studies. In addition, for practices for which we provide only preliminary results, we compiled a database from an additional 525 studies. Using the results of these 1,773 studies, we developed a set of rates of GHG-avoidance on an area-basis (per acre, per hectare or per square meter basis) or, in the case of practices for which we calculate emissions-avoidance as the difference between practice emissions and average cropland emissions, a set of practice cropland emission rates. In many instances, these were taken from meta-analyses of study results found in the published literature. Meta-analysis is a powerful statistical tool used in ecology and other disciplines to aggregate results from studies with widely divergent designs and draw overall conclusions across studies. When the results from meta-analyses were not available, we used simple arithmetic averaging of study results from the larger literature.

For each practice, we developed a GHG-avoidance budget with an itemized accounting of GHG-avoidance by emission source and gas. We accompanied each budget with an extended discussion of the physical, biological and biochemical processes that underlie estimated emissions or emissions-avoidance. For each source of emissions or emissions-avoidance, we also developed descriptive statistics of the relevant study results from the database, including standard errors and confidence intervals.

The results of the analysis are shown in Table 2 in abbreviated form. Of practices for which we have results, all but one of these 13 practices result in GHG-avoidance. Of practices that involve cropland idling or conversion of cropland to buffers, shelterbelts, field borders and other land-uses that indirectly support crop production, all result in net GHG-avoidance, with avoidance falling into an estimated range of 0.8 to 2.7 CO₂-equivalent short tons per acre of practice. Of practices involving tillage and cropping change, six of seven deliver GHG-avoidance benefits. Only the conversion of cropland from corn monoculture to corn-soybean in a two-year rotation results in increased estimated GHG emissions. These estimates, it should be noted, are for average per acre avoidance. Not all acres will experience these estimated levels of GHG-avoidance or do so consistently.

The resulting analysis is intended to answer the question: based on best available science, what general level of annual GHG-avoidance might be expected from different agricultural best management practices implemented today. Uncertainties notwithstanding, and they can be substantial, what is the best estimate of emissions-avoidance of the practices?

Of practices for which we have only preliminary results, three practices – constructed and restored wetlands, subsurface nitrogen fertilizer placement and spring nitrogen fertilizer application – result in increased emissions, although the results are preliminary and may change with further analysis. According to the analysis, GHG emissions are avoided in five of the practices for which we have preliminary results.

Preliminary results should be treated with caution, as they may change as the analysis is better developed. For the practices for which we have only preliminary results, there exists a dearth of research, excepting the results for nitrification and urease inhibitors and controlled release fertilizers. For some of these practices, other researchers may have come to conclusions different from ours based on different choices in how the problem is set-up and in data.
Table 2. Estimated annual greenhouse gas-avoidance from agricultural practices (CO₂-equivalent short tons per 100,000 acres per year)

<table>
<thead>
<tr>
<th>Cropland Idling or Related Conservation Land-Uses</th>
<th>Tons per 100,000 acres per year a,b,c</th>
<th>Tillage and Cropping Changes</th>
<th>Tons per 100,000 acres per year a,b,c</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final Results</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shelterbelts/hedges</td>
<td>(269,000)</td>
<td>Cropland to hayland</td>
<td>(121,000)</td>
</tr>
<tr>
<td>Cropland idling in trees</td>
<td>(263,000)</td>
<td>Crop rotation with perennial forages</td>
<td>(50,000)</td>
</tr>
<tr>
<td>Forested riparian buffers</td>
<td>(203,000)</td>
<td>No-till, reduced tillage</td>
<td>(23,000)</td>
</tr>
<tr>
<td>Cropland idling in grass</td>
<td>(162,000)</td>
<td>counterfactual d</td>
<td></td>
</tr>
<tr>
<td>Field borders and related</td>
<td>(161,000)</td>
<td>Cover crops</td>
<td>(20,000)</td>
</tr>
<tr>
<td>Riparian grass buffers</td>
<td>(77,000)</td>
<td>Reduced tillage</td>
<td>(15,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No-till</td>
<td>(14,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous corn to corn-soybean rotation</td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Preliminary Results-Only</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cropland Idling or Related Conservation Land-Uses</td>
<td>Tons per 100,000 acres per year a,b,c</td>
<td>Nutrient Reduction Practices</td>
<td>Tons per 100,000 acres per year a,b</td>
</tr>
<tr>
<td>Constructed/restored wetlands</td>
<td>66,000</td>
<td>Biochar</td>
<td>(120,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Controlled release fertilizers</td>
<td>(27,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nitrification inhibitors</td>
<td>(24,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Split fertilizer application</td>
<td>(13,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15% fertilizer reduction</td>
<td>(6,000)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spring N fertilizer application</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subsurface N fertilizer application</td>
<td>31,000</td>
</tr>
</tbody>
</table>

a negative = emissions-avoided; positive = emissions increase  
c for terrestrial carbon sequestration, assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass  
d counterfactual = base tillage condition against which the effect of no-till is evaluated.

The estimates given in Table 2, in Section II below (Tables 7 and 8) and throughout this report for annual GHG avoidance are roughly comparable to those reported in the published literature. Published studies that address GHG-avoidance across multiple practices report, for best cropping and tillage practices, annual avoidance of 0.72 to 0.85 CO₂-equivalent short tons per acre and, from cropland idling in grass or trees and related conservation land-use, annual avoidance of 1.23 to 1.92 CO₂-equivalent short tons per acre. (Eagle et al., 2012; Gelford and Robertson, 2015; Robertson et al., 2000; Swan et al., 2015) For cropland idling and related conservation land-use change, the annual avoidance estimates reported in this study range from 0.77 to 2.69 CO₂-equivalent short tons per acre, while those for tillage and
cropping practices\(^4\) range from 0.14 to 1.21 CO\(_2\)-equivalent short tons per acre. Estimates of total GHG-avoidance taken from the published literature are provided throughout this report by practice (see Tables 10, 32, 37, 49 and 56).

In general, agricultural practices, if well designed, can reduce GHG emissions to the atmosphere. The average rate of avoidance for the six practices that involve cropland idling or conversion of cropland to a supporting role in the form of buffers and related land-uses, and for which we have results, is 1.7 CO\(_2\)-equivalent tons per acre. If implemented in Minnesota on half a million acres, these practices would result in the avoidance of about 850,000 CO\(_2\)-equivalent short tons of GHG emissions. For cropping and tillage practices, again for which we have results, the average rate of avoidance is 0.3 CO\(_2\)-equivalent short tons per acre. If implemented on 10 million acres, these practices would result in the avoidance of about 3 million CO\(_2\)-equivalent short tons of GHGs per year or about 10 percent of the estimated 2016 emissions from Minnesota crop agriculture (26.9 CO\(_2\)-equivalent million short tons).\(^5\) These totals seem generally indicative of at least a modest potential for GHG avoidance from improved cropland practices.

II. Methodology

Greenhouse emissions-avoidance from the implementation of an agricultural or land-use practice is calculated as the sum of the changes in GHG emissions by gas for each practice from each of the individual emissions sources from agriculture. In crop production, emitted greenhouse gases include: CO\(_2\), N\(_2\)O and CH\(_4\). Sources of GHG emission include cropped soils, fuel use, surface waters, land surfaces downwind of crop production on which volatilized ammonia might be deposited, and the mostly out-of-state manufacture of agricultural chemicals and fuels used in crop production. Emissions and emissions-avoidance are expressed on an area-basis in a common unit, CO\(_2\)-equivalent short tons, which cumulatively give the net impact of the practice on emissions in the form of a single value. In this analysis, these are annualized to give the average annual change in GHG emissions – whether an increase or a decrease - associated with the establishment of some practice. The change in emissions is calculated on a 100,000-acre basis. The results for each practice are reported as the change in CO\(_2\)-equivalent emissions per year on 100,000 acres. The quantification is set up so that a negative change in total annual average emissions indicates net GHG emissions-avoidance and a positive change indicates a net emissions increase from some change in agricultural practice.

The boundaries to this analysis were selected following the practice, now widely accepted, of Robertson \textit{et al.} (2000) and Mosier \textit{et al.} (2005, 2006). This limits the frame of analysis to the change in emissions from soils, vegetation, surface waters, fuel use, and agricultural chemicals manufacture, omitting downstream emissions and emissions-avoidance resulting from land-use changes of a more international nature that might result, through the market price mechanism, from changes in crop production in North America. Also not considered are changes in net emissions or net emissions-

\(^4\) All cropping and tillage practices shown in Table 2 except cropping change from continuous corn to corn and soybeans in rotation, a practice not treated in Eagle \textit{et al.} (2012), Gelford and Robertson (2015), Robertson \textit{et al.} (2000), or Swan \textit{et al.} (2015).

avoidance as a result of specific downstream uses of field commodities, for instance, in livestock operations or biofuels production.

The estimates that are developed in this analysis reflect present-day experience with different agricultural practices. In general, in Minnesota, we are most interested in mitigating GHG emissions on a decadal timeframe; with the state’s statutory 2025, 30 percent GHG reduction targets now just 6 years off and the state’s progress in reducing emissions about 5 percent as of 2015, the first target year given in state statute. For policymaking, the relevant window of effectiveness of different practices, then, is a decade or two, which in assembling data on the effectiveness of practices we generalize to 20-years, excluding responses that fall outside of that window. This is important because response rates of GHG to different practices can be quite different in the out-years following the introduction of an improved practice, 20 to 50 years after introduction, than in the initial 20 years.

As noted in the introduction, emissions-avoidance is evaluated against a cropland counterfactual; emissions under changed practice less emissions from cropland under average current conditions gives the level of emissions-avoidance for each practice. Due to a scarcity of published research, it was not possible to evaluate emissions-avoidance against a pastureland or grassland counterfactual, particularly with respect to changes in soil carbon. The restoration of degraded grassland was not evaluated as one of our 21 options, but, in future versions of this report, it may be addressed, along with other improved livestock grazing practices.

The estimates of emissions-avoidance account for net changes in emissions that result from soil carbon sequestration. During photosynthesis, CO₂ is removed from the atmosphere and incorporated into plant biomass and, potentially, through roots and crop residue inputs to soil, to soil organic carbon. This results in a net drawdown of atmospheric CO₂ levels, which, as with most other researchers, we treat as a negative emission.

CH₄ is treated similarly. Atmospheric methane is oxidized in cropland soils, removing it from the atmosphere. An increase in CH₄ oxidation from a change in agricultural practice results in a drawdown of atmospheric CH₄ levels, which again we treat as a negative emission.

The avoided-emissions estimates (or estimates of increased emissions) contained in this report are calculated using the Global Warming Potential Index values drawn from the 2007 IPCC Fourth Scientific Assessment. (IPCC, 2007) This index provides relative weightings of greenhouse gases that allow us to express the emission of any one GHG in terms of its equivalent in units of emitted CO₂. This allows us to add emissions of GHGs with quite different warming capacities to derive net GHG emission (or net emission-avoidance) totals. To maintain a common reference point, it has become something of an agreed convention in science to continue to use the 2007 version of this index. We follow this practice. In 2013, the 2007 weightings were superseded by an updated version in the IPCC Fifth Scientific Assessment. (IPCC, 2013)

In converting nominal units of sequestered soil carbon (or rates of sequestration) to CO₂-equivalent units, we used a global warming potential value of 0.4. This corresponds to a period of persistent storage of newly sequestered carbon in agricultural landscapes of about 20 years. This is the longest period over which, in our judgment, persistent storage safely can be assumed. The larger calculation of

---

Pastureland soils are more like native grassland or forest soils than cropland soils. However, unlike the effect of changes in cropland or former cropland soil carbon under different land-use practices, relatively little work has been published on the change in organic carbon from land retirement from pastureland to unmanaged grassland or from pastureland or unmanaged grassland to forestland or wetland.
the 0.4 global warming potential value derives from an estimate of CO₂ retention in the atmosphere for emitted CO₂ from fossil fuel combustion. Once emitted to the atmosphere, a unit of mass of CO₂, e.g., ton, kilogram, lbs., is only partially retained in the atmosphere. One-hundred years after emission, an estimated 38 percent of that mass will remain in the atmosphere. Expressed in ton-years, an emission of one ton of CO₂ to the atmosphere will, over the one hundred year period, result in 52 ton-years of atmospheric retention. To offset one ton of emission, a ton of sequestered organic carbon must remain in storage an equal 52 years. At 20 years, storage of organic carbon would offset only 20-ton-years of emissions or about 40 percent what might be needed to offset a ton of emitted CO₂ from oil or coal combustion.

Organic carbon stored in soils or on the landscape in tree biomass is subject to rapid loss with a change to more intensive tillage, changed cropping patterns or land-clearing or conversion from less intensive land uses, like conservation purposes or hayland, to more intensive uses of the land, like row crop cultivation. Past changes in land use have proven very difficult to predict, making it difficult to conclude much about the likelihood of the persistence of carbon storage beyond a decade or two.\(^7\)

Regarding the larger lifecycle approach using GWP-weightings, this is a longstanding approach in the scientific literature stretching back to 2000. (Adviento-Borbe et al., 2007; Amadi et al., 2017; Archer and Halvorson, 2010; Del Grosso et al., 2005; Dendooven et al., 2012; Gan et al., 2011; Gan et al., 2014; Gelfand and Robertson, 2015; Hernandez-Ramirez et al., 2009; Johnson et al., 2011; Kaye and Quemada, 2017; Kim and Dale, 2008; Kusterman et al., 2008; Liebig et al., 2010; Merbold et al., 2014; Robertson et al., 2000; Sainju et al., 2014; Six et al., 2004; Smith et al., 2008; Soussana et al., 2007) Recent applications have been in meta-analysis of the results of published lifecycle analyses using GWP-weightings (Sainju, 2016) and in related comparative assessments of net emissions-avoidance by practice, built-up emissions source by emissions source from statistical analyses of study results of GHG-avoidance taken from the scientific literature. (Eagle et al., 2012; Fargione et al., 2018; Swan et al., 2015)

In this report, we mainly follow the practice pursued in Eagle et al. (2012), Swan et al. (2015) and Fargione et al. (2018) in aggregating results across a large number of published studies to come to a set of conclusions about the relative effectiveness of agricultural practices in mitigating GHG emissions.

Table 3 lists emission sources or sources of emissions-avoidance for the 13 agricultural and land-use practices for which we have final results. Of these, the sources with the greatest influence on estimated GHG-avoidance, across all evaluated practices are: soil carbon sequestration, soil N₂O emissions, and soil CH₄ emissions from wet anoxic soils. In the following subsections, we focus on these sources, including how in each case response rates for emissions-avoided (or, if this is the case, emissions increases) are estimated and the issues associated with that estimation. Response rates are at the heart of the analysis presented here.

---

\(^7\) Perhaps the best example might be Conservation Reserve Program lands in Minnesota, which include lands that are temporarily idled, mostly as unmanaged grassland. These lands stored large amounts of organic carbon, which, as is often noted, will be quickly reemitted to the atmosphere as CO₂ if placed back into intensive cultivation. (Gelfand et al., 2011) Based on the most recently available statistics, once enrolled in CRP, only about 10 percent of these idled lands were re-enrolled beyond the initial 15-year contract period. (USDA-FSA, 2017) If, at initial enrollment, it had been assumed that this organic carbon build-up would be retained indefinitely, that would have been an incorrect assumption.
Table 3. Sources of emissions-avoidance or increase for agricultural practices

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Dominant Term in Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>carbon accumulation in soils and biomass</td>
<td>all practices but one evaluated</td>
</tr>
<tr>
<td>N₂O</td>
<td>soils</td>
<td>9 out of 13 practices evaluated</td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>grassland and forested riparian buffers</td>
</tr>
<tr>
<td>N₂O-indirect leaching</td>
<td>indirect emissions-surface waters from leached soil nitrate</td>
<td>cover crops</td>
</tr>
<tr>
<td>N₂O indirect volatilization</td>
<td>indirect emission-downwind soils from nitrogen volatilization/redeposition</td>
<td>none</td>
</tr>
<tr>
<td>CO₂</td>
<td>lime and urea use (soils)</td>
<td>none</td>
</tr>
<tr>
<td>CO₂, N₂O, CH₄</td>
<td>fossil fuel and electricity use in crop production</td>
<td>none</td>
</tr>
<tr>
<td>CO₂, CH₄</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>grass riparian buffers, perennials added to rotation, continuous corn to corn-soybean rotation</td>
</tr>
</tbody>
</table>

The remainder of emissions and emissions-avoidance--from indirect N₂O emissions from surface waters and volatilization and deposition, fuel use, urea and liming, and upstream chemical manufacture--are treated separately near the end of this section on Methodology.

A. Terrestrial carbon sequestration response rates

As just noted, average response rates of emissions and terrestrial carbon sequestration to specific agricultural and land-use practices are at the heart of the analysis presented here. With different practices, organic carbon can be sequestered in soils or in live biomass and surface litter or detritus. Derived from the pool of atmospheric carbon, each increment of additional carbon storage represents a net drawdown of atmospheric CO₂ levels, which with most other researchers we treat as a negative emission.

In this study, response rates of terrestrial carbon sequestration to different practices are developed from review of the scientific literature, principally from the review of results taken from long-term and short-term controlled experiments of sequestration potential using side-by-side experimental plots, or, more often, derivative statistical studies of those results. The results from literature reviews and studies that propose mean values for response rates based on expert judgment also are used, as are results from numerical modeling studies. Side-by-side experiments include long-term soil sampling experiments under controlled conditions, eddy covariance studies of net carbon exchange, and studies of total ecosystem carbon using a combination of soil sampling and biometric approaches to biomass estimation.

Regarding derivative statistical studies, it is now common practice for scientists to produce and publish derivative statistical analyses of the results of controlled side-by-side studies, time-series analyses, and modeling studies, collapsing large numbers of study results down to a single mean practice response rate. The side-by-side studies particularly suffer from high variability in response rates across environmental and soil conditions. Rates of terrestrial sequestration vary within agricultural fields, across county and state lines, across soil types, and, in response to decadal climatic fluctuations, across time. Because of this high variability in results, to determine response rates to individual practices, a
very large number of experimental results, spanning a wide range of environmental and edaphic conditions and often decades of observations, often are required. Using the body of published side-by-side experimental work, derivative statistical analyses extract their results from just such a large number of studies spanning the necessary range of environmental and edaphic conditions.

Derivative statistical analyses include formal meta-analyses. Meta-analysis is a powerful statistical tool used to evaluate and integrate results from experiments of different designs and draw overall conclusions about response rates. (Luo et al., 2010; Du et al., 2017) Beginning with initial studies in the early 2000s, meta-analysis has taken on an ever more central role in the analysis of GHG response rates to different practices.

Literature reviews and studies that propose mean values for response rates based on expert judgment serve a similar function to meta-analyses, albeit on a less quantitative basis. In integrating across expert knowledge, these types of studies act as distillations of what is known scientifically, with estimates of likely mean response rates an extension of that corporate wisdom.

Modeling studies mathematically describe the biological, biochemical and physical processes involved in sequestration and integrate across the interactions.

In selecting response rates, we give preference to the results of meta-analyses, if any, followed by the mean of the results for all studies across study type. Meta-analysis was designed specifically to address the problem of mean response rate under conditions of wide variability in environmental and other conditions and divergent study designs. Use of a mean value of the results from all studies is an obviously second best choice, but in absence of results from formal meta-analyses, is the best alternative. The studies that fall under the category ‘statistical summaries and other derivative analyses’ are a mixed lot, sometimes simple data compendia, with and without averaging. The utility of modeling studies is generally constrained by limited numbers of available studies, as are literature reviews and reviews that, in advancing estimates of mean response rates to practices, rely on expert judgment.

The mean response rate used to estimate net carbon sequestration, if developed from a set of meta-analysis study results, is the simple arithmetic average of those results.

For some practices, no changes occur in organic carbon storage beyond those in soils. Generally, these retain cropland in production without land-use change. For these, it is sufficient in evaluating the effects on biogenic carbon storage to report on changes solely in soil organic carbon. For some practices, substantial land-use changes are involved. For these, sequestration is measured by the change in total ecosystem carbon, including, besides soils, carbon in aboveground and belowground live biomass, woody detritus and aboveground litter. Almost without exception, practices that add trees to the landscape add large amounts of new carbon to existing carbon pools, resulting in substantial carbon sequestration. The same is true, though to a lesser extent, for practices like grassland restoration, in which large stores of biogenic carbon are maintained year-round in aboveground vegetation and litter or below ground in live roots.

Finally, many or most of the studies on carbon sequestration in soils, regardless of the practice involved, report results in tons of carbon sequestered per hectare or acre per practice, either over some set of years or per year, rather than percentage changes. This is true for empirical site studies using paired plots. (Dean and Kataki, 2003; Gelfand and Robertson, 2015; Olson et al., 2013). It is also true for expert reviews (Chambers et al., 2016; Conant et al., 2017; Lal et al., 1998; Misnasny et al., 2017; Smith et al., 2005), modeling studies (Del Grosso et al., 2005; Desjardin et al., 2005) and derivative statistical
analyses like meta-analyses. (Angers and Ericksen-Hamel, 2008; Congreves et al., 2014; Luo et al., 2010; Puget and Lal, 2005; Six et al., 2002b; Virto et al, 2012; West and Post, 2002) There are some notable exceptions.

The same is true for studies of carbon sequestration in aboveground and belowground biomass and surface detritus like forest litter or downed dead trees.

Given the limits of the literature, we follow general practice in estimating sequestration response rates to different agricultural or land-use practices in absolute units, typically metric tons of carbon per hectare (megagrams of carbon per hectare). Annually avoided emissions are calculated on 100,000 acres.

B. N₂O and CH₄ response rates

N₂O and CH₄ response rates are estimated differently than those for terrestrial carbon sequestration. For agricultural practices that involve a change in land use, response rates are estimated as the difference between annual emission or flux rates under the improved practice and average cropland net annual flux rates. Practices that involve a change in land-use include grassland restoration, afforestation on idled croplands, shelterbelts, field borders and vegetative barriers, riparian buffers and cropland to hayland conversions. Annual flux rates for the cropland counterfactual are, for N₂O, drawn from the MPCA Greenhouse Gas Emission Inventory, and, for CH₄, from Aronson and Helliker (2010) for average temperate cropland soils.

Most emission estimates for N₂O emissions under these practices derive from empirical site studies, with relatively few meta-analyses available for the results of these empirical studies. In estimating average annual emissions rates per acre, we use a simple average of the results from all available studies, though in practice these results tend to derive overwhelmingly from empirical site studies.

CH₄ is produced in and emitted from wet soils in which anaerobic conditions predominate, while, in well-drained upland soils, CH₄ generally is oxidized. CH₄ fluxes can be expressed in terms of emissions or oxidation. As in the case of N₂O, most estimates of CH₄ fluxes under improved land-use practice, whether upward fluxes to the atmosphere or net negative fluxes, which denote oxidation, derive from empirical site studies.

For agricultural practices that involve a change in cropping or tillage practice, response rates for N₂O and CH₄ are the product of average cropland net annual flux rates and the estimated percentage change in that annual flux under the new practice. Practices that involve a change in cropping/tillage practice include: use of cover crops, conversion from conventional tillage to no-till and reduced tillage, and rotational change from continuous corn or a corn-soybean rotation to an extended rotation with two years of alfalfa or another hay, or from continuous corn to a corn-soybean rotation.

To calculate response rates, for the cropland counterfactual we use flux or emission rates from, for N₂O, the MPCA Greenhouse Gas Emission Inventory, and, for CH₄, from Aronson and Helliker (2010) for average temperate cropland soils. Estimated flux rates for cropland under improved tillage or rotations most often are taken from meta-analysis-type studies. For the reasons discussed above with respect to terrestrial carbon sequestration, in estimating average flux rates for N₂O and CH₄, preference is given to the results of meta-analyses, if any, followed by the mean of the results for all studies across study type.
Finally, in developing estimates for flux rates by practice or the change in flux rates with the implementation of different practices, a simple arithmetic average of study results by study is used. Given a set of derived response rates, annually avoided emissions are calculated on 100,000 acres.

C. Database practices

To understand the potential role of agriculture in GHG emission mitigation, we examine, on a practice-by-practice basis, the GHG avoidance-potential of practices that, in the scientific literature, have been identified as potentially effective in mitigating emissions. To date, we have assessed the effect of 13 practices on greenhouse gas emission-avoidance. The results of that analysis are reviewed in abbreviated form in the following section and, at length, on a practice-by-practice basis, in the section following that. Preliminary information on the GHG effects of an additional eight practices is included in the appendices.

To support this analysis, we have assembled a database of the results of 1,248 studies for the 13 practices reviewed thus far. An additional 525 studies have been reviewed to support the analyses that appear, in preliminary form in the appendices, bringing the total number of studies included in the database to 1,773. While not exhaustive, the database accounts for a large percentage of published studies on the effects of different agricultural practices on GHG emissions.

GHG emissions from agriculture, regardless of species, are highly variable both spatially and temporally. This is as true for emissions from practices introduced to mitigate emissions as it is for emissions under conventional agricultural practices. This variability results from the large number of environmental controls on emissions. To be useful, the set of studies used to support analysis needs to be broadly representative of that variability, with results across a wide range of environmental conditions roughly analogous to those encountered in and across agroecosystems. With analysis based largely on observational data, the more representative is the data, the more robust the conclusions are likely to be.

The results included in the database are from studies of one of five types: empirical site studies, modeling studies, meta-analyses, statistical summaries or other derivative statistical analyses, and literature or expert reviews. The results from empirical site studies are generally limited to those from field studies and, within the class of field studies, to studies with observations covering at least two-thirds of a growing season. With but a few exceptions, the results of laboratory experiments are excluded from the database. Studies involving flood field rice paddy agricultural also are excluded as involving fundamentally different soil conditions than found in upland croplands, as is crop production on highly organic soils.

To estimate changes in soil carbon sequestration, CH₄, or N₂O with changed practices against a conventional agricultural practice baseline, side-by-side studies under controlled condition are required. This is true regardless of whether changes are presented in absolute units of change, e.g., tons per acre per year, as in the case of terrestrial soil carbon, or in terms of percentage changes from a baseline. The vast majority of study results housed in the database are from side-by-side studies conducted under controlled conditions. In the studies housed in the database, changes in soils carbon typically are evaluated over periods of time of at least 10 years. We determined that, to be included in the database, sequestration studies had to include enough information to for observed changes in carbon levels to be annualized. We also determined that, to be included in the database, the results of studies of soil carbon sequestration had to have been developed on a mass, as opposed to a concentration, basis, accounting
for changes in bulk density over time. In general, we include in the database only the results from studies that provide clear information on the units in which results are reported, as well as on experiment duration, and location.

Modeling studies can be forward or backward looking, while most other study types are backward looking, developing information based on experimentation and long-experience. The set of studies that are included in the database are largely, but not completely, limited to those providing results from a 20-year window of time either side of the present year. The database excludes model forecast results for practices implemented in the later years of this century, beyond 2040.

To simplify the data housed in the database, wherever possible within studies we average results across environmental and management conditions. For the 13 studies discussed below, we commonly average results across soil type, crop residue treatment, and fertilizer nitrogen amounts, placement and timing. Depending on the practice under inquiry, we also average results across tillage practice, so long as the study inquiry is not into the effect of tillage practice on emissions or sequestration, likewise for cover crop treatments, and crops and crop rotations.

In assembling the database, we did not request information on all study replicates, but restricted our analysis to the data presented in the studies themselves.

Because of this averaging, the ratio of numbers of studies to numbers of study results in the database is near to, though not exactly, unity. Some notable exceptions include studies that report results using multiple study types, or where, in the case of cover crops, results are reported for both nonleguminous cover crops and leguminous cover crops and for cover crop incorporation or non-incorporation. Other notable exceptions include tillage studies that report multiple results based on cover crop treatment and cover crop studies that report multiple study results based on different tillage practices. It is increasingly common in field research to investigate the effects of different tillage and cover crop treatments jointly, due to the perceived soil benefits of joint implementation of these practices. Because of the importance of cover cropping to tillage results, and tillage to cover cropping results, research results are retained in the database for tillage practices across different cover crop treatments (with and without cover crops) and for cover crop practices across different types of tillage.

Multiple study results also are retained when given for buffer types (forested riparian buffer practice), forage type (cropland to hayland practice), grassland restoration by participation or nonparticipation in CRP, and grassland and forestland status as newly restored or existing mature systems (grassland restoration and afforestation practices.)

For belowground sequestration, we include results for the deepest soil layer reported. Where a series of estimated rates of sequestration are reported for multiple sets years, we include only the results from the longest experiment duration consistent with our general 20-year window for results. Where, particularly with meta-analyses, it is possible to calculate an average 15- or 20-year rate of emission or sequestration, we do so, using this in lieu of point estimates of sequestration or emission in the 5th, 10th or 20th year after experiment initiation. Regarding cropping, in selecting results we use results reported at the multi-year rotation level, rather than for individual crop years within a rotation.

Changes in soil carbon may be examined on a fixed-depth basis or a soil mass-equivalent basis. In the scientific literature, the latter approach generally is the preferred approach. Wherever possible, results developed using the latter approach are included in the database. Similarly, given a choice between
sequestration results developed using long-term soil sampling and those developed from observed respiration rates, again the former are used as, again, seemingly the preferred alternative.

It is a convention in the literature to calculate annual rates of sequestration from study endpoints, assuming linearity between endpoints. Where individual studies provide multi-year estimates of sequestration, but do not provide annualized estimates, we follow general convention in annualizing using total sequestration mass and experiment duration in years.

Often in older experimental plots, carbon mass was not measured in the initial years. In these older studies, results were reported using the difference in soil carbon mass in the terminal year of the experiment, working from the assumption that, since side-by-side plot were involved, initial levels of soil carbon must have been similar if not identical. Again, where individual studies provide multi-year estimates of sequestration, but provide neither annualized estimates nor estimates of soil carbon mass in the initial experiment years, we follow standard conventions in estimating sequestration rates from the annualized difference in reported soil organic carbon mass in the experiment’s final year.

Finally, regarding geographical range, generally we limit the study results included in the database to those from temperate climates. While a number of studies from subtropical climates are included in the database, including studies from subtropical Australia, Brazil, Mexico and China, the bulk of the results housed in the database derive from North American and European sources. In general, the geographical range of the data in the database has to be broad enough to capture enough studies under a wide enough array of environmental conditions so that, in terms of mean response to different practices, the mean of the database studies is in fact roughly representative of the mean in nature.

In practice, this means that the results given here have general applicability rather than local applicability. They give the average response of emissions to these practices at large spatial scales, rather than small spatial scales, like the land area of the state of Minnesota, for which only a small number of published studies, about 30, exist for GHG-avoidance across the 21 agricultural and conservation practices considered in this study. The small number of available Minnesota-specific studies probably now precludes the development of estimates of GHG-avoidance tailored narrowly to Minnesota.

D. Weight of evidence test
As already noted, flux rates of GHGs from agricultural soils are highly variable. The same is true for changes in flux rates resulting from alternative agricultural practices that are implemented to lower emission rates or to offset emissions.

Given this endemic high variability, for N₂O and CH₄ emissions-avoidance and CO₂-avoidance in the form of carbon sequestration, we use a weight of the evidence test in assessing how well an estimate of mitigation potential is known. Throughout this study, we provide estimates of the numbers of study results for each practice by study type, the ratio of positive-to-negative results, again by study type, along with standard errors and confidence intervals. We also provide in the case of each practice and soil emittant (or sequestered gas) a discussion of the underlying science at the process level, including what the science tells us should be happening, based on underlying scientific understanding. The corporate judgment of the community of involved scientists, as expressed in expert reviews, is particularly informative of the larger state of the science.
We also identify estimates that, based on width of confidence intervals and odd anomalies in the results, are somewhat or substantially uncertain and for which caution in their use is warranted.

We accept that, because of the need to act to reduce GHG emissions, which is nearly universally acknowledged, in the end it is a matter of best presently available science. What does best available science tell us and, very high levels of uncertainty aside, is it known well enough at a probabilistic ‘weight of the evidence’ level to underpin action? Is it good enough? We provide the underlying factual basis for judging that issue.

E. Response rates: Indirect N₂O emissions, emissions from fuel use and upstream manufacturing emissions

Finally, in most instances, the contribution of indirect N₂O sources to changes in emissions under changed practices is small. The same is true for fuel use sources of emissions and minor sources of CO₂ like urea fertilizer and crushed limestone. In certain instances, the contribution of out-of-state manufacture of agricultural chemicals and fuels can be significant, but generally, the effects are small.

Response rates for these sources to alternative agricultural practices are estimated using simple methodologies and, typically, using a single, albeit authoritative, data source for estimated mitigation potential or in some cases several sources. By its nature, the standard methodology for estimating emissions change from the avoided manufacture of agricultural chemicals and fuels – the amount of these commodities produced multiplied by the average US GHG emission per unit produced – is simplified.

Table 4 delineates the simplified calculative approaches taken with respect to response rates of emissions in the case of each of these minor sources. In the case of indirect N₂O from leached nitrate or NH₃ volatilization and redeposition, response rates are the product of average emission rates from these sources at a statewide level and estimated percentage rates of emission reduction per practice. The reduction rates are, in the case of nitrate loading, taken from MPCA, Minnesota Nutrient Reduction Strategy (MPCA, 2014), and, for NH₃, from Pan et al. (2016). In some instances, response rates for these sources are calculated as the difference in average N₂O flux rates statewide from these sources, on a per acre basis, and emissions per acre under alternative practices, like grassland restoration or shelterbelt establishment. Estimated average flux rates for cropland are from the MPCA GHG emission inventory, while, for idled land in upland or riparian grass or trees, they are taken from Bouwman et al. (1997).

In most instances, avoided-emissions from fuel use are calculated using the crop-based and tillage-based fuel use intensity factors given in Camargo et al. (2013). These are converted to avoided-emissions using standard conversion values. Camargo et al. (2013) is likewise the source of the emission intensity of avoided agricultural fertilizer and chemical manufacture, which, using a weighted average for crop production and average chemical and fertilizer use rates for Minnesota crops from USDA-NASS (2018), is expressed as a rate of emission intensity per acre of cropland for use in calculation.

Tables 5 and 6 show the equations used to calculate fuel and agricultural chemicals and fertilizer use-avoided in this report, by agricultural practice.
<table>
<thead>
<tr>
<th>GHG</th>
<th>Calculative Approach to Emissions-avoidance</th>
<th>Base emission level</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-Indirect, nitrate leaching, NH₃ redeposition</td>
<td>% reduction in NO₃⁻ runoff to surface waters ⁶, ⁷, ⁸, % reduction in NH₃ volatilization and redeposition ⁹, ¹⁰</td>
<td>Minnesota N₂O emissions from NO₃⁻ leaching and from NH₃ deposition to cropland, 2012-2015 average ¹¹ Data source: MPCA GHG emission inventory</td>
</tr>
<tr>
<td>CO₂-urea use, liming</td>
<td>urea: (no urea use, idled cropland) – (CO₂ from urea use on cropland) ¹²; liming: (CO₂ from crushed limestone applications to alfalfa) – (CO₂ from crushed limestone applications to average MN cropland) ¹³</td>
<td>Minnesota N₂O and CO₂ emissions from Nitrogen fertilizer and limestone use, respectively, 2012-2015 average Data source: MPCA GHG emission inventory</td>
</tr>
<tr>
<td>GHGs-fuel use in crop production</td>
<td>(per acre fuel use intensity of changed practice) – (per acre fuel use intensity baseline practice). For cover cropping, subtraction or addition of emissions from crop production operations foregone or added beyond baseline. Data source for per acre fuel use intensity by practice and fuel use rate per operation: Camargo et al. (2013)</td>
<td>Minnesota fuel use emissions, 2012-2015 average, using a weighted average of fuel use per rotation from Camargo et al. (2013)</td>
</tr>
<tr>
<td>GHGs-manufacture of fertilizer, other agricultural chemicals and fuels</td>
<td>subtraction or addition of emissions from upstream fertilizer, chemicals and fuel use from crop production operations foregone or added beyond baseline. Data source for emissions rates per lbs. of N, P and K fertilizer, herbicides, insecticides and fungicides manufactured: Camargo et al. (2013)</td>
<td>Minnesota average per acre fertilizer and agricultural chemical use on cropland, using a weighted average across major crops, from most recent USDA-NASS fertilizer and chemical use summaries (NASS, 2018)</td>
</tr>
</tbody>
</table>

* Assumes that the reduction in N₂O from surface waters and NH₃ volatilization and downwind redeposition is the same as the estimated percentage reduction in NO₃⁻ runoff and volatilization, respectively, after IPCC (2006) methodology.

  · ¹ cover crops, no-till, reduced tillage, riparian buffers, shelterbelts/hedges, afforestation on idled cropland
  · ² no till, reduced tillage
  · ³ field borders, grassland restoration, cropland conversion to hayland, expanded rotations with perennials
  · ⁴ grassland restoration, afforestation on idled upland cropland, shelterbelts/hedges, field borders/vegetative barriers, riparian buffers
  · ⁵ cropland to hayland conversion, extended rotations with perennials
  · ⁶ 0.75 percent of leached nitrogen is assumed to be emitted to the atmosphere as N₂O, after the IPCC (2006) methodology. 1 percent of nitrogen that is redeposited on land surface after ammonia volatilization is assumed to be emitted to the atmosphere as N₂O, again after IPCC (2006)
### Table 5. Fuel use changes by agricultural or land-use practice

<table>
<thead>
<tr>
<th>Practice</th>
<th>Equations Giving the Basis for the Calculated Change in Emissions from Fuel Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-till, Reduced tillage</td>
<td>(weighted fuel intensity per acre, no-till or reduced tillage) – (weighted fuel intensity per acre, conventional tillage) for corn, soybeans, corn silage, wheat and alfalfa</td>
</tr>
<tr>
<td>No-till with Reduced Tillage Counterfactual</td>
<td>(weighted fuel intensity per acre, no-till) – (weighted fuel intensity per acre, conventional till) for corn, soybeans, corn silage, wheat and alfalfa</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>add 1 seed drill operation, 1 roller packer operation</td>
</tr>
<tr>
<td>Cropland to Hayland Conversion</td>
<td>(weighted fuel use intensity per acre, alfalfa) – (weighted fuel use intensity, all Minnesota cropland)</td>
</tr>
<tr>
<td>Extended Rotations with Alfalfa or Other Hay or Grass</td>
<td>(weighted fuel use intensity per acre, corn-corn-alfalfa-alfalfa rotation) – (weighted fuel use intensity, all Minnesota cropland)</td>
</tr>
<tr>
<td>Continuous Corn to Corn-Soybean Rotation</td>
<td>(weighted fuel use intensity per acre, continuous corn) – (weighted fuel use intensity, corn-soybean rotation)</td>
</tr>
<tr>
<td>All Other</td>
<td>(no fuel use) - (weighted fuel use intensity, all Minnesota cropland)</td>
</tr>
</tbody>
</table>

### Table 6. Assumed changes in fertilizer and agricultural chemicals use by agricultural or land-use practice

<table>
<thead>
<tr>
<th>Practice</th>
<th>Equation Giving the Basis for the Calculated Change in Emissions from Avoided Manufacture of Agricultural Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Crops</td>
<td>– (Nitrogen credit for cover crops) – (–15% reduction, herbicide use) + (energy input to cover crop seed production)</td>
</tr>
<tr>
<td>Cropland to Hayland Conversion</td>
<td>(P,K and lime applications to alfalfa) – (N, P, K, lime, herbicide, insecticide applications to cropland)</td>
</tr>
<tr>
<td>Extended Rotations with Alfalfa or Other Hay or Grass</td>
<td>(P,K and lime applications to alfalfa) – (N, P, K, lime, herbicide, insecticide applications to cropland), 2 years of 4 year rotation – N credit to corn after alfalfa, 140 and 70 lbs. per acre, first and second year after alfalfa</td>
</tr>
<tr>
<td>Continuous corn to corn-soybean rotation</td>
<td>no N applications to soybean phase of corn-soybean rotation, plus N credit 35 lbs. N/acre credit to corn after soybeans</td>
</tr>
<tr>
<td>All Other</td>
<td>(no fertilizer or chemical use) - (N, P, K, lime, herbicide, insecticide applications to cropland)</td>
</tr>
</tbody>
</table>

*a a small amount of upstream emissions from oil production and the refining and transport of fuels used in crop production is included in the totals in Table 2, but is not shown above*
III. Results

As noted in the Introduction, thirteen agricultural practices have been reviewed thus far, falling into two basic categories: practices that involve land-use change from cropland to a cropland-supporting role in buffers and related land-uses, or long-term idling; and practices that retain land in crops with changes in tillage and cropping rotations. An additional eight agricultural practices have been reviewed on a preliminary basis.

The results of the analyses are shown Table 7. Results are given in CO₂-equivalent short tons of GHG-avoided for each practice per 100,000 acres. Emissions-avoided are shown for both in-state sources of avoidance and total avoidance, both in-state and out-of-state. Of the 13 practices that have been reviewed, all but one results in per acre greenhouse gas reductions. Only rotational change from continuous corn to 2-year corn-soybean rotation increases GHG emissions. Six of the seven largest estimated per acre emission reductions involve changing land-uses from cropland to a cropland supporting role, like that played by riparian buffers or shelterbelts, or long-term cropland idling in unmanaged grasses or trees.

Of the 13 practices reported on in the main body of this report, the practices that yield the largest per acre greenhouse gas-avoidance are shelterbelts, long-term cropland idling in trees and in forested and multispecies riparian buffers. In the case of each, land that was formerly in annual crop production is planted to trees, which enables the storage of large amounts of organic carbon in the form of aboveground and belowground biomass. Organic carbon is fixed in plant biomass during photosynthesis, effectively removing it from the atmosphere.

Expressed as emissions-avoided per acre, average annually avoided emissions with shelterbelts, afforestation on idled cropland, forested riparian buffers, upland grassland restorations, field borders and related grass barriers, and grassland riparian buffers are an estimated 2.7, 2.6, 2.0, 1.6, 1.6, and 0.8 short CO₂-equivalent tons per acre, respectively.

With the exception of cropland to hayland conversion and, to a lesser extent, extended crop rotations with forage perennials like alfalfa, changed tillage and cropping practices are an order of magnitude less effective on a per acre basis in reducing GHG emissions than practices that idle or retire cropland to buffers, field borders, vegetative barriers or conservation plantings. These practices do allow cropland to remain in production, which allows them to be implemented across the Minnesota landscape potentially on millions of acres of cropland. While cropland idling, buffer establishment and related practices might be established in Minnesota on tens of thousands to hundreds of thousands of acres, these practices are unlikely to be implemented in Minnesota on millions of acres.

Of cropping and tillage practices, cropland to hayland conversion results in the largest per acre annual GHG-avoidance. Cropland to hayland conversion acts similarly to cropland idling, with per acre greenhouse gas-avoidance of 1.2 CO₂-equivalent short tons per acre per year. In both instances, most intensive tillage ceases, which acts to create conditions in soils in which microbial decomposition of organic matter slows, allowing organic carbon to accumulate.
Table 7. Emissions-avoided from agricultural practices (short CO₂-e tons per 100,000 acres per year)

<table>
<thead>
<tr>
<th>Practices that Involve Land-Use Change from Cropland to Cropland-Supporting Role or Long-term Idling</th>
<th>Emissions-avoided a,b</th>
<th>in-state plus out-of-state</th>
<th>in-state-only c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelterbelts, Hedgerows</td>
<td>(269,265)</td>
<td>(249,074)</td>
<td></td>
</tr>
<tr>
<td>Land Retirement/Long-term Idling: Afforestation</td>
<td>(262,611)</td>
<td>(242,421)</td>
<td></td>
</tr>
<tr>
<td>Forested and Multispecies Riparian Buffers</td>
<td>(203,251)</td>
<td>(183,061)</td>
<td></td>
</tr>
<tr>
<td>Land Retirement/Long-term Idling: Grassland Restoration</td>
<td>(162,411)</td>
<td>(142,221)</td>
<td></td>
</tr>
<tr>
<td>Field Borders, Contour Buffer Strips, Vegetated Barriers, Herbaceous Wind Barriers</td>
<td>(161,038)</td>
<td>(140,847)</td>
<td></td>
</tr>
<tr>
<td>Grassland Riparian Buffers</td>
<td>(77,299)</td>
<td>(57,109)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cropping and Tillage Practices d,e</th>
<th>Emissions-avoided a,b</th>
<th>in-state plus out-of-state</th>
<th>in-state-only c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland to Hayland</td>
<td>(121,339)</td>
<td>(107,966)</td>
<td></td>
</tr>
<tr>
<td>Add a Perennial Grass to Crop Rotation</td>
<td>(49,685)</td>
<td>(37,799)</td>
<td></td>
</tr>
<tr>
<td>No-Till Tillage-reduced tillage counterfactual</td>
<td>(22,565)</td>
<td>(22,332)</td>
<td></td>
</tr>
<tr>
<td>Winter Cover Crops/Catch Crops</td>
<td>(20,474)</td>
<td>(19,287)</td>
<td></td>
</tr>
<tr>
<td>Reduced Tillage</td>
<td>(14,543)</td>
<td>(14,176)</td>
<td></td>
</tr>
<tr>
<td>No-Till Tillage</td>
<td>(13,807)</td>
<td>(13,208)</td>
<td></td>
</tr>
<tr>
<td>Corn-Soybean Rotation Replacing Continuous Corn</td>
<td>39,830</td>
<td>57,127</td>
<td></td>
</tr>
</tbody>
</table>

Preliminary Results-Only: f

<table>
<thead>
<tr>
<th>Practices that Involve Land-Use Change from Cropland to Cropland-Supporting Role or Long-term Idling</th>
<th>Emissions-avoided a,b</th>
<th>in-state plus out-of-state</th>
<th>in-state-only c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contructed and Restored Wetlands</td>
<td>65,17</td>
<td>85,708</td>
<td></td>
</tr>
</tbody>
</table>

Nutrient Reduction Practices

<table>
<thead>
<tr>
<th>Emissions-avoided a,b</th>
<th>in-state plus out-of-state</th>
<th>in-state-only c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochar</td>
<td>(119,713)</td>
<td>(122,642)</td>
</tr>
<tr>
<td>Controlled Release Fertilizers</td>
<td>(27,369)</td>
<td>(27,369)</td>
</tr>
<tr>
<td>Nitrification and Urease Inhibitors</td>
<td>(24,033)</td>
<td>(24,033)</td>
</tr>
<tr>
<td>Split Fertilizer Application</td>
<td>(13,455)</td>
<td>(13,455)</td>
</tr>
<tr>
<td>15% Fertilizer Use Reduction</td>
<td>(5,878)</td>
<td>(3,757)</td>
</tr>
<tr>
<td>Spring Fertilizer Application</td>
<td>2,115</td>
<td>2,115</td>
</tr>
<tr>
<td>Subsurface Fertilizer Placement</td>
<td>31,060</td>
<td>30,970</td>
</tr>
</tbody>
</table>

a positive = emissions increase, negative = emissions reduction
c emissions-avoided within the borders of Minnesota
d often also result in reduced nutrient run-off and leaching to surface and groundwater
e for terrestrial carbon sequestration, assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass
f see appendices A-H

Of practices for which we have only preliminary results, the most effective is the use of biochar in soils. At a one-time rate of application of about 6.5 tons of biochar per acre, the use of biochar results in annual GHG-avoidance that is roughly similar to that of cropland idling, an estimated 120,000 CO₂-equivalent tons per 100,000 acres or 1.2 CO₂-equivalent tons per acre. Nitrification and urease inhibitors
and controlled release fertilizers are the next most effective of measures for which we have only preliminary results. GHG-avoidance for these measures is an estimated 0.2 and 0.3 CO₂-equivalent short tons per acre, respectively (24,000 and 27,000 CO₂-equivalent short tons per 100,000 acres).

It is likely that the use of restored and constructed wetland to control nitrate-loading of surface waters will act to increase emissions through enhanced CH₄ emission, though more research on alternative wetland designs, particularly with respect to vegetation, might temper this conclusion. Wetlands that are seasonally inundated may act similarly to riparian buffers, resulting in net GHG reductions upon restoration. Preliminary results suggest that subsurface placement of nitrogen fertilizer also may act to increase GHG emissions to the atmosphere.

Tables with these preliminary conclusions can be found in Appendices A-H.

Table 8 provides an itemized accounting of GHG avoidance, practice-by-practice and by gas. The totals shown in Table 8 are the same as appear in Table 7. Sequestration of biogenic carbon in soils and biomass is largest contributor to greenhouse gas-avoidance in the practices for which the analysis is final, typically accounting for 40 to 90 percent of total GHG avoidance under those 13 practices. Expressed as an offset of emitted CO₂ from fossil fuel combustion, rates of sequestration fall into a range of 0.5 to 2 tons of CO₂ per acre for practices that idle cropland or move cropland to a supporting role in production, as with shelterbelts or riparian buffers. Expressed as carbon, annual rates of sequestration for these practices range from 0.13 to 0.5 short tons of carbon per acre. As noted in the Methodology section of this report, these were calculated assuming a 20-year period of persistent storage of newly sequestered biogenic carbon. With 50 years of assumed storage, these rates of annual sequestration roughly double. Sequestration under changed tillage and cropping practices are smaller than those involving land-use change, 0.1 to 0.4 CO₂-equivalent tons per acre per year (13,000 to 43,000 CO₂-equivalent short tons per 100,000 acres), or in short tons of carbon, 0.04 to 0.1 ton of carbon per acre per year.

After sequestration, avoided direct emissions of N₂O are next in importance, often accounting in the practices examined for between 5 and 30 percent of total GHG-avoidance.

N₂O emissions do not always decline under the practices that were examined. Emissions of N₂O in soils tend to increase in saturated soil, in which rates of denitrification are accelerated. This occurs most obviously in riparian buffer soils, particularly buffer soils in trees, offsetting a part of the mitigating effects of enhanced biogenic carbon sequestration in buffer soils and in aboveground and belowground buffer live biomass. This largely explains the advantage that idled upland soils enjoy over wet riparian soils with respect to GHG-avoidance or mitigation (see Table 8). Based on the analysis, N₂O emissions increase with the use of cover cropping, and likewise with a change in tillage practice from conventional tillage to no-till, at a rate of about 0.04 and 0.08 CO₂-equivalent short tons per acre, respectively (3,800 and 7,500 CO₂-equivalent short tons per 100,000 acres).

Avoided-emissions from the avoided out-of-state manufacture of agricultural fertilizers, chemicals and fuels are the third largest source of avoided-emissions.
Table 8 Emissions-avoided from agricultural practices (short CO₂-e tons per 100,000 acres per year)  

| Practices that Involve Land-Use Change from Cropland to Cropland-Supporting Role or Long-term Idling | N₂O-direct | N₂O-indirect volatilization | N₂O-indirect leaching | CH₄ | CO₂-carbon sequestration | CO₂-urea, liming | GHGs-energy | Out-of-State Upstream GHGs | In-State Upstream GHGs | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Shelterbelts, Hedgerows | (48,242) | (2,148) | (14,020) | (184) | (174,780) | (2,808) | (6,892) | (20,190) | - | (269,265) |
| Land Retirement/Long-term Idling: Afforestation | (48,242) | (2,148) | (14,020) | (184) | (168,126) | (2,808) | (6,892) | (20,190) | - | (262,611) |
| Forested and Multispecies Riparian Buffers | 7,033 | (2,148) | (13,653) | 33,466 | (198,058) | (2,808) | (6,892) | (20,190) | - | (203,251) |
| Land Retirement/Long-term Idling: Grassland Restoration | (41,091) | (2,107) | (11,703) | 468 | (78,089) | (2,808) | (6,892) | (20,190) | - | (162,411) |
| Field Borders, Contour Buffer Strips, Vegetated Barriers, Herbaceous Wind Barriers | (41,091) | (2,107) | (11,703) | 468 | (78,089) | (2,808) | (5,518) | (20,190) | - | (203,251) |
| Grassland Riparian Buffers | (9,405) | (2,107) | (13,653) | 27,176 | (49,420) | (2,808) | (6,892) | (20,190) | - | (203,251) |
| Cropland to Hayland | (52,012) | (2,107) | (11,703) | NK | (43,040) | (2,786) | 3,681 | (13,373) | - | (121,339) |
| Add a Perennial Grass to Crop Rotation | (2,897) | (1,053) | (6,826) | NK | (32,490) | (1,393) | 6,861 | (11,886) | - | (49,685) |
| No-Till Tillage-reduced tillage counterfactual | (8,260) | 553 | - | NA | (13,575) | - | (1,051) | (233) | - | (22,565) |
| Winter Cover Crops/Catch Crops | 7,511 | NK | (7,329) | 131 | (20,118) | - | 519 | (1,187) | - | (20,474) |
| Reduced Tillage | (102) | 553 | - | 52 | (13,026) | - | (1,653) | (366) | - | (14,543) |
| No-Till Tillage | 3,815 | 553 | - | (283) | (14,589) | - | (2,704) | (599) | - | (13,807) |
| Corn-Soybean RotationReplacing Continuous Corn | (11,147) | NK | NK | NK | 69,182 | - | (909) | (17,296) | - | (39,830) |

**Preliminary Results-Only**

<table>
<thead>
<tr>
<th>Practices</th>
<th>N₂O-direct</th>
<th>N₂O-indirect volatilization</th>
<th>N₂O-indirect leaching</th>
<th>CH₄</th>
<th>CO₂-carbon sequestration</th>
<th>CO₂-urea, liming</th>
<th>GHGs-energy</th>
<th>Out-of-State Upstream GHGs</th>
<th>In-State Upstream GHGs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochar</td>
<td>(17,996)</td>
<td>(325)</td>
<td>(5,174)</td>
<td>(572)</td>
<td>(138,936)</td>
<td>-</td>
<td>13,224</td>
<td>2,929</td>
<td>27,136</td>
<td>(119,713)</td>
</tr>
<tr>
<td>Controlled Release Fertilizers</td>
<td>(21,152)</td>
<td>(1,475)</td>
<td>(4,743)</td>
<td>NK</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(27,369)</td>
</tr>
<tr>
<td>Nitrification and Urease Inhibitors</td>
<td>(20,415)</td>
<td>(995)</td>
<td>(2,012)</td>
<td>(612)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(24,033)</td>
</tr>
<tr>
<td>Split Fertilizer Application</td>
<td>(13,125)</td>
<td>108</td>
<td>(1,006)</td>
<td>NK</td>
<td>-</td>
<td>-</td>
<td>568</td>
<td>-</td>
<td>-</td>
<td>(13,455)</td>
</tr>
<tr>
<td>15% Fertilizer Use Reduction</td>
<td>(2,545)</td>
<td>(255)</td>
<td>(573)</td>
<td>NK</td>
<td>-</td>
<td>(385)</td>
<td>-</td>
<td>(2,120)</td>
<td>-</td>
<td>(8,787)</td>
</tr>
<tr>
<td>Spring Fertilizer Application</td>
<td>2,236</td>
<td>116</td>
<td>(237)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,115</td>
</tr>
<tr>
<td>Subsurface Fertilizer Placement</td>
<td>36,750</td>
<td>(1,187)</td>
<td>(4,999)</td>
<td>NK</td>
<td>-</td>
<td>-</td>
<td>409</td>
<td>90</td>
<td>-</td>
<td>31,060</td>
</tr>
<tr>
<td>Constructed and Restored Wetlands</td>
<td>(4,856)</td>
<td>(2,169)</td>
<td>(7,186)</td>
<td>218,640</td>
<td>(109,022)</td>
<td>(2,808)</td>
<td>(6,892)</td>
<td>(20,190)</td>
<td>-</td>
<td>65,517</td>
</tr>
</tbody>
</table>

*positive = emissions increase, negative = emissions reduction

*see appendices A-H
Finally, looking at practices for which we have only preliminary results, with the exception of biochar and constructed and restored wetlands, the results are dominated by the response of direct N$_2$O emissions to various nutrient reduction practices. In the published literature, the analysis of GHG-avoidance with these practices is largely restricted to direct N$_2$O emissions from soils. Thus, this conclusion may be an artefact of what has and has not been assessed regarding emission sources and sinks. Biochar applications act to lengthen the mean residence time of crop residue carbon in soils, adding large amounts of long-lived carbon to soils. As noted above, wetlands are large producers of methane. Biogenic carbon is sequestered in wetland soils, but this removal of carbon from the atmosphere to wetland soils is often overwhelmed in permanently inundated constructed and restored wetlands by enhanced rates of CH$_4$ emission, making these wetlands a net GHG source. As noted above, wetlands that are seasonally inundated may act similarly to riparian buffers, resulting in net GHG reductions upon restoration.

IV. Detailed results and discussion

Below we treat in depth the GHG emission reduction potential of the 13 practices for which we provide final avoidance estimates, including itemized GHG-avoidance budgets by emission source and gas for each practice. We also provide detailed discussion of the physical, biological and chemical processes that, in the case of each practice, underlie emissions-avoidance or, in some cases, increased GHG emissions. We identify what, in our judgement, is in the case of each emissions source the best estimate of emissions-avoidance based on best available science and identify alternative estimates and their physical basis. To support this discussion, we present descriptive statistics for the body of published results for emission-avoidance for individual GHGs and sources. With these descriptive statistics, we build up a picture of the state of the published literature on these issues.

The budgets of emission-avoidance include avoidance from all sources, including all direct GHG emissions from and removal mechanisms (sinks) in soils, emissions from fuel used in cropland field operations and indirect emissions from surface waters and downwind soil surfaces resulting from nitrate leaching and ammonia volatilization and redeposition. Emissions that result from the manufacture of agricultural chemicals and fuels used in crop production also are included. Detailed discussion of GHG-avoidance is limited to GHG-avoidance resulting from carbon sequestration in soils and plant biomass and changes in direct N$_2$O soil emissions and CH$_4$ emission from or oxidation in soils. As noted in earlier sections, with the exception of avoided out-of-state emissions from the manufacture of agricultural fertilizer, most of these non-soil sources of emissions-avoidance (or increase) are small. In the case of agricultural fertilizer manufacture, the methods conventionally used to estimate emissions-avoidance are throughput-based calculations based on a set of simplified emission factors that might be described in a sentence or two.

The methods and sources used to estimate avoided indirect N$_2$O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture are discussed above in Section II, Subsection E.

We begin the discussion with practices that involve cropland idling or the conversion of cropland to a supporting role in crop production in the form of buffers, shelterbelts, field borders and herbaceous barriers. Subsections A through F house this discussion. These are followed by Subsections G through M, which house the discussion of per acre emission-avoidance potential of seven practices involving potential cropping and tillage change.
Earlier in the Methodology Section of this report, we provided a generic description of the calculative methods used to evaluate emissions-avoidance from upstream agricultural chemical and fertilizer manufacture, field fuel use, and indirect N$_2$O emissions. As was noted there, for nitrate control, the source of emissions-avoidance for indirect N$_2$O from nitrogen run-off and leaching, we defer to the expertise on nitrate control embedded in the MPCA, Nutrient Reduction Strategy. (MPCA, 2014)

Results from the eight practices for which only preliminary results are available are provided in table form in Appendices A through H. Included are emissions-avoidance budgets and descriptive statistics for the body of research results on emissions or emissions-avoidance developed from the scientific literature.

A. Land retirement/Long-term idling: Grassland restoration

Under land retirement or long-term idling, land that historically has been managed as cropland or pastureland is sown to grass or planted to trees and, for periods of a decade to many decades, is idled. In Minnesota, about 1.13 million acres of lands are idled or temporarily retired under the Federal Conservation Reserve Program (CRP), most of it as restored grassland. In addition, 250,000 acres of environmentally sensitive agricultural lands have been permanently retired under the Reinvest in Minnesota Program (RIM) in more than 6,000 easements. The CRP is a US Department of Agriculture program that, under contracts typically 15 years long, pays agricultural producers temporarily to retire lands to grass, trees, wetlands or other conservation uses.

In Table 9 are shown the emissions-avoidance effects of the temporarily idling of 100,000 acres of cropland as restored grassland. For each 100,000 acres of cropland retired to grass, an estimated 162,000 CO$_2$-equivalent short tons of greenhouse gases are avoided annually within the 20-year window of analysis discussed in the preceding sections, or 1.6 short CO$_2$-equivalent tons per acre.

A little less than 90 percent of emissions annually avoided through grassland restoration are avoided in state at the field level, with the remainder avoided out-of-state and associated with the mining and manufacture of agricultural fertilizer, chemicals, and fuels that, as a result of land retirements or idling in Minnesota, does not occur. Of total avoided-emissions from cropland idling in unmanaged grass, roughly 85 percent derives from soil organic carbon accumulation in soils and live biomass, avoided-emissions of N$_2$O from soils, and avoided GHGs from unneeded out-of-state production of agricultural chemicals and fertilizer (see Table 9).

As discussed in the Methodology section of this report, in calculating avoided-emissions associated with biogenic carbon sequestration in soils or live biomass, a 20-year timespan for storage was assumed. In our judgment, this is the longest that continuous storage can safely be assumed for grassland restoration for purposes of calculating the effects today of cropland retirement to grass.\(^8\) Under this assumption, avoided-emissions are an estimated 162,000 CO$_2$-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from grassland restoration would have totaled 241,000 CO$_2$-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 475,000 CO$_2$-equivalent short tons (see Table 9). The approach that we

---

\(^8\) As of September 2017, of the 1.128 million acres currently idled in Minnesota under the Conservation Reserve Program, only about 10 percent have been idled for more than 20 years, the remainder for 20 years or less. As of September 2017, half of all CRP acres in Minnesota had been enrolled in the program for less than 10 years. The CRP program was initiated roughly 30 years ago, in 1987. (USDA-FSA, 2017)
use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II).

Currently, using the values shown in Table 9, on the roughly 1.13 million acres in Minnesota in CRP (as of September 2017), an estimated 1.8 million CO$_2$-equivalent tons of emissions are avoided annually through grassland restoration. (USDA-FSA, 2017) Additional grassland retirements beyond these 1.13 million acres would add to this annual total. Under the Conservation Reserve Enhancement Program (CREP), participation in which requires permanent retirement of cropland or pastureland, an additional 30,000 CO$_2$-equivalent tons of annually avoided emissions on 80,000 acres also might reasonably be expected. Of the 107,000 CREP acres in Minnesota, about three-quarters are grassland and the remaining one-quarter are restored wetlands.

Table 9. Land retirement/Long-term idling - Grassland restoration: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO$_2$-e short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N$_2$O-direct</td>
<td>soils</td>
<td>(41,091)</td>
<td>crop production</td>
</tr>
<tr>
<td>N$_2$O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(2,107)</td>
<td>crop production</td>
</tr>
<tr>
<td>N$_2$O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(11,703)</td>
<td>crop production</td>
</tr>
<tr>
<td>CH$_4$</td>
<td>soils</td>
<td>(468)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>carbon accumulation in soils and biomass</td>
<td>(78,089)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>cultivated soils from lime or urea use</td>
<td>(2,808)</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(6,892)</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(20,190)</td>
<td>crop production</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>(162,411)</strong></td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

| 40 year storage | all sources and sinks | (240,501) | crop production |
| 100 year storage | all sources and sinks | (474,769) | crop production |

*a positive = emissions increase, negative = emissions reduction
*b reduction in soil CH$_4$ oxidation = relative increase in emissions
*c carbon accumulation in soil and biomass = net removal of CO$_2$ from the atmosphere = net emission reduction
*d assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass

A number of estimates have been published of the net change in greenhouse gas emissions resulting from the conversion of cropland to unmanaged grassland. These are shown below in Table 10 in CO$_2$-equivalent short tons per 100,000 acres. With the exception of one outlying modeling study, they support a range of emissions reductions of 75,000 to 240,000 short CO$_2$-equivalent tons for each 100,000 acres of conversions.

Biogenic carbon sequestration from grassland restoration on idled soils is discussed below, as are avoided direct emissions of N$_2$O from soils and the effects of grassland restoration on soil CH$_4$ oxidation.

The methods and sources used to estimate avoided indirect N$_2$O emissions from nitrate leaching and ammonia volatilization, avoided- emissions from fuel use, and avoided-emissions from foregone
agricultural chemicals and fuels manufacture were discussed above in the Methodology section (Section II, Subsection E) of this report.

Table 10. Published estimates of greenhouse gas-avoidance from cropland idling in unmanaged grassland

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of study</th>
<th>CO₂-eq. short tons per acre per year</th>
<th>CO₂-eq. short tons per 100,000 acres per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelfand and Robertson (2015)</td>
<td>site study</td>
<td>1.92</td>
<td>192,007</td>
</tr>
<tr>
<td>Miao et al. (2015) b</td>
<td>site study</td>
<td>1.09</td>
<td>108,916</td>
</tr>
<tr>
<td>Robertson et al. (2000)</td>
<td>site study</td>
<td>1.23</td>
<td>122,653</td>
</tr>
<tr>
<td>Del Grosso et al. (2002)</td>
<td>modeling study</td>
<td>0.10</td>
<td>9,561</td>
</tr>
<tr>
<td>Del Grosso et al. (2005)</td>
<td>modeling study</td>
<td>0.83</td>
<td>83,350</td>
</tr>
<tr>
<td>Desjardins et al. (2005) b</td>
<td>modeling study</td>
<td>1.80</td>
<td>180,129</td>
</tr>
<tr>
<td>Grant et al. (2004)</td>
<td>modeling study</td>
<td>1.14</td>
<td>113,733</td>
</tr>
<tr>
<td>Robertson (2011) b</td>
<td>modeling study</td>
<td>0.74</td>
<td>73,544</td>
</tr>
<tr>
<td>Smith et al. (2008) b</td>
<td>modeling study</td>
<td>2.39</td>
<td>239,061</td>
</tr>
<tr>
<td>Swan et al. (2015) b</td>
<td>literature review/expert judgment</td>
<td>1.39</td>
<td>138,866</td>
</tr>
<tr>
<td>Eagle et al. (2012)</td>
<td>derivative statistical analysis</td>
<td>1.59</td>
<td>159,226</td>
</tr>
<tr>
<td>Kim and Kirschbaum (2015) b, c</td>
<td>derivative statistical analysis</td>
<td>1.18</td>
<td>117,573</td>
</tr>
<tr>
<td>This report</td>
<td>literature review</td>
<td>1.62</td>
<td>162,411</td>
</tr>
</tbody>
</table>

* results as reported without adjustments

b partial difference, accounting for direct soils emissions and soil carbon sequestration-only
c reversion to natural site vegetation, including grasses, wetlands or trees
d annual soil sequestration calculated from using a 20-year cumulative total annualized

a. Carbon sequestration in soils and biomass

In long-term idling of cropland through grassland restoration, cropland is converted to unmanaged grassland. During cultivation, cropland soils are tilled, which acts to disrupt soil structure and expose soil organic matter in soil macroaggregates and microaggregates to microbial decomposition. In an undisturbed grassland or forestland soil, biogenic carbon is deposited in the soil profile through the growth and decay of plant roots and rhizodeposition in the form of sloughed-off plant cells or root exudates. Some biogenic carbon is also deposited into deep soil layers in the form of leached dissolved organic carbon. In undisturbed grassland or forestland, soil organic carbon is physically protected from soil decomposing bacteria by soil macroaggregates, mostly in soil pores that, due to small size, are inaccessible bacteria and fungi (or water soluble enzymes) or too anaerobic for aerobic soil bacteria. (Jones and Donnelly, 2004) Soil carbon is also chemically protected by clay and silt particles, which bind to soil organic matter and, in the very long-term, by various metals and mineral anions and cations which biochemically bind to organic matter to form organomineral complexes. (Follett *et al.*, 2001; Nair, 2010; *Six et al.*, 2002a) Once adsorbed on to mineral surfaces, organic matter is highly recalcitrant and remains resident in the soil profile for hundreds to thousands of years.

Cropland cultivation disrupts soil structure, breaking up protective soil macroaggregates and exposing soil organic carbon to microbial decomposition. (*Six et al.*, 2002a) It is estimated that, upon conversion of native grassland to arable cropland, 20 to 60 percent of soil organic carbon is oxidized and is released to the atmosphere in the form of CO₂. (Guo and Gifford, 2002; Mann, 1986; Post and Kwan, 2000) These losses occur quickly, over period of less than 20 years. (Davidson and Ackerman, 1993; Poeplau *et al.*, 2011) In general, cultivated soils are more highly aerated and warmer than unmanaged grassland soils,
which accelerates microbial decomposition of organic matter. The soils also are exposed to much higher rates of soil loss from wind and water erosion.

Cropland idling in the form of grassland restoration reverses the processes of soil degradation, slowly building carbon in grassland soils through renewed physical and biochemical protection of soil organic matter, as well as enhanced allocation of carbon to roots, and other processes. Upon cropland idling as restored grassland, soil organic carbon accumulates for 50 to 100 years, eventually stabilizing at levels somewhat lower than those of never disturbed grassland. (Don et al., 2009; Poeplau et al., 2011) In the US, soil organic carbon (SOC) storage on croplands is estimated to be about 45 short tons of carbon per acre (100 metric tons of carbon per hectare), while organic carbon storage in native grassland soils is 59 short tons per acre (132 metric tons per hectare). (Follett, 2009). This suggests that, on average in the US, with grassland restorations, an additional 10 to 15 short tons of carbon per acre might be stored.

Factors besides reduced disturbance that promote sequestration of organic carbon in converted grassland soils include: absence of harvest removals (Omonode and Vyn, 2006; Vuichard et al., 2008), enhanced allocation of carbon to roots and rhizomes in perennial grasses (Bell et al., 2012), rooting depth (Knops and Bradley, 2009), and inherent recalcitrance of root portions. (Guzman and al Kaisi, 2010)

On croplands, harvest removals for annual crops account for between 40 and 45 percent of cropland net primary productivity (NPP). (West et al., 2011) Little of this is available as input to soils. This only partially compensates for the generally lower net primary productivity of grasslands in comparison to croplands.

Regarding the allocation of net primary productivity, in unmanaged grasslands, about two-thirds of net primary productivity is allocated belowground to root growth and rhizomes, where it is made available for storage in SOC. By contrast, only about 20 percent of the net primary productivity of annual crops is allocated belowground. Extensive, deep rooting promotes deep deposition of plant carbon in the form of root turnover and exudation; in general, the degree of SOC stabilization or recalcitrance is greater at deeper soil levels. The inherent recalcitrance of root portions lengthens root carbon residence time in soils.

The capacity of grassland soils to store carbon varies depending on soil texture, soil wetness and temperature, soil clay content, the degree of prior carbon loss, plant productivity, and, again, rooting depth. In general, wet, fine textured soils with high clay contents store more carbon than do coarse, dry soils, particularly where cool climatic conditions prevail. By limiting aeration, wetness inhibits microbial decomposition of soil organic matter (SOM) in soils, as do cool temperatures. As discussed above, soil clay acts to physically protect soil aggregates, again inhibiting microbial decomposition of soil organic matter. Regarding prior carbon loss, as an empirical matter, soil scientists have consistently noted that the highest rates of soil carbon sequestration occur on soils that, due to prior land uses, have experienced large losses of soil organic carbon. Finally, since plant primary productivity determines the input of carbon to soils, highly productive grasses with deep roots are often associated with high rates of observed carbon sequestration.

In addition to the sequestration of carbon in soils, organic carbon also is stored in aboveground and belowground live and dead biomass. Between 2.25 and 9 short tons of carbon per acre (5 to 20 metric tons of carbon per hectare) are allocated to aboveground and belowground biomass in reconstructed prairies. (Guzman and al Kaisi, 2010; Tufekcioglu, et al., 2003) Unlike aboveground and belowground biomass on croplands, much of which is removed at harvest or otherwise rapidly decomposes, grassland...
biomass is largely retained after the growing season as belowground live roots or aboveground in the form of litter and plant detritus.

In Table 9, an estimate for annual carbon sequestration in restored grasslands of 78,089 short tons of CO₂ or 21,311 tons of carbon was given, covering 100,000 acres of restorations. As discussed above, this was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence of storage. In aggrading grasslands, CO₂ is removed from the atmosphere and incorporated into the roots and aboveground live biomass of perennial grasses and, eventually, into grassland litter and soils. This offsets emissions of CO₂ from fossil fuel combustion. In developing the sequestration estimates, the calculations were done initially in metric units and then converted to English or common units.

The sequestration estimate given in Table 9 was developed from 18 studies of total ecosystem carbon in restored grasslands. As discussed in the Methodology section of this report, total ecosystem carbon accounting is probably the best approach for approximating rates of carbon sequestration in natural and managed ecosystems. Total ecosystem gain or loss of carbon is estimated as the difference between gross primary productivity and ecosystem respiration, adjusting for, in unmanaged natural systems, the export of organic carbon in the form of DOC (dissolved organic carbon) or methane, and in the case of cropland, additionally the import of manure and harvest removals. The mean value for carbon sequestration in restored grassland from total ecosystem carbon studies is an estimated 1.24 ± 0.3 metric tons of carbon per hectare (0.55 ± 0.13 short tons of carbon per acre), implying that, on a per acre basis, carbon storage in grassland that is temporarily idled in grass annually offsets about 2 tons of CO₂ emissions elsewhere. This is the estimated rate prior to truncation to accommodate an assumed 20-year persistence of newly stored organic carbon in grasslands. Of the total ecosystem carbon studies, 13 were eddy-covariance-based, while the remainder were chamber-based studies.

Overall, 126 studies were reviewed. Most of these studies (107 studies) reported on changes in soil organic carbon only and, as such, were of limited utility. Only a handful of the 126 studies that were reviewed reported reductions in carbon storage after conversion of cropland to grassland; slightly less than 95 percent reported increased carbon storage.

By study type, 13 meta-analyses and other derivative statistical summaries or analyses were reviewed, as were the 48 soil sampling-type site studies, 20 modeling studies, the 13 eddy-covariance and 4 chamber studies noted above, and 27 literature reviews or studies relying on expert judgment. The meta-analyses were limited to studies of soil carbon change with grassland restoration, as were most of the statistical summaries or other derivative statistical analyses. By study type, estimated rates of carbon sequestration ranged from 0.6 to 1.3 metric tons of carbon per hectare (0.27 to 0.60 short tons of carbon per acre).

The average sequestration rate for the literature and expert reviews was 0.71 metric tons per hectare per year.

The descriptive statistics for the studies by study type, by soil sampling depth, and by age of grassland restoration are shown in Table 11.
In the set of studies that were reviewed, existing grassland sequestered slightly more on an annual basis than restored grassland, but the data set for existing grasslands is quite limited. Additionally, the studies of existing grassland tended to focus on total ecosystem carbon storage, while most of the restored grassland studies, as noted above, reported on changes in soil carbon only. Within the soil sampling subgroup of studies, the effect of sampling depth had little observable effect on the results. Within our 20-year window for evaluating the effects of carbon sequestration, sequestration was more rapid in younger grassland restorations (0 to 14 years old), but not substantially. The overwhelming weight of evidence supports a positive response rate for carbon sequestration in grassland restorations, before truncation for 20 years of assumed storage, generally in a range of 0.5 to 1.5 metric tons of carbon per hectare per year (0.22 to 0.70 short tons per acre), with a best estimate near 1.25 metric tons per hectare per year.

b. Nitrous oxide

Nitrous oxide is produced microbially in soils during nitrification, during which ammonium is oxidized to nitrate, and denitrification, during which nitrate is reduced to N₂O. N₂O is produced in converted grassland soils and cropland soils. N₂O emissions from croplands are often four-fold higher than those of unmanaged restored or existing grasslands. In croplands, emissions are sustained by large inputs of mineral and organic nitrogen in the form of synthetic fertilizer, manure and crop residues. As a
consequence, in part of tillage, a large amount of nitrogen also is made available to soil bacteria through soil nitrogen mineralization. Land idled as unmanaged grasslands is typically untilled and unfertilized.

As discussed above, avoided nitrous oxide emissions from the conversion of cropland to grassland are calculated as the difference on 100,000 acres between estimated emissions from restored grassland and average annual Minnesota cropland N\textsubscript{2}O emissions, taken from the MPCA Greenhouse Gas Emission Inventory. For each 100,000 acres of cropland converted to grassland, an estimated 41,000 CO\textsubscript{2}-equivalent short tons of emissions are avoided or some 138 tons of N\textsubscript{2}O.

N\textsubscript{2}O emissions from restored grassland were estimated using emission rates developed on a per hectare basis from the scientific literature, and converted to lbs. per acre for use in the calculation. In developing the average N\textsubscript{2}O emission rate for unmanaged grasslands, 53 studies were reviewed with 55 study results. These included 35 empirical site studies, 11 modeling studies, 5 derivative statistical summaries or analyses and 2 literature reviews or studies that depend on expert judgment.

An average value for all of the studies that were reviewed was selected as the best estimate of annual emissions from restored grassland. No formal meta-analyses were available for N\textsubscript{2}O from restored grassland. No other study attribute pointed to one study type as clearly superior in estimating N\textsubscript{2}O annual emissions from unmanaged grassland. Using the average value for the studies that were reviewed, restored grasslands were estimated to emit on an annual basis 1.71 ± 0.6 kg N\textsubscript{2}O per hectare (1.52 ± 0.54 lbs. N\textsubscript{2}O per acre).

By contrast, the estimated annual rate of N\textsubscript{2}O emission from Minnesota cropland, from the MPCA GHG emission inventory, was, for 2013-2015, 4.8 kg N\textsubscript{2}O per hectare (4.3 lbs. N\textsubscript{2}O per acre).

The descriptive statistics for the various studies that were reviewed are shown in Table 12. In these studies, annual emission rates for restored and existing grasslands ranged from 0.8 to 2 kg N\textsubscript{2}O per hectare (0.71 to 1.78 lbs. N\textsubscript{2}O per acre). The results for studies that report results on an annual basis were three times higher than those that report growing season-only emissions. The results for studies that were conducted over more than one year were about half those of studies conducted over a single year, although quite near both to the mean value reported in Table 12 for all studies and the value used in this analysis to calculate N\textsubscript{2}O emissions from cropland converted to grass. The results from restored grassland were about two-those of existing grasslands, but again were within 10 percent of the mean value reported in Table 12 for all studies.

Thirty-four studies reported on the difference in emissions from cropland (or pastureland) and land idled as restored grassland. In these studies, on an annual basis, unmanaged grassland emitted 3.1 kg N\textsubscript{2}O per hectare (2.77 lbs. N\textsubscript{2}O per acre) less than cropland or pastureland. In the calculation for avoided N\textsubscript{2}O emissions shown in Table 9, the difference between cropland emissions and emissions from restored grassland is some 3.2 kg N\textsubscript{2}O per hectare per year (3.64 lbs. N\textsubscript{2}O per acre per year), or quite near the literature estimate.

The weight of the evidence generally supports an N\textsubscript{2}O emission from restored grassland that is one-quarter to 40 percent that of fertilized cropland. Given the high variability of N\textsubscript{2}O from different land surfaces, it is not clear that additional research can do much to further narrow this estimate.
Table 12. Descriptive statistics: Land retirement/Long-term idling - Grassland restoration, N$_2$O

<table>
<thead>
<tr>
<th></th>
<th>emissions (kg N$_2$O/ hectare/yr) $^a$</th>
<th>number of study results $^{bc}$</th>
<th>ratio of positive-to-negative results: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>1.71</td>
<td>55/0</td>
<td>0.58</td>
<td>0.59</td>
<td>2.84</td>
<td></td>
</tr>
<tr>
<td>empirical site studies</td>
<td>2.02</td>
<td>36/0</td>
<td>0.88</td>
<td>0.30</td>
<td>3.74</td>
<td></td>
</tr>
<tr>
<td>modeling studies</td>
<td>1.22</td>
<td>12/0</td>
<td>0.37</td>
<td>0.49</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries $^a$</td>
<td>1.00</td>
<td>5/0</td>
<td>0.29</td>
<td>0.43</td>
<td>1.57</td>
<td></td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>0.79</td>
<td>2/0</td>
<td>0.29</td>
<td>0.23</td>
<td>1.35</td>
<td></td>
</tr>
<tr>
<td>grassland restorations</td>
<td>1.18</td>
<td>31/0</td>
<td>0.23</td>
<td>0.74</td>
<td>1.63</td>
<td></td>
</tr>
<tr>
<td>existing grasslands</td>
<td>2.80</td>
<td>18/0</td>
<td>1.73</td>
<td>(0.59)</td>
<td>6.18</td>
<td></td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>2.20</td>
<td>36/0</td>
<td>0.88</td>
<td>0.48</td>
<td>3.92</td>
<td></td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>0.75</td>
<td>18/0</td>
<td>0.14</td>
<td>0.48</td>
<td>1.02</td>
<td></td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>4.18</td>
<td>11/0</td>
<td>2.77</td>
<td>(1.25)</td>
<td>9.61</td>
<td></td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>1.10</td>
<td>36/0</td>
<td>0.22</td>
<td>0.66</td>
<td>1.54</td>
<td></td>
</tr>
<tr>
<td>grassland restorations against cropland or pastureland counterfactual</td>
<td>(3.07)</td>
<td>34/0</td>
<td>0.90</td>
<td>(4.83)</td>
<td>(1.31)</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ Negative emissions = removal from atmosphere and destruction in soils

$^b$ Statistical summaries or analyses other than meta-analyses

$^c$ 55 study results, 53 studies (5 statistical summaries or derivative statistical analyses, 11 modeling studies, 35 empirical site studies, 2 expert reviews)

$^d$ 2 studies report multiple results by study type or grassland status (existing vs restored)

c. Methane

Methane is produced in saturated soils in anoxic conditions by methanogenic bacteria and is consumed microbiologically in aerated soils by methanotrophic bacteria. In upland cropland or existing or restored grasslands, methane typically is oxidized. In these soils, methane sources include atmospheric methane and methane produced in deep soil layers. The rate of methane oxidation in cropland soils is typically less than in native grassland. (Dutaur and Verchot, 2007; Jacinthe and Lal, 2005) Tillage in cropland soils acts to disrupt and lessen the diversity of the methanotrophic microbial communities that oxidize methane. (LeMer and Roger, 2001; Levine et al., 2011) Additionally, methane oxidation in well-aerated cropland soils is suppressed in the presence of high levels of ammonium-based nitrogen fertilizer. In the presence of high levels of ammonium, methanotrophic bacteria preferentially oxidize ammonia, shifting oxidation from methane to ammonia and limiting soil methane consumption. (Bayer et al., 2012; Tate 2015)

By converting cropland to grassland, soil CH$_4$ oxidation is enhanced, but the timeframes for recovery are likely long, as long as 200 years, with limited recovery over periods as short as 20 years. (Allen et al., 2009; Suwanaree and Robertson, 2005) The extra microbial CH$_4$ destruction that occurs in soils from the conversion of cropland to grassland is calculated as the difference in CH$_4$ soil oxidation in cropland and in grassland converted from cropland. Average cropland oxidation rates are taken from Aronson and Helliker (2010). In converting 100,000 acres of cropland to grassland, CH$_4$ oxidation is estimated to decrease slightly, 468 CO$_2$-equivalent short tons or some 19 tons of CH$_4$.

In developing the average soil CH$_4$ oxidation rate for unmanaged grasslands, 30 studies were reviewed with 31 study results. These included 19 empirical site studies, 6 modeling studies, and 5 derivative statistical summaries or analyses.
An average value for all of the studies that were reviewed was selected to best represent soil CH$_4$ oxidation in restored grassland soils. No formal meta-analyses were available for CH$_4$ from restored grassland. No other study attribute clearly pointed to one study type as clearly superior to the others in projecting annual rates of CH$_4$ oxidation in the soils of restored grassland. Using the average value for the studies that were reviewed, restored grasslands were estimated to oxidize on an annual basis $1.43 \pm 0.33$ kg CH$_4$ per hectare (1.28 ± 0.29 lbs. CH$_4$ per acre).

The descriptive statistics for the various studies that were reviewed are shown in Table 13. In the studies, annual CH$_4$ oxidation rates for restored and existing grasslands range from 0.6 to 3 kg CH$_4$ per hectare (0.54 to 2.68 lbs. CH$_4$ per acre). In not quite 90 percent of all observations, upland grassland soils oxidized CH$_4$. The rate of CH$_4$ oxidation in restored grassland soils was about one-third that of existing grasslands, but based on a small number of observations (12). Soil oxidation rates for studies that reported CH$_4$ losses on an annual basis were about three-fold larger than those that limited observations to the growing season. Soil CH$_4$ oxidation in studies with more than 1 year of observations was about 3-fold higher than those with shorter observational periods. The results from published statistical summaries or derivative statistical analyses generally support higher mean oxidation rates from restored or existing grassland than the mean value reported in Table 13 for all studies, while results from empirical site-studies a somewhat lower value.

**Table 13. Descriptive statistics: Land retirement/Long-term idling - Grassland restoration, CH$_4$**

<table>
<thead>
<tr>
<th>study type</th>
<th>soil CH$_4$ oxidation (kg CH$_4$/hectare/yr)</th>
<th>number of study results$^{a,d}$</th>
<th>ratio of positive-to-negative results: number of</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>1.43</td>
<td>31</td>
<td>26/5</td>
<td>0.33</td>
<td>0.79</td>
<td>2.07</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>0.80</td>
<td>20</td>
<td>15/5</td>
<td>0.33</td>
<td>0.16</td>
<td>1.45</td>
</tr>
<tr>
<td>modeling studies</td>
<td>3.02</td>
<td>6</td>
<td>6/0</td>
<td>1.01</td>
<td>1.04</td>
<td>5.00</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries$^b$</td>
<td>2.03</td>
<td>5</td>
<td>5/0</td>
<td>0.39</td>
<td>1.26</td>
<td>2.80</td>
</tr>
<tr>
<td>grassland restorations</td>
<td>0.61</td>
<td>12</td>
<td>9/3</td>
<td>0.36</td>
<td>(0.09)</td>
<td>1.31</td>
</tr>
<tr>
<td>existing grasslands</td>
<td>2.02</td>
<td>17</td>
<td>16/1</td>
<td>0.49</td>
<td>1.05</td>
<td>2.99</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>2.03</td>
<td>18</td>
<td>16/2</td>
<td>0.49</td>
<td>1.07</td>
<td>2.98</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>0.61</td>
<td>13</td>
<td>10/3</td>
<td>0.28</td>
<td>0.07</td>
<td>1.15</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>0.50</td>
<td>6</td>
<td>5/1</td>
<td>0.31</td>
<td>(0.10)</td>
<td>1.10</td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>1.52</td>
<td>16</td>
<td>12/4</td>
<td>0.58</td>
<td>0.38</td>
<td>2.66</td>
</tr>
<tr>
<td>grassland restorations against cropland or pastureland counterfactual</td>
<td>0.20</td>
<td>18</td>
<td>8/9/1</td>
<td>0.26</td>
<td>(0.31)</td>
<td>0.71</td>
</tr>
</tbody>
</table>

$^{a}$ CH$_4$ soil oxidation = removal from atmosphere and destruction in soils  
$^b$ statistical summaries or analyses other than meta-analyses  
$^c$ 31 study results, 30 studies (5 statistical summaries or derivative statistical analyses, 6 modeling studies, 19 empirical site studies)  
$^d$ 1 study reports multiple results by grassland status (existing vs restored)

Finally, seventeen studies reported on the difference in CH$_4$ oxidation from cropland (or pastureland) and land idled as restored grassland. About half of the study results indicated increased soil CH$_4$ uptake or oxidation as a result of grassland restoration, and about half-reduced uptake, with a mean emission value of -0.2 kg CH$_4$ per hectare, indicating slight uptake.

**B. Land retirement/Long-term idling: Afforestation**

Instead of grassland, cropland can be put into trees, which when accumulating carbon annually store, on a per acre basis, about two and one-half times as much biogenic carbon as do grasslands. As described
above, as trees grow, CO\textsubscript{2} is photosynthetically removed from the atmosphere and incorporated into live tree biomass and, eventually, into soils and the forest floor. For each 100,000 acres of cropland retired to trees, an estimated 263,000 CO\textsubscript{2}-equivalent short tons of GHGs are avoided annually, much of it in the form of atmospheric CO\textsubscript{2} removal. More than 90 percent of this is avoided in state, with the remainder avoided out-of-state from avoided agricultural chemicals (herbicides, pesticides, and fungicides), fertilizer and fuels production.

The budget for greenhouse gas emissions-avoidance from afforestation is shown in Table 14. The largest sources of emissions-avoidance are, in order of significance: biogenic carbon sequestration (64 percent); avoided direct field emissions of N\textsubscript{2}O (18 percent); avoided out-of-state emissions associated with the manufacture of fertilizer, agricultural chemicals and fuels no longer consumed in crop production (8 percent); and avoided-emissions of N\textsubscript{2}O from nitrate not leached to surface and groundwater (5 percent). As discussed above, during biogenic carbon sequestration, CO\textsubscript{2} is removed photosynthetically from the atmosphere and is sequestered in live tree biomass, soil organic carbon, tree detritus and the forest floor.

Table 14. Land retirement/Long-term idling - Afforestation: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO\textsubscript{2}-e short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N\textsubscript{2}O-direct</td>
<td>soils</td>
<td>(48,242)</td>
<td>crop production</td>
</tr>
<tr>
<td>N\textsubscript{2}O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(2,148)</td>
<td>crop production</td>
</tr>
<tr>
<td>N\textsubscript{2}O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(14,020)</td>
<td>crop production</td>
</tr>
<tr>
<td>CH\textsubscript{4}</td>
<td>soils</td>
<td>(184)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO\textsubscript{2}</td>
<td>carbon accumulation in soils and biomass</td>
<td>(168,126)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO\textsubscript{2}</td>
<td>cultivated soils from lime or urea use</td>
<td>(2,808)</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(6,892)</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(20,190)</td>
<td>crop production</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(262,611)</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

<table>
<thead>
<tr>
<th>Storage Period</th>
<th>Sources and Sinks</th>
<th>Emission (CO\textsubscript{2}-e short tons)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 year storage</td>
<td>all sources and sinks</td>
<td>(430,737)</td>
<td>crop production</td>
</tr>
<tr>
<td>100 year storage</td>
<td>all sources and sinks</td>
<td>(935,115)</td>
<td>crop production</td>
</tr>
</tbody>
</table>

\textsuperscript{a} positive = emissions increase, negative = emissions reduction
\textsuperscript{b} increase in soil CH\textsubscript{4} oxidation = relative decrease in emissions
\textsuperscript{c} carbon accumulation in soil and biomass = net removal of CO\textsubscript{2} from the atmosphere = net emission reduction
\textsuperscript{d} assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass

In estimating the emissions-avoided from afforestation of cropland, a 20-year timespan was assumed for assured carbon storage in living and dead biomass and soils. Under this assumption, avoided-emissions are an estimated 263,000 CO\textsubscript{2}-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from afforestation of former croplands would have totaled 431,000 CO\textsubscript{2}-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 935,000 CO\textsubscript{2}-equivalent short tons (see Table 14). The approach that we use in converting
observed rates of sequestration to emissions offsets, and by logical extension avoided-emissions, was addressed above in the Methodology section (Section II).

Biogenic carbon sequestration on afforested cropland and pastureland is discussed below, as are avoided direct emissions of N\textsubscript{2}O from soils and the effects of afforestation of cropland on soil CH\textsubscript{4} uptake and oxidation. The methods and sources used to estimate avoided indirect N\textsubscript{2}O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed in the Methodology section (Section II, Subsection E) of this report.

a. Carbon sequestration in soils and biomass

As is true for grassland restoration, afforestation of cropland reverses the processes that, with cropland tillage, lead to the loss of organic carbon from soils. In undisturbed forestland, soil organic carbon is physically protected from microbial decomposition by soil macroaggregates, mostly in soil pores too minute for bacteria and fungi (or water soluble enzymes) to access or too anaerobic for aerobic soil bacteria. Soil carbon also is chemically protected by clay and silt particles, which bind to soil organic matter and, in the very long-term, by various metals and mineral anions and cations which biochemically bind to organic matter to form organomineral complexes that are highly recalcitrant. Soil aeration rates and soil temperature also are lower in undisturbed afforested soils.

Tillage disrupts soil structure, breaking up protective soil macroaggregates and exposing soil organic carbon to microbial decomposition. Idling of land in trees reverses the processes of soil degradation, slowly building carbon in afforested soils through renewed physical and biochemical protection of soil organic matter, as well as enhanced allocation of carbon to roots, reduced soil aeration and temperature, and other processes. At reduced soil aeration and soil temperature, decomposition rates of unprotected organic matter generally slow. Soil aeration and soil temperature are generally lower in undisturbed, untilled soils.

Afforestation of land that was formerly cultivated also leads to the accumulation of large amounts of carbon in aboveground and belowground biomass, effectively removing it from the atmosphere for decades or longer. In the United States, the average forest stores an estimated 74 short tons of carbon per acre (166 metric tons of carbon per hectare), with roughly 45 percent stored in aboveground biomass, roots, standing and down detritus and the forest floor, and the remainder in soils. (US Global Change Research Program, 2018)\textsuperscript{9} It is estimated that, during the first 20 years of growth, carbon accumulation in aboveground ground biomass and live roots accounts for up to 80 percent of the sequestration potential of US Midwest afforested lands, with soil organic carbon and the forest floor accounting about equally for the remainder. (Niu and Duicker, 2006)

Carbon storage in US grasslands is an estimated 59 short tons per acre (132 metric tons per hectare) and on US croplands, 44 short tons per acre (98.5 metric tons of carbon per hectare). (Follet, 2009) Using the numbers cited immediately above, the average acre or hectare of forestland stores 1.7 times as much organic carbon as does cultivated cropland.

In Table 14, an estimate is given for annual carbon sequestration in afforested former cropland, some 168,126 short tons of CO\textsubscript{2} or 45,882 tons of carbon, covering 100,000 afforested acres. As discussed

\textsuperscript{9} Due to generally cooler conditions in Minnesota, and slower rates of decomposition of organic matter in Minnesota forested soils, this US average may understate the percentage contribution of forested soils to total forest carbon in Minnesota.
above, this was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence of storage. This is the longest period of time that, in our estimation, safely can be assumed in calculating the offset value of present-day sequestration. Since much or most of the science on terrestrial carbon sequestration is developed in metric units, this average rate is given in metric tons of carbon and converted to short CO₂-equivalent tons for inclusion in the summary Table 14. During afforestation, CO₂ is removed from the atmosphere and incorporated into tree biomass and, eventually, into woody detritus and soils. This acts to offset emissions of CO₂ from elsewhere in the economy.

The average sequestration rate per acre was developed from 22 studies of total ecosystem carbon in afforested former croplands. Total ecosystem carbon accounting is probably the best approach to approximating carbon sequestration in unmanaged ecosystems with large amounts of carbon stored in aboveground and belowground live biomass, woody detritus, and soils. Total ecosystem gain or loss of carbon is estimated as the difference between gross primary productivity and ecosystem respiration or, in studies that measure changes in individual carbon pools, the change in carbon storage across all important carbon pools. Using the total ecosystem carbon approach, former cropland planted to trees is estimated to annually sequester 2.67 ± 0.47 metric tons of carbon per hectare (1.19 ± 0.21 short tons of carbon per acre). This is the estimated rate prior to truncation to account for an assumed 20-year persistence of organic carbon stored in and on afforested former cropland.

Overall, 75 studies were reviewed, including seven meta-analyses, six other derivative statistical summaries or analyses, twelve modeling studies, 33 empirical site studies, 15 literature reviews or studies involving expert judgment, and two eddy covariance-types studies (see Table 15). Of the seven meta-analyses, none addressed carbon storage in aboveground or belowground biomass. Excluding the results from the meta-analyses, estimated annual carbon sequestration, by study type, ranged from 1.4 to 3.4 metric tons of carbon per hectare (0.62 to 1.52 short tons of carbon per acre). For studies that treat total ecosystem carbon, aboveground and belowground biomass carbon, or aboveground biomass carbon plus soil carbon, annual sequestration rates ranged from 2.67 to 3.62 metric tons of carbon per hectare (1.19 to 1.61 short tons of carbon per acre).

Of the 75 studies that were reviewed, five reported net losses of or no change in organic carbon storage following afforestation, while 70 reported net increases. In general, the evidence overwhelmingly supports a positive annual sequestration rate, prior to truncation for 20-years of assumed storage, in the range of approximately 2.5 to 3.5 metric tons of carbon per hectare (4.1 to 5.7 short tons per acre), with a best estimate a conservative 2.7 metric tons per hectare.
Finally, soil-sampling depth does not appear to be a substantial issue. Sequestration appears to have increased faster at sampling depth below 40 cm (16 inches) than in the 10-40 cm (4 to 16 inches) sampling depth. This may result from the much deeper root penetration in forested soils. Soil sequestration rates tended to fall off with afforestation age, from 3.37 to 1.58 metric tons per hectare per year for 0 to 15 year old afforestations and 15 to 25 year old afforestations, respectively.

**b. Nitrous oxide**

$N_2O$ fluxes from forestland are typically one-third those of cultivated cropland. (Dalal and Allen, 2008) Emissions from cropland are sustained by inputs of synthetic and organic nitrogen in the form of mineral fertilizer, manure and crop residues, as well as nitrogen made available through soil nitrogen mineralization. On newly afforested former cropland, most exogenous inputs of nitrogen are foregone, minimizing the pool of soil nitrate and ammonium that sustains $N_2O$ production in soils. Of what remains, a part is immobilized in plant biomass, as a result of the large nutrient needs of young trees, and eventually as organic nitrogen in soils. (Gelfand *et al.*, 2016) Immobilized in plant biomass, nitrogen is no longer available for microbial production of $N_2O$.

Avoided nitrous oxide emissions from the conversion of cropland to forestland are calculated as the difference on 100,000 acres in estimated emissions between forestland converted from cropland and...
average annual N₂O emissions from Minnesota cropland. Annual Minnesota cropland N₂O emissions are taken from the MPCA Greenhouse Gas Emission Inventory.

N₂O emissions from forestland converted from cropland are estimated using emission rates developed on a per hectare basis from the scientific literature, and converted to lbs. per acre for use in the calculation. In deriving the latter, 40 studies were reviewed with 41 study results. These included 27 empirical site studies, eight modeling studies, and five derivative statistical summaries or analyses.

An average value for all of the studies that were reviewed was selected as the best estimate of annual emissions from afforested former cropland. In this, no study attribute clearly pointed to one study type as clearly superior to the others in estimating N₂O emissions from afforested former cropland. No formal meta-analysis was available for N₂O from restored grassland. Using the average value for the studies that were reviewed, afforested former croplands are estimated to emit on an annual basis 1.18 ± 0.22 kg of N₂O per hectare (1.05 ± 0.2 lbs. of N₂O per acre). This value is almost identical to what might be estimated using the reviewed empirical site studies and very close to the average from the five derivative statistical summaries or analyses. By study type, annual emission rates for afforested and forest soils fall into narrow range of 0.97 to 1.39 kg of N₂O per hectare (0.86 to 1.25 lbs. of N₂O per acre).

Average annual cropland N₂O emission rates from the MPCA GHG emission inventory are an estimated 4.8 kg N₂O per hectare (4.3 lbs. N₂O per acre).

The flux or emission rates shown in Table 16 derive from studies of both afforested soils and the soils of mature forests. Flux rates are generally quite similar across these two classes of forestland.

Descriptive statistics from the 40 studies that were reviewed are shown in Table 16, including standard errors and calculated upper and lower 95 percent confidence intervals.

Nine studies evaluated the effect on N₂O emissions of converting cropland to forestland, with a mean annual reduction in emissions across all nine studies of 1.72 kg of N₂O per hectare (1.53 lbs. N₂O per acre). Using the mean for all studies for afforested former cropland and average Minnesota cropland N₂O emissions, taken from the MPCA Greenhouse Gas Emission Inventory, we derive a higher value of 3.67 kg N₂O per hectare per year (3.27 lbs. N₂O per acre per year). The estimates agree that, with afforestation, N₂O emissions will decline. Generally there is little sense in the scientific literature that, with cropland abandonment to trees, and nitrogen fertilizer inputs to soils essentially eliminated, N₂O emissions will do anything but decline.

c. Methane

In upland afforested soils, CH₄ generally is oxidized. Due to the large root systems and moisture requirements of trees, afforested soils are typically drier than croplands or grassland, with reduced bulk density, conditions that favor gas diffusion into soils and the oxidation of atmospheric CH₄. (Amadi et al., 2017; Dutaur and Verchot, 2007) CH₄ oxidation in forested soils is often inhibited at soil moisture higher than 60 percent or water-filled pore space of 43 percent. (Luo et al., 2013) On a per acre basis, soils beneath both established forestland and recently afforested land oxidize more CH₄ than restored grassland and far more than cropland. As discussed earlier, CH₄ oxidation in cropland is likely suppressed by tillage disruptions to methanotroph communities and by the application of ammonium-based synthetic fertilizers.
The extra microbial CH₄ destruction that occurs in soils as a result of the conversion of cropland to forestland is calculated as the difference, across 100,000 acres, between average cropland CH₄ uptake and uptake from afforested former cropland. Average uptake of CH₄ per hectare of cropland was taken from Aronson and Helliker (2010) and converted to lbs. per acre for use in calculation.

In developing the estimate for CH₄ uptake by afforested former croplands, we reviewed 34 studies with 35 study results. In this, no study attribute clearly pointed to one study type as clearly superior to the others in estimating CH₄ oxidation in the soils of afforested former cropland. An average value for all of the studies that were reviewed was selected as the best estimate of annual emissions from afforested former cropland. No formal meta-analyses were available for CH₄ from afforested former cropland.

Using the average value for the studies that were reviewed, afforested former croplands are estimated to oxidize on an annual basis 2.02 ± 0.52 kg CH₄ per hectare (1.80 ± 0.46 lbs. CH₄ per acre). Applying this to 100,000 acres, only a small amount of additional CH₄ will be oxidized from converting cropland to trees, on an annual basis an estimated 176 CO₂-equivalent short tons or some 7 tons of CH₄ (see Table 14). The effects of this on the larger emissions-avoidance budget for afforestation on former cropland are negligible.

The descriptive statistics for the various studies that were reviewed are shown in Table 17. Annual emission rates for afforested and forest soils range from 1.7 to 3.06 kg CH₄ per hectare (1.49 to 3.21 lbs. CH₄ per acre). In greater than 90 percent of all observations, upland forested soils oxidized CH₄. The derivative statistical summaries reported generally higher rates of oxidation than the mean value taken from all observations, the empirical sites studies generally lower values. Studies reporting on CH₄ oxidation in existing forest soils tended to report higher values than afforested soils, but not excessively so.

### Table 16. Descriptive statistics: Land retirement/Long-term idling - Afforestation, N₂O

<table>
<thead>
<tr>
<th></th>
<th>emissions (kg N₂O/ hectare/yr) a</th>
<th>number of study results c,d</th>
<th>ratio of positive-to-negative results: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>1.18</td>
<td>41</td>
<td>41/0</td>
<td>0.22</td>
<td>0.72</td>
<td>1.63</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>1.16</td>
<td>28</td>
<td>27/1</td>
<td>0.31</td>
<td>0.56</td>
<td>1.76</td>
</tr>
<tr>
<td>modeling studies</td>
<td>1.30</td>
<td>8</td>
<td>8/0</td>
<td>0.54</td>
<td>0.25</td>
<td>2.35</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries a</td>
<td>1.18</td>
<td>5</td>
<td>5/0</td>
<td>0.28</td>
<td>0.53</td>
<td>1.62</td>
</tr>
<tr>
<td>afforestation</td>
<td>0.97</td>
<td>13</td>
<td>13/0</td>
<td>0.38</td>
<td>0.22</td>
<td>1.72</td>
</tr>
<tr>
<td>existing forestland</td>
<td>1.27</td>
<td>28</td>
<td>28/0</td>
<td>0.29</td>
<td>0.70</td>
<td>1.85</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>1.19</td>
<td>33</td>
<td>33/0</td>
<td>0.28</td>
<td>0.89</td>
<td>1.89</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>0.30</td>
<td>8</td>
<td>7/1</td>
<td>0.09</td>
<td>0.13</td>
<td>0.47</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>2.11</td>
<td>6</td>
<td>6/0</td>
<td>0.58</td>
<td>0.97</td>
<td>3.26</td>
</tr>
<tr>
<td>&gt;1 year of observations or simulations</td>
<td>1.12</td>
<td>25</td>
<td>24/1</td>
<td>0.34</td>
<td>0.46</td>
<td>1.78</td>
</tr>
<tr>
<td>afforestation against cropland or pastureland counterfactual</td>
<td>(1.72)</td>
<td>9</td>
<td>9/0</td>
<td>0.39</td>
<td>(2.57)</td>
<td>(0.87)</td>
</tr>
</tbody>
</table>

---

a Negative emissions = removal from atmosphere and destruction in soils
b Statistical summaries or analyses other than meta-analyses
c 41 study results, 40 studies (5 statistical summaries or derivative statistical analyses, 8 modeling studies, 27 empirical site studies)
d 1 study reports multiple results by forest status (existing vs afforested)

---

The effects of this on the larger emissions-avoidance budget for afforestation on former cropland are negligible.

The descriptive statistics for the various studies that were reviewed are shown in Table 17. Annual emission rates for afforested and forest soils range from 1.7 to 3.06 kg CH₄ per hectare (1.49 to 3.21 lbs. CH₄ per acre). In greater than 90 percent of all observations, upland forested soils oxidized CH₄. The derivative statistical summaries reported generally higher rates of oxidation than the mean value taken from all observations, the empirical sites studies generally lower values. Studies reporting on CH₄ oxidation in existing forest soils tended to report higher values than afforested soils, but not excessively so.
Relatively wide confidence intervals were calculated for each grouping of data by study type or by years of total observations.

Finally, studies that report on the difference in CH₄ oxidation from cropland and land planted to trees indicate rates of CH₄ oxidation above cropland levels of 2.55 kg CH₄ per hectare per year (2.27 lbs. CH₄ per acre per year). This is substantially higher than the 0.3 kg CH₄ per hectare (0.27 lbs. CH₄ per acre per year) additional CH₄ oxidation given in this review.¹⁰

### C. Shelterbelts and hedgerows

Shelterbelts and hedgerows are installed at field edges or around farmsteads to protect soils from crosswinds and, on cropland, wind-driven erosion. In Minnesota, white spruce and poplar are popular tree species for use in shelterbelts or windbreaks. Hedgerow species are shorter lived and of smaller stature. Estimated average annual GHG emissions-avoided from shelterbelts and hedgerows are shown in Table 18 by source. For each 100,000 acres of cropland retired to shelterbelts or hedgerows, an estimated 269,000 CO₂-equivalent short tons of emission that otherwise would have occurred are avoided. Of this, about two-thirds, results from CO₂ that, during plant growth, is removed from the atmosphere and is photosynthetically incorporated into live biomass and, with time, into standing and down dead tree detritus, the forest floor and soils. Of the remainder, about one-fifth, are avoided direct emissions of N₂O from cropland soils. Slightly more than 90 percent of all emissions avoided through the

---

¹⁰ Estimated oxidation in afforested soils (see Table 17) minus oxidation in cropland soils, from Aronson and Heliker (2010): 2.02 – 1.85 kg CH₄/ha/yr
establishment of shelterbelts and hedges are avoided in state, with the remainder avoided out-of-state from avoided agricultural fertilizer, chemicals and fuels production.

In the preceding section on general upland afforestation, the biological and biochemical processes involved in woodland sequestration of biogenic carbon in plant biomass, woody detritus and soils were reviewed, as were the microbial processes involved in the soil production and emission of N\textsubscript{2}O and uptake and oxidation of CH\textsubscript{4}. (See Section IV, Subsection B) Since the same processes discussed earlier for general upland afforestation of former cropland are operative in recently established shelterbelts and hedges, this discussion will not be repeated. It simply might be noted that, due to the linear array of shelterbelts and hedges, trees in these plantings face fewer competitive pressures than trees in a closed forest. As a result, they may accumulate carbon more rapidly. Shelterbelts and hedges are open on two sides to sunlight and, bordering on fertilized farm fields, are less likely to be nutrient-limited than trees in a closed forest. (Amichev et al., 2017)

It also might be noted that shelterbelts in particular are designed to intercept windblown sediment, which is then preferentially deposited in shelterbelt soils, where in stabilized forms it is stored. (Sauer et al., 2007) Due to physical disruption and deposition on warm, dry soil surfaces, the organic carbon in wind-blown soils is subject to oxidation.

Due to dense rooting in shelterbelts and hedges, uptake and immobilization of nitrogen in plant biomass and shelterbelt soils also may lead to the production of less N\textsubscript{2}O \textit{in situ} in soils and reduced N\textsubscript{2}O emission to the atmosphere. (Amadi et al., 2017)

In developing the emission-avoided estimates shown in Table 18, a 20-year timespan for continuous biogenic carbon storage was employed. As in the case of other conservation practices that we review in this report, in our judgment, this is the longest period over which continuous storage can safely be assumed for purposes of calculating the more certain effects today of shelterbelt or hedgerow establishment. Under this assumption, avoided-emissions are an estimated 269,000 CO\textsubscript{2}-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from shelterbelt establishment would have been greater, totaling 444,000 CO\textsubscript{2}-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 968,000 CO\textsubscript{2}-equivalent short tons (see Table 18). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II).

The estimated average annual rate of carbon sequestration associated with cropland retirement to shelterbelts or hedges is discussed below, as are direct emissions of N\textsubscript{2}O that are avoided by cropland conversion and generally enhanced rates of CH\textsubscript{4} oxidation in afforested soils. The methods and sources used to estimate avoided indirect N\textsubscript{2}O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed in the Methodology section of this report, Section II, Subsection E above.
Greenhouse gas reduction potential of agricultural best management practices  •  October 2019  Minnesota Pollution Control Agency

a. Carbon sequestration in soils and biomass

As discussed elsewhere, during forest growth, CO₂ is removed from the atmosphere and incorporated in live tree biomass and, eventually, woody detritus, litter and forest soils. This offsets CO₂ emissions from fossil fuel use. Again, as discussed earlier, one ton of biogenic carbon removed from the atmosphere and incorporated into plant biomass and soils acts to offset about 0.4 tons of carbon emitted to the atmosphere from fossil sources. This assumes a 20-year lifetime of that carbon in terrestrial carbon pools before reemission, the longest period that, in our estimation, safely can be assumed in calculating the offset value of present-day sequestration. In this regard, total sequestration is estimated for 100,000 acres of land retired to shelterbelts and hedges using an average per acre sequestration rate truncated to accommodate an assumed 20-year lifetime of carbon in terrestrial carbon pools before reemission to the atmosphere.

Since most of the science on terrestrial carbon sequestration is developed in metric units, this average rate is given in metric tons per hectare per year and then converted to CO₂-equivalent short tons per acre per year for summary Table 18.

From Table 18, with 100,000 acres of shelterbelts and hedges, roughly 175,000 CO₂-equivalent short tons of emissions would be offset annually, or 1.75 CO₂-equivalent short tons per acre.

In newly established shelterbelts and hedges, as generally in recently established upland forests, a substantial part of sequestered carbon is stored in aboveground biomass, roots and woody detritus. (Amichev et al., 2016; Udawatta and Jose, 2011) Because of this, carbon sequestration on forestland is
best estimated as the change in total ecosystem carbon, which for shelterbelts and hedges is estimated at an annual rate of 2.78 ± 0.73 metric tons of carbon per hectare (1.24 ± 0.33 short tons of carbon per acre).11 This estimate was developed from ten studies that provide information on total ecosystem carbon storage in shelterbelts and hedges. (See Table 19 below) Studies that address only changes in soil carbon report rates of annual sequestration that are less than a third of this total ecosystem rate.

In general, relatively few studies can be found in the scientific literature that address carbon sequestration in recently established and growing shelterbelts and hedges, which limits, to a degree, the strength of the quantitative conclusions that might be drawn from a review of the published literature. We reviewed 26 studies. No published meta-analysis of study results was identified for sequestration in recently established and growing shelterbelts and hedges. Of the total ecosystem studies, three were modeling studies, three were site studies that employed soil sampling and a mix of different means to estimate aboveground carbon storage in shelterbelts and hedges, and four were literature reviews or studies that report results developed using expert judgment.

In the majority of studies that involve literature review or rely on expert judgment, the analysis of biogenic carbon sequestration was confined to shelterbelt soils. As a consequence, the results from these types of studies were of limited use in establishing a representative sequestration rate for shelterbelts and hedges.

Of the 26 studies that were reviewed, all reported net sequestration following shelterbelt establishment. While somewhat expansive, the calculated confidence intervals were positive and, in the case of the total ecosystem studies, robustly so. As in the case of upland afforestation, the evidence overwhelmingly supports a positive sequestration response rate, with best estimates for annual sequestration very similar to that for upland afforestation.

The descriptive statistics for the studies that were reviewed are shown in Table 19.

b. Nitrous oxide

$\text{N}_2\text{O}$ is produced microbially in the soils of shelterbelts and hedges, albeit at rates lower than are observed in the soils of fertilized cropland. Avoided nitrous oxide emissions from the establishment of shelterbelts and hedges are calculated as the difference on 100,000 acres between emissions estimated for forestland converted from cropland and average Minnesota cropland $\text{N}_2\text{O}$ emissions, as taken from the MPCA Greenhouse Gas Emission Inventory. Emissions from forestland converted from cropland are estimated on a per hectare basis (kilograms of $\text{N}_2\text{O}$ per hectare), and then converted to a per acre basis (lbs. $\text{N}_2\text{O}$ per acre) for the calculation of emissions on 100,000 acres.

There exist relatively few published estimates of $\text{N}_2\text{O}$ fluxes from shelterbelts and hedges. In lieu of $\text{N}_2\text{O}$ emission estimates specific to shelterbelts and hedges, in calculating avoided $\text{N}_2\text{O}$ emissions, we use the average emission rate for upland afforestation of former cropland, which is discussed above in Section IV, Subsection Bb. Afforested former croplands are estimated annually to emit 1.18 kg $\text{N}_2\text{O}$ per hectare (1.05 lbs. $\text{N}_2\text{O}$ per acre). Estimated average annual cropland emissions of nitrous oxide are 4.8 kg $\text{N}_2\text{O}$ per hectare (4.3 lbs. $\text{N}_2\text{O}$ per acre) or roughly four-fold higher.

---

11 Prior to truncation, to accommodate an assumed 20-year persistence of organic carbon stored in shelterbelt and hedgerow live biomass, soils and woody detritus.
Six studies of N_{2}O emissions from shelterbelts and hedges were identified in the scientific literature. The mean rate of emission for these six studies is some 0.81 kg N_{2}O per hectare per year, which is not too different from the average value calculated for upland afforested former croplands. The descriptive statistics for these six studies of N_{2}O emissions from shelterbelts and hedges are shown below in Table 20.

**c. Methane**

Methane is oxidized in both cropland and forested soils. The change in the rate of CH_{4} oxidation in soils from establishing shelterbelts and hedges is calculated as the difference in the rate of soil CH_{4} oxidation in cropped soils, as taken from Aronson and Helliker (2010), and estimated annual oxidation in shelterbelts and hedges. Relatively few published estimates of CH_{4} oxidation rates for soils of shelterbelts and hedges can be found in the literature; we were able to identify five studies. In lieu of an adequate set of estimates for soil CH_{4} oxidation rates specific to shelterbelts and hedges, in estimating the change in CH_{4} uptake by shelterbelts establishment we use the mean rate of CH_{4} oxidation for soils afforested former cropland (see Section IV, Subsection Bc above).
In Table 21, we show the descriptive statistics for the five studies that do provide information on mean annual CH4 oxidation in shelterbelt soils. These are given in metric units, following general scientific conventions. The mean for these studies is generally lower that was reported in Table 17 for afforested formerly cultivated soils. It is not known whether the difference in the estimates reflects a real difference in soil CH4 uptake potential between shelterbelt soils and soils of upland afforested former cropland.

As noted in discussing afforestation on idled cropland, the contribution of changes in soil CH4 oxidation from land-use change to overall GHG-avoidance is small.

Table 21. Descriptive statistics: Shelterbelts and hedgerows - CH4

<table>
<thead>
<tr>
<th></th>
<th>soil CH4 oxidation (kg CH4/ hectare/ yr)</th>
<th>number of study results</th>
<th>ratio, positive-to-negative results: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>0.89</td>
<td>6</td>
<td>6/0</td>
<td>0.23</td>
<td>0.45</td>
<td>1.34</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>1.00</td>
<td>5</td>
<td>5/0</td>
<td>0.24</td>
<td>0.52</td>
<td>1.48</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.35</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>shelterbelts</td>
<td>0.66</td>
<td>6</td>
<td>6/0</td>
<td>0.34</td>
<td>0.00</td>
<td>1.32</td>
</tr>
<tr>
<td>hedgerows</td>
<td>0.50</td>
<td>2</td>
<td>2/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>studies with cropland counterfactuals</td>
<td>0.92</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

*CH4 soil oxidation = removal from atmosphere and destruction in soils

b 6 study results, 5 studies (4 empirical site studies, 1 modeling/empirical site study)

c 1 study reports multiple results by study type

D. Field borders, contour buffer strips, vegetative barriers, herbaceous wind barriers

Field borders are strips of permanent vegetation at fields edges placed there to intercept nutrients and sediments leaving the field and to reduce soil and wind erosion. Contour buffer strips and vegetative barriers are intra-field strips of permanent vegetation that follow the contour of the land, particularly the contour of sloping hills. They are designed to trap sediment and reduce erosion. Contour buffer strips often are alternated with strips of annual row crops. Herbaceous wind barriers are narrow strips of perennial or annual grasses placed across the path of prevailing winds and designed to reduce wind erosion of soils. Generally planted in deep-rooted perennial grasses, these field borders, strips and herbaceous barriers act similarly to grassland retirements to sequester organic carbon in soils. Emissions of N2O generally are lower in these unfertilized, mostly perennial plantings, though only a few studies exist to verify this understanding.

Field studies of biogenic carbon sequestration in field borders, as well as in contour buffer strips and vegetative and herbaceous wind barriers, are relatively few. The same is true for field studies of N2O emission from and CH4 uptake and in situ oxidation in soils under these practices. It is conventional to apply to these practices rates of carbon sequestration taken from studies of restored grassland. The same is true for N2O emission and CH4 emission and uptake rates. (Swan et al., 2015; Eagle et al., 2012). We follow this practice.

Table 22 shows the budget for greenhouse gas-avoidance for field borders, contour buffer strips and vegetative and herbaceous wind barriers. In developing this budget, it was assumed that these grass areas would be mowed at least once per year, so the avoided-emissions are slightly different from those...
for cropland temporarily retired to grass (see Table 9 above). Using this approach, for each 100,000
acres of cropland converted to contour buffer strips, field borders, and vegetative and herbaceous wind
barriers, an estimated 161,000 CO₂-equivalent short tons of greenhouse gases that otherwise would
have occurred are avoided. Of this, a little less than 90 percent is avoided from in-state sources.

Table 22. Field borders, contour buffer strips, vegetative barriers, herbaceous wind barriers: Emissions- avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>(41,091)</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(2,107)</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(11,703)</td>
<td>crop production</td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>468</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂⁺d</td>
<td>carbon accumulation in soils</td>
<td>(78,089)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>cultivated soils from lime or urea use</td>
<td>(2,808)</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(5,518)</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(20,190)</td>
<td>crop production</td>
</tr>
<tr>
<td>Total</td>
<td>all sources and sinks</td>
<td>(161,038)</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

| 40 year storage | all sources and sinks | (239,127) | crop production |
| 100 year storage | all sources and sinks | (473,395) | crop production |

* positive = emissions increase, negative = emissions reduction

b reduction in soil CH₄ oxidation = relative increase in emissions
c carbon accumulation in soil and biomass = net removal of CO₂ from the atmosphere = net emission reduction
d assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass

d About half of the calculated emission-avoidance potential results from biogenic carbon sequestration,
mostly in grassland soils, but also in live roots and aboveground biomass. A value of 0.55 short tons of
carbon per acre per year (1.24 metric tons of carbon per hectare per year) was used to calculate this,
again taken from the calculations used to estimate the GHG emission reduction potential of temporary
cropland idling in perennial grass. The relatively few studies that are specific to the practices discussed
in this section report annual sequestration values ranging from 0.06 to 0.98 short tons of carbon per
acre (0.13 to 2.19 metric tons per hectare), with a mean value of 0.44 short tons of carbon per acre
(0.99 metric tons per hectare), or not too different from the 0.55 short ton per acre value cited above.
(Blanco-Canqui et al., 2014; Brouillard et al., 2013; Fallon et al., 2004; Lenka et al., 2012; Perez-Suarez et al., 2014; Swan et al., 2015)

Iqbal et al. (2014) report annual N₂O flux rates from N₂O production in upland grass filter strips of 0.89
lbs. N₂O per acre (1 kg N₂O per hectare), which is not too different from the 1.28 lbs. N₂O per acre per
year (1.44 kg N₂O per hectare per year) value used in Table 22 to calculate avoided N₂O emissions from
field borders, contour buffer strips, and vegetative and herbaceous wind barriers.
No similar estimates specific to field borders or intra-field buffers or barriers were available for soil CH$_4$ uptake and oxidation for use in evaluating the suitability of the approach taken here on in soil CH$_4$ removals from the atmosphere.

E. Grassland riparian buffers

Riparian buffers are vegetative buffers placed along surface waters that are designed to intercept nutrient run-off from cropland and pastureland. Riparian buffers are lands adjacent to streams, rivers and lakes that are in trees or perennial grasses, or a combination. Due to placement between surface waters and fertilized cropland (or fertilized or grazed pastureland), the soils in riparian buffers are typically wetter and more susceptible to N$_2$O losses than are upland soils. Whereas upland soils generally act to oxidize CH$_4$, riparian buffer soils often act as net sources of emission of CH$_4$ to the atmosphere, although field observations of CH$_4$ emissions from or uptake and oxidation in riparian buffer soils are limited in number.

In Minnesota, as of 2014, there were an estimated 475,000 acres of land in riparian buffers, most of it in grassland-type riparian buffers. Under the state’s Nutrient Reduction Strategy, roughly 100,000 additional acres of land will be retired to riparian buffers.

Table 23 shows the estimated net annual greenhouse gas balance from the conversion of cropland to riparian grassland or herbaceous riparian buffers. For each 100,000 acres of cropland retired to grassland buffer, an estimated 77,000 CO$_2$-equivalent short tons of GHGs would be avoided annually, or less than half of what is estimated above for upland soils temporarily idled in grass (see Section IV, Subsection A).

Of total estimated avoided-emissions from converting cropland to grassland-type riparian buffers, about 75 percent is from in-state sources and about 25 percent from the avoided out-of-state manufacture of agricultural chemicals, fertilizer and fuels resulting from cropland retirement. In state, net emissions of CH$_4$ from generally wetter riparian soils offset reductions in the emission of N$_2$O from these soils. The average acre of cropland in Minnesota is heavily fertilized with synthetic and manure-based nitrogen. Emissions of N$_2$O to the atmosphere result from the application of nitrogen to soils, as well as from enhanced mineralization of organic nitrogen in soils during tillage and the addition to soils of large amounts of crop residues, particularly those high in nitrogen content. Some emissions of N$_2$O occur downstream of crop production in river, stream and lake sediments as a result of runoff and leaching of nitrate and nitrogen in other forms to surface and groundwater.

Estimated atmospheric removals of CO$_2$ through biogenic carbon sequestration on 100,000 acres of riparian soils are some 49,000 tons, accounting for two-thirds of all estimated avoided-emissions, both in-state and out-of-state, from use of this practice on 100,000 acres.

In developing the estimates shown in Table 23, it was assumed that 20 years was the longest period of time over which sustained terrestrial carbon storage, once initiated, safely could be assumed. Under this assumption, avoided-emissions are an estimated 77,000 CO$_2$-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from the establishment of grassland riparian buffers would have been greater, totaling 127,000 CO$_2$-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 275,000 CO$_2$-equivalent short tons (see Table 23). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II) of this report.
Table 23. Grassland riparian buffers: Emissions-avoided *

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>(9,405) crop production</td>
<td></td>
</tr>
<tr>
<td>N₂O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(2,107) crop production</td>
<td></td>
</tr>
<tr>
<td>N₂O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(13,653) crop production</td>
<td></td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>27,176 crop production</td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td>carbon accumulation in soils and biomass</td>
<td>(49,420) crop production</td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td>cultivated soils from lime or urea use</td>
<td>(2,808) crop production</td>
<td></td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(6,892) crop production</td>
<td></td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(20,190) crop production</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(77,299) crop production</td>
<td></td>
</tr>
</tbody>
</table>

A number of estimates have been published of the net change in total greenhouse gas emissions resulting from the conversion of cropland to grassland riparian buffers. These include estimates by Eagle et al. (2012) and Swan et al. (2015), which report avoided-emissions for cropland conversion to riparian buffers of 1.59 and 1.39 CO₂-equivalent short tons per acre per year, respectively, or 159,000 and 139,000 CO₂-equivalent short tons per year on 100,000 acres. These estimates are generally similar to, if smaller than, the estimates given in Table 23 above.

Biogenic carbon sequestration riparian grassland buffers is discussed below, as are avoided direct emissions of N₂O from the idling of cropland in riparian grassland buffers and the effects of buffer establishment on soil CH₄ oxidation or emission. The methods and sources used to estimate avoided indirect N₂O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed above in the Methodology section of this report, Section II, Subsection E.

a. Carbon sequestration in soils and biomass

Cropland tillage acts to disrupt soil structure, leading to rapid decomposition of soil organic matter. In uncultivated soil, organic carbon in soil is physically and chemically protected from microbial decomposition by soil macroaggregates, mostly in soil pores too minute for bacteria and fungi (or water soluble enzymes) to penetrate or too anaerobic for aerobic soil bacteria. (Jones and Donnelly, 2004) Soil carbon also is chemically protected by clay and silt particles, which bind to soil organic matter and, in the very long-term, by various metals and mineral anions and cations which biochemically bind to organic matter to form complexes that are highly recalcitrant and persist in soils for hundreds to thousands of years. (Follett et al., 2001; Nair et al. 2010)
Cropland cultivation disrupts soil structure, breaking up protective soil macroaggregates and exposing soil organic carbon to microbial decomposition, in upland soils as well as cropland in the riparian zone. (Marquez et al., 2017; Six et al., 2002a) Cropland idling in riparian grassland buffers reverses the processes of soil degradation, building carbon in grassland soils through renewed physical and biochemical protection of soil organic matter, as well as enhanced allocation of carbon to plant roots in unmanaged grassland buffers. (Bell et al., 2012) Plant rooting depth also is important. (Knops and Bradley, 2009)

Of particular note in riparian grassland buffers is absence of harvest removals (Omonode and Vyn, 2006; Vuichard et al., 2008), which on cropland limit organic carbon inputs to soils. The amount of carbon in soils is determined by carbon inputs and the degree to which organic carbon in soils is protected from microbial decomposition. On croplands planted to annuals, harvest removals account for between 40 and 45 percent of cropland net primary productivity. (West et al., 2011) Little of this is available as input to soils. By contrast, perennial grasses allocate about two-thirds of net primary productivity belowground to root growth and rhizomes, where it is then available for storage as soil organic carbon.

The soils of riparian grassland buffers are generally wetter than upland cropped soils and subject to elevated water tables and periodic inundation. In general, wet, fine textured soils with high clay contents store more carbon than do coarse, dry soils, particularly where cool climate conditions prevail. By limiting aeration, wetness inhibits microbial decomposition of soil organic matter in soils, as do cool temperatures.

The amount of soil organic carbon that, on average, is stored in riparian grassland buffers is about twice that of adjacent croplands. (Marquez et al., 1999; Rheinhart et al. 2012)

In addition to the sequestration of carbon in soils, also is stored in aboveground and belowground live and dead biomass. Unlike biomass storage in cropland annuals, where aboveground biomass is removed at harvest or rapidly decomposes, biomass storage in unmanaged grassland is retained belowground after the growing season as live roots or above ground in the form of litter and plant detritus. On an annual basis, carbon storage in riparian grassland buffers in live and dead aboveground and belowground biomass and litter is about 2.25 to 5 short tons per acre (5 to 10 metric tons per hectare), while, again on an annualized basis, corn and soybeans might store 0.65 to 0.9 short tons per acre (1.5 to 2 metric tons per hectare) as aboveground and belowground living biomass and dead roots and litter. (Tufekcioglu et al., 2003)

During sustained carbon sequestration, ecosystems remove carbon from the atmosphere photosynthetically and store it in plant biomass or, over longer periods, in soils and aboveground litter. From Table 23, we estimate that, on 100,000 acres in perennial grasses, riparian buffers on former cropland will sequester 49,000 short tons of carbon as CO₂ (13,000 nominal short tons of carbon). As noted above, this estimate was developed using an average per acre sequestration rate truncated to accommodate an assumed 20-year lifetime of carbon in terrestrial carbon pools before reemission to the atmosphere. Since most of the science on terrestrial carbon sequestration is developed in metric units, this average annual rate is given in metric tons per hectare and then converted to CO₂-equivalent short tons per acre for summary Table 23.

In developing our estimate of annual sequestration in riparian grassland buffers, we reviewed fourteen studies, including one micro-meteorological (eddy covariance) site study, four other empirical site studies, one derivative statistical study and eight literature reviews or studies that report results developed using expert judgment (see Table 24). Eight of the studies gave sequestration estimates
limited to losses or gains in soil organic carbon; three addressed sequestration at the ecosystem level, including aboveground and belowground biomass and soil organic carbon. No meta-analyses were available to support the calculation. Given the limited number of published studies, we averaged across the results from all of the available 14 studies to derive an estimate of annual carbon sequestration from riparian grassland buffers.

Table 24. Descriptive statistics: Grassland riparian buffers - carbon sequestration in soils and biomass

<table>
<thead>
<tr>
<th>Study Type</th>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of studies</th>
<th>ratio of sequestration to emission: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>0.79</td>
<td>14</td>
<td>14/0</td>
<td>0.153</td>
<td>0.49</td>
<td>1.09</td>
</tr>
<tr>
<td>total ecosystem carbon (soil organic carbon [SOC], above and belowground biomass)</td>
<td>0.53</td>
<td>3</td>
<td>3/0</td>
<td>0.052</td>
<td>0.43</td>
<td>0.63</td>
</tr>
<tr>
<td>above and belowground biomass, litter, detritus</td>
<td>1.31</td>
<td>2</td>
<td>2/0</td>
<td>0.931</td>
<td>(0.52)</td>
<td>3.13</td>
</tr>
<tr>
<td>soil organic carbon-only a</td>
<td>0.66</td>
<td>9</td>
<td>9/0</td>
<td>0.073</td>
<td>0.52</td>
<td>0.81</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries b</td>
<td>0.54</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>expert judgment/literature review</td>
<td>0.55</td>
<td>8</td>
<td>8/0</td>
<td>0.042</td>
<td>0.47</td>
<td>0.63</td>
</tr>
<tr>
<td>empirical site study- eddy covariance (NECB/NBP)</td>
<td>0.63</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site study-destructive biomass sampling</td>
<td>1.73</td>
<td>2</td>
<td>2/0</td>
<td>0.931</td>
<td>(0.09)</td>
<td>3.56</td>
</tr>
<tr>
<td>empirical site studies-soil sampling</td>
<td>0.99</td>
<td>2</td>
<td>2/0</td>
<td>0.094</td>
<td>0.81</td>
<td>1.18</td>
</tr>
<tr>
<td>average 20 year rate of sequestration</td>
<td>0.56</td>
<td>2</td>
<td>2/0</td>
<td>0.098</td>
<td>0.37</td>
<td>0.76</td>
</tr>
<tr>
<td>average 5 to 10 year rate of sequestration</td>
<td>1.25</td>
<td>5</td>
<td>5/0</td>
<td>0.357</td>
<td>0.55</td>
<td>1.95</td>
</tr>
</tbody>
</table>

a estimates for empirical site studies, soil sampling, soil organic carbon-only, and average 5 to 10 year rate of sequestration developed against a cropland counterfactual
b statistical summaries or derivative statistical analyses other than meta-analyses
14 study results, 14 studies
c ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions

derivative statistical analyses or statistical summaries

Based on the fourteen studies, the idling of cropland in riparian grassland buffer is estimated to sequester 0.79 metric tons of biogenic carbon per hectare (0.35 short tons of carbon per acre). This is the estimated rate prior to truncation to accommodate 20-year assumed persistence of carbon in buffers vegetation and soils. By study type, annual sequestration rates taken from these 14 studies range from 0.55 to 1.73 metric tons of carbon per hectare (0.25 to 0.77 short tons of carbon per acre). Grouped by study type and carbon pools treated, the estimates scatter widely without readily apparent pattern. For instance, annual rates of carbon sequestration in site studies that report changes in soil carbon are higher than those that report total ecosystem carbon storage, including storage in belowground and aboveground biomass. The same is true for site studies that report on changes solely in live biomass, excluding soils.

In general, the studies were uniform in their judgment that, with riparian buffer establishment, carbon would be sequestered, offsetting fossil CO₂ emissions elsewhere in the economy. More studies may be needed, particularly at the level of total ecosystem carbon, to more firmly establish, within the range noted above, a mean best estimate for carbon sequestration in these systems.

b. Nitrous oxide

Nitrous oxide is produced in riparian buffers that are adjacent to cropland predominantly by denitrification of nitrate in groundwater flows. (Hinslow and Dahlgren, 2016) Nitrate in groundwater is
the principal form in which excess nitrogen is removed from cropland. During denitrification, nitrate is microbially reduced to N\textsubscript{2}O or N\textsubscript{2} under anaerobic conditions. Riparian buffers are much wetter that the soils of upland croplands. Maximum N\textsubscript{2}O production in soils occurs around water-filled pore space of 70 to 80 percent, which is also optimal soil wetness for denitrification. (Hefting et al., 2006; Machefert et al., 2002) Nitrate-laden groundwater flows from cropland to riparian grassland buffers sustain substantial emissions of N\textsubscript{2}O from buffers to the atmosphere. (Schelde et al., 2012)

Riparian grassland buffers are established in agricultural areas specifically to act as sites of intensive denitrification of nitrate in groundwater flows. N\textsubscript{2}O production and emissions are the unintended byproduct of that use of riparian buffers for nitrate control.

N\textsubscript{2}O production in riparian buffers also is promoted by periodic flooding and or high water tables, both of which contribute to the formation of anaerobic conditions in buffers. (Fisher et al., 2014; Jacinthe et al., 2012) The availability of large amounts of organic carbon substrate in riparian buffers also promotes N\textsubscript{2}O production, as does the presence of fine textured soils.

In general, N\textsubscript{2}O emissions from riparian buffers, grassland or forestland, are higher than emissions from upland unmanaged grassland, but lower than N\textsubscript{2}O emissions from adjacent cropland. (Ambus and Christensen, 1995; Dunmola et al., 2010; Groh et al., 2018; Kim et al., 2009; Vllain et al., 2012) Riparian grassland buffers are largely unmanaged, with little intentional input of synthetic fertilizer or manure and no tillage, resulting in much lower N\textsubscript{2}O emissions than are found in adjacent croplands.

Avoided-emissions from the conversion of cropland to riparian grassland buffers are calculated as the difference in emissions on 100,000 acres between estimated emissions from riparian grassland buffers and average Minnesota cropland N\textsubscript{2}O emissions, as taken from the MPCA Greenhouse Gas Inventory. In developing an emissions estimate for riparian grassland buffers, we reviewed 15 studies, 14 of which were empirical sites studies and one a modeling study. An average of the results from the 15 studies was selected as the best available estimate of annual N\textsubscript{2}O emissions from riparian grassland buffers.

Using the average of the results from the 15 studies that were reviewed, riparian grassland buffers are estimated to annually emit 4.1 ± 0.88 kg N\textsubscript{2}O per hectare (3.66 ± 0.78 lbs. N\textsubscript{2}O per acre), or about three times as much as upland restored grassland.

Based on MPCA emission inventory totals, average annual N\textsubscript{2}O emissions from Minnesota cropland are an estimated 4.8 kg N\textsubscript{2}O per hectare (4.3 lbs. N\textsubscript{2}O per acre), or only marginally higher than what is estimated for grassland riparian buffers.

The descriptive statistics for the 15 studies that were reviewed are shown in Table 25. In most of the studies, emissions were monitored on an annual basis, as opposed to a growing season basis. Of the two, emissions monitored on a growing season basis tend to be much higher. Studies that report results for multiple years tend to produce results that are lower than the 4.1 kg N\textsubscript{2}O per hectare per year estimate for all 15 studies, but too few studies report multiple year results for much to be concluded here. Seven studies report on the difference in N\textsubscript{2}O emissions in paired, side-by-side experiments between riparian grassland buffers and adjacent cropland. In these studies, on an annual basis, riparian grassland buffers emitted 13.93 kg N\textsubscript{2}O per hectare (12.43 lbs. N\textsubscript{2}O per acre) less than adjacent cropland, which is directionally consistent with our results, if also more extreme in terms of reported reductions. From table 23, we estimate annual reductions of 0.72 kg N\textsubscript{2}O per hectare (0.63 lbs. N\textsubscript{2}O per acre).
A good deal more empirical research need to be developed, particularly directed toward this latter discrepancy. Based on what admittedly is a very small group of studies, it seems possible that \(\text{N}_2\text{O}\) emissions from the conversion of cropland to riparian buffers could decline a small amount or a very large amount.

Table 25. Descriptive statistics: Grassland riparian buffers - \(\text{N}_2\text{O}\)

<table>
<thead>
<tr>
<th></th>
<th>emissions (kg (\text{N}_2\text{O}/)hectare/yr)</th>
<th>number of studies</th>
<th>ratio, positive to negative results: number of studies</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>4.10</td>
<td>15</td>
<td>15/0</td>
<td>0.88</td>
<td>2.38</td>
<td>5.82</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>4.32</td>
<td>14</td>
<td>14/0</td>
<td>0.91</td>
<td>2.53</td>
<td>6.10</td>
</tr>
<tr>
<td>modeling studies</td>
<td>2.63</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>3.49</td>
<td>11</td>
<td>11/0</td>
<td>0.68</td>
<td>2.17</td>
<td>4.82</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>7.33</td>
<td>11</td>
<td>11/0</td>
<td>3.33</td>
<td>0.80</td>
<td>13.86</td>
</tr>
<tr>
<td>1 year or less of observations or simulations</td>
<td>4.91</td>
<td>10</td>
<td>10/0</td>
<td>1.23</td>
<td>2.50</td>
<td>7.32</td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>2.43</td>
<td>4</td>
<td>4/0</td>
<td>0.69</td>
<td>1.09</td>
<td>3.77</td>
</tr>
<tr>
<td>grassland riparian buffers against counterfactuals cropland</td>
<td>(13.92)</td>
<td>7</td>
<td>3/4</td>
<td>7.41</td>
<td>(28.44)</td>
<td>0.60</td>
</tr>
</tbody>
</table>

\(^a\) negative emissions = removal from atmosphere and destruction in soils  
\(^b\) 15 study results, 15 studies

**c. Methane**

As just discussed, the soils in riparian buffers tend to be much wetter than those of upland cropland, in part due to periodic high water levels and flooding, in part due to shading and high levels of soil organic matter. (Kim et al., 2010) Anaerobic conditions in wet soils promote the production \(\text{CH}_4\) and its emission to the atmosphere. Methane is produced microbially in soils under anaerobic or anoxic conditions by methanogenic bacteria. Across the course of a year, riparian buffers experience wet and dry conditions, During dry seasons, \(\text{CH}_4\) is taken up by soils and oxidized by methanotrophic bacteria and, as just noted, under near-saturated conditions, \(\text{CH}_4\) is produced by methanogenic bacteria. On an annual basis, the balance between these processes of methane consumption (methanotrophy) and \(\text{CH}_4\) production (methanogenesis) determines whether a riparian buffer is a net source or net sink of \(\text{CH}_4\). (Jacinthe and Vidon, 2017)

In this report, net \(\text{CH}_4\) emissions to or removals from the atmosphere from the conversion of cropland to grassland riparian buffers are calculated as the difference across 100,000 acres in \(\text{CH}_4\) uptake and oxidation in temperate croplands, developed from the average rates of cropland \(\text{CH}_4\) oxidation given in Aronson and Helliker (2010), and estimated emissions from grassland riparian buffers.

In developing a \(\text{CH}_4\) emissions estimate for grassland riparian buffers, we reviewed eleven studies, all empirical site studies. No results from any other study type was available in the published literature. Of the eleven studies, nine reported \(\text{CH}_4\) emissions from riparian buffers, while two reported net \(\text{CH}_4\) uptake. The mean value for \(\text{CH}_4\) emission for these eleven studies was 22.52 kg \(\text{CH}_4\) per hectare per year (20.09 lbs. \(\text{CH}_4\) per acre per year).

Care should be taken with this mean \(\text{CH}_4\) emissions estimate for grassland riparian buffers. Studies that report emissions estimates developed on an annual basis, as opposed to a growing season basis, also report substantially lower rates of \(\text{CH}_4\) production than would be indicated by the mean of the results of the eleven studies reviewed, although with only six studies reporting annual flux data, it is not clear
what conclusions to draw from this (see Table 26). Many more empirical site studies may be needed for a better sense of the size of net CH$_4$ emissions from riparian grassland buffers.

**Table 26. Descriptive statistics: Grassland riparian buffers - CH$_4$**

<table>
<thead>
<tr>
<th>Source of Emission Avoidance</th>
<th>Emissions (kg CH$_4$/hectare/yr)</th>
<th>Number of Studies</th>
<th>Ratio, Positive to Negative Results: Study Numbers</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All studies</td>
<td>22.52</td>
<td>11</td>
<td>9/2</td>
<td>12.36 (1.71)</td>
<td>46.75</td>
<td></td>
</tr>
<tr>
<td>Empirical site studies</td>
<td>22.52</td>
<td>11</td>
<td>9/2</td>
<td>12.36 (1.71)</td>
<td>46.75</td>
<td></td>
</tr>
<tr>
<td>Annual flux monitoring/modeling</td>
<td>3.24</td>
<td>6</td>
<td>4/2</td>
<td>2.24 (1.15)</td>
<td>7.64</td>
<td></td>
</tr>
<tr>
<td>Growing season and subgrowing season flux monitoring/modeling</td>
<td>45.35</td>
<td>5</td>
<td>4/1</td>
<td>24.38 (2.43)</td>
<td>93.13</td>
<td></td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>21.53</td>
<td>7</td>
<td>6/1</td>
<td>16.41 (10.63)</td>
<td>53.68</td>
<td></td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>17.54</td>
<td>5</td>
<td>3/2</td>
<td>17.62 (16.99)</td>
<td>52.07</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ negative emissions = removal from atmosphere and destruction in soils
$^b$ 11 study results, 11 studies

**F. Forested and multispecies riparian buffers**

Due to the large amounts of carbon that might be stored in living and dead biomass on afforestation lands, forested and multispecies riparian buffers are generally more effective in mitigating GHG emissions from agricultural sources than grassland riparian buffers. Multispecies buffers are a mixture of grassland species, medium-stature shrubs, and trees arranged by stature and placed adjacent to surface waters. For each 100,000 acres of cropland converted to forested or multi-species riparian buffers, an estimated 203,000 CO$_2$-equivalent short tons of emissions that would otherwise have occurred are avoided (see Table 27 below). For croplands converted to forested buffers, this is roughly two and one-half times what is avoided by grassland-type riparian buffers, but only 80 percent that of upland afforested lands.

Forested and multispecies riparian buffers are emission sources of both CH$_4$ and N$_2$O, although in the case of N$_2$O, just barely. Large net emissions of CH$_4$ from forested and multi-species riparian buffers account for the large advantage of upland afforestation over afforestation in the riparian zone, although, as we will discuss in the subsection on CH$_4$, the number of studies that address CH$_4$ emissions from forested buffers is limited. In upland forested acres, soils act to oxidize atmospheric CH$_4$ thereby offsetting a small part of surface emissions of other GHGs. In much wetter, occasionally inundated riparian soils, anoxic conditions favor the production of CH$_4$.

As noted above in Section IV, Subsection Gb, the large amounts of nutrients that, by design, are intercepted in buffers sustain high levels of N$_2$O production in riparian soils. Soil wetness also contributes to relatively high rates of N$_2$O emission from these soils.

Avoided-emissions from forested and multispecies buffers on former cropland are shown in Table 27 by source of emission-avoidance. Most avoided-emissions from the retirement of cropland to forested riparian buffers or multispecies buffers occur in state, about 90 percent. The rest is associated with the out-of-state avoided manufacture of fertilizer, fuel and agricultural chemicals no longer used in crop production.
Biogenic carbon sequestration from forested buffer establishment on idled soils is discussed immediately below. Avoided direct emissions of \( \text{N}_2\text{O} \) from soils and the effects of forested riparian buffer creation on soil \( \text{CH}_4 \) oxidation are discussed in the subsequent two subsections. The methods and sources used to estimate avoided indirect \( \text{N}_2\text{O} \) emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture are discussed in the Methodology section (Section II) of this report.

In quantifying avoided-emissions, we assumed a 20-year timespan for carbon storage prior to its reemission to the atmosphere as \( \text{CO}_2 \). As noted elsewhere in this report, this is the longest period that, in our judgment, sustained terrestrial carbon storage, once initiated, can be assumed in estimating its value as a GHG offset. Under this assumption, avoided-emissions are an estimated 203,000 \( \text{CO}_2 \)-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from the establishment of forested riparian buffers would have been greater, totaling 401,000 \( \text{CO}_2 \)-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 995,000 \( \text{CO}_2 \)-equivalent short tons (see Table 27). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section of this report, Section II, Subsection E.

a. Carbon sequestration in soils and biomass

Owing to continuous water and nutrient supplies, temperate riparian forests are highly productive, storing large amounts of carbon. At maturity an estimated 89 to 172 short tons of carbon is stored per acre (200 to 385 metric tons of carbon per hectare) in riparian forest buffers. (Sutfin et al., 2016) Of this,
half to three-quarters is in the form of live biomass and woody detritus and litter, the remainder in the form of soil organic carbon. In mineral cropland soil, total ecosystem carbon, down to 39 inches (100 centimeters) of soil depth, is rarely more than 45 short tons per acre (100 metric tons per hectare), and often less. Meta-analysis of riparian forests suggest that, on a per acre basis, in wet temperate climates, forests in the riparian zone will accumulate about 89 short tons of carbon beyond what is typically stored on croplands. (Dybala et al., 2018)

Besides reduced water deficits and optimal phosphorus and nitrogen supply, factors that contribute to carbon sequestration in forested and multi-species riparian buffers include: enhanced physical and chemical protection of carbon in soils after the cessation of tillage; soil wetness, which slows decomposition of soil organic matter; and imports into the riparian zone of carbon rich sediments and woody debris. (Riegler et al., 2017) To the degree that sediments accumulate in a tillage-free environment, sediments imported into the riparian zone contribute to soil carbon sequestration. The absence of tillage acts to stabilize organic carbon in soil macroaggregates and microaggregates and in mineral-organic complexes, leading to the long-term accumulation of organic carbon in soils.

Riparian forest and multi-species buffers can be planted to fast growing hybrid poplars with a 20-year rotation, followed by harvest and replanting. Over 20 years of growth, hybrid poplars in the riparian zone can store 15 to 45 short tons of carbon per acre (33 to 100 metric tons of carbon) in aboveground and belowground biomass, or at annual rates of 0.76 to 2.5 short tons of carbon per acre (1.7 to 5.5 metric tons of carbon per hectare). (Fortier et al., 2015)

From Table 27, we estimate that, on 100,000 afforested acres, riparian buffers on former cropland will sequester 198,000 short tons of carbon as CO₂, or 54,000 nominal short tons of carbon. This estimate was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence of newly stored organic carbon in soils and biomass. This is the longest period of time that, in our estimation, safely can be assumed in calculating the offset value of present-day sequestration. Since much or most of the science on terrestrial carbon sequestration is developed in metric units, this average rate is given in metric tons of carbon and converted to short CO₂-equivalent tons for inclusion in the summary Table 27. During afforestation, CO₂ is removed from the atmosphere and incorporated into tree biomass and, eventually, into woody detritus and soils. This acts to offset emissions of CO₂ from elsewhere in the economy.

The average per acre sequestration rate for forests in riparian areas was developed from 15 studies of total ecosystem carbon in forested riparian buffers on former croplands. Because it addresses carbon storage in aboveground and belowground biomass and woody detritus, in addition to carbon storage in soils, total ecosystem carbon accounting provides the best indication of how carbon storage will change with a change in conservation practice. Using the total ecosystem carbon approach, forested and multi-species buffers are estimated annually to sequester 3.15 ± 0.69 metric tons of carbon per hectare (1.41 ± 0.31 short tons of carbon per acre). This is the estimated rate prior to truncation to accommodate an assumed 20-year persistence of organic carbon in riparian buffer vegetation and soils.

Overall, 27 studies of carbon sequestration in forested and multi-species buffers were reviewed. None reported carbon losses. Only one meta-analysis was available, but yielded an estimate of annual sequestration reasonably close to that of the mean for the 15 total ecosystem studies. The same is true of the one other derivative statistical analysis, and to a somewhat lesser degree, for the six literature reviews or studies that report results based on expert judgment.
The descriptive statistics for the 27 studies of carbon sequestration in riparian and multi-species buffers that were reviewed are shown in Table 28. Carbon sequestration rates in studies that reported carbon gains solely for riparian soils were about half of those reporting changes in carbon across all pools, including aboveground and belowground biomass, woody detritus and soils. The results for total ecosystem carbon gain from the eddy covariance studies were remarkably similar to those reported for the larger set of studies reporting changes in total ecosystem carbon. Pooled, the sequestration estimates range from 1.57 to 5.58 metric tons of carbon per hectare per year (0.70 to 2.49 short tons of carbon per acre per year). Given the relatively few studies in each grouping, the confidence intervals were wide.

Of the studies that were reviewed, twenty-one studies provided sequestration data by age of buffer. In these, in terms of sequestration rates by riparian buffer age, the annual rate of sequestration was substantially higher during the first 15 years after buffer establishment than afterwards and as much as 40 percent higher than the mean rate of sequestration taken from the 15 total ecosystem carbon studies. This may suggest that, for purposes of estimating carbon sequestration for our 20-year window, the mean sequestration rate developed from the 15 total ecosystem carbon studies may be conservative.

Table 28. Descriptive statistics: Forested riparian buffers and multispecies buffers - carbon sequestration in soils and biomass

<table>
<thead>
<tr>
<th>biogenic carbon sequestration (Mg C/ha/yr) a</th>
<th>number of studies b</th>
<th>ratio of sequestration to emission: study numbers c</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>total ecosystem carbon (soil organic carbon [SOC], above and belowground biomass)</td>
<td>3.15</td>
<td>15</td>
<td>15/0</td>
<td>0.69</td>
<td>1.79</td>
</tr>
<tr>
<td>soil organic carbon-only</td>
<td>1.57</td>
<td>5</td>
<td>5/0</td>
<td>0.57</td>
<td>0.46</td>
</tr>
<tr>
<td>above and below ground biomass</td>
<td>3.16</td>
<td>5</td>
<td>5/0</td>
<td>0.80</td>
<td>1.58</td>
</tr>
<tr>
<td>empirical site study-eddy covariance (NECB/NBP)</td>
<td>2.92</td>
<td>3</td>
<td>3/0</td>
<td>0.30</td>
<td>2.33</td>
</tr>
<tr>
<td>empirical site study-SOC soil sampling</td>
<td>1.93</td>
<td>3</td>
<td>3/0</td>
<td>0.81</td>
<td>0.34</td>
</tr>
<tr>
<td>empirical site study-soil sampling, bole measurements, destructive biomass sampling, allometric relationships</td>
<td>5.58</td>
<td>4</td>
<td>4/0</td>
<td>1.95</td>
<td>1.75</td>
</tr>
<tr>
<td>meta-analyses</td>
<td>2.60</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>other derivative statistical analyses or statistical summaries b</td>
<td>3.00</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>modeling study</td>
<td>2.18</td>
<td>4</td>
<td>4/0</td>
<td>0.30</td>
<td>1.60</td>
</tr>
<tr>
<td>expert judgment/literature review</td>
<td>2.33</td>
<td>6</td>
<td>6/0</td>
<td>1.06</td>
<td>0.26</td>
</tr>
<tr>
<td>15 to 25 year annual rate of sequestration</td>
<td>3.86</td>
<td>8</td>
<td>8/0</td>
<td>1.29</td>
<td>1.33</td>
</tr>
<tr>
<td>0 to 15 year annual rate of sequestration</td>
<td>4.72</td>
<td>7</td>
<td>7/0</td>
<td>1.25</td>
<td>2.28</td>
</tr>
<tr>
<td>&gt;25 year annual rate of sequestration</td>
<td>3.91</td>
<td>6</td>
<td>6/0</td>
<td>1.44</td>
<td>1.09</td>
</tr>
</tbody>
</table>

a all estimates developed against cropland counterfactuals except other derivative statistical analyses or statistical summaries, empirical site studies-eddy covariance studies (NECB/NBP), and modeling studies
b statistical summaries or derivative statistical analyses other than meta-analyses
b 27 study results, 27 studies
c ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions

In total, the overwhelming weight of the evidence supports a large, positive response rate for sequestration, before truncation for 20-years of assumed storage, in the range of 2.5 to 5.5 metric tons of carbon per hectare per year (1.12 to 2.5 short tons per acre per year), with a best estimate of 3.2 metric tons per hectare per year.
b. Nitrous oxide

The microbial processes and environmental conditions that, in riparian buffers, give rise to N₂O emission were discussed above in Section IV, Subsection Eb. That discussion will not be repeated.

Avoided-emissions from the conversion of cropland to forested riparian buffers are calculated as the difference in on 100,000 acres between estimated emissions from forested and multispecies riparian buffers and N₂O emissions from Minnesota cropland. N₂O emissions from Minnesota cropland are taken from the MPCA Greenhouse Gas Inventory. N₂O emissions from forested riparian buffers are estimated using emission rates developed on a per hectare basis from the scientific literature and converted to lbs. N₂O per acre for use in the calculation. To estimate N₂O emissions from forested and multi-species buffers, 28 studies with 33 discrete study results were reviewed. With one exception, they were all empirical site studies. Slightly less than three quarters reported emissions on an annual, as opposed to a growing season, basis. We used the mean emission rate from the 29 studies (5.33 kilograms N₂O per hectare per year [4.76 lbs. N₂O per acre per year]) as the best estimate of mean annual N₂O emissions from forested riparian buffers.

No meta-analyses were available to support the calculation. The same is true of other classes of derivative statistical analyses. Likewise, results from literature reviews and from studies that report results based on expert judgment were not available.

Finally, eight studies were found in the scientific literature that, in side-by-side experiments compare N₂O emissions from forested riparian buffers with emissions from adjacent cropland. These suggest a difference in emissions between forested buffers and cropland of 6.61 kg N₂O per hectare per year (5.9 lbs. N₂O per acre per year), favoring croplands as by far the higher emitting source. These results contrast substantially with the results we present in Table 27, which suggests that uncertainty still shrouds these issues. Based on the side-by-side studies, few as they are, it seems possible that N₂O emissions from cropland converted to riparian forestland could decline. Clearly, more research is needed on this question.

The descriptive statistics for the studies that were reviewed are shown in Table 29.

<table>
<thead>
<tr>
<th>Emissions (kg N₂O/ha/yr)</th>
<th>Number of Study Results</th>
<th>Ratio, Positive to Negative Results: Number of Study Results</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Studies</td>
<td>5.33</td>
<td>33/1</td>
<td>1.94</td>
<td>1.53</td>
<td>9.14</td>
</tr>
<tr>
<td>Empirical Site Studies</td>
<td>5.22</td>
<td>32/1</td>
<td>2.00</td>
<td>1.29</td>
<td>9.14</td>
</tr>
<tr>
<td>Derivative statistical analyses or statistical summaries</td>
<td>9.10</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Annual flux monitoring/modeling</td>
<td>6.76</td>
<td>24/1</td>
<td>2.62</td>
<td>1.63</td>
<td>11.90</td>
</tr>
<tr>
<td>Growing season and subgrowing season flux monitoring/modeling</td>
<td>1.49</td>
<td>9/0</td>
<td>0.47</td>
<td>0.56</td>
<td>2.42</td>
</tr>
<tr>
<td>1 year or less of observations or simulations</td>
<td>6.79</td>
<td>20/1</td>
<td>2.67</td>
<td>1.56</td>
<td>12.01</td>
</tr>
<tr>
<td>&gt;1 year of observations or simulations</td>
<td>3.76</td>
<td>21/0</td>
<td>1.75</td>
<td>0.32</td>
<td>7.19</td>
</tr>
<tr>
<td>Forested riparian buffers against cropland or pastureland counterfactuals</td>
<td>(6.61)</td>
<td>8/3</td>
<td>4.29</td>
<td>(15.01)</td>
<td>1.80</td>
</tr>
</tbody>
</table>

a) Negative emissions = removal from atmosphere and destruction in soils
b) Statistical summaries or derivative statistical analyses other than meta-analyses
c) 33 study results, 28 studies (1 derivative statistical analysis, 27 empirical site studies)
d) 4 studies report multiple results by buffer type (forested, mixed) or vegetation type
c. Methane

Depending on soil wetness, methane may be produced in soils and emitted to the atmosphere or may be taken up by soils and oxidized. Excess soil wetness in forested riparian soils favors the production of CH$_4$ by methanogenesis, although buffers are notoriously heterogeneous spatially. It is possible for one part of a buffer to maintain oxic conditions and take up and consume CH$_4$, while most of buffer is a net producer of CH$_4$.

Methane production or uptake in forested and multispecies buffers is calculated as the difference on 100,000 acres between estimated emissions from forested and multi-species riparian buffers and CH$_4$ uptake in temperate cropland, developed using the rates of uptake given in Aronson and Helliker (2010). In developing our estimate of emissions from forested buffers, we viewed 15 studies, nine of which reported forested riparian buffers to be net emitters of CH$_4$ to the atmosphere, while six reported CH$_4$ oxidation to dominate in forested and multispecies riparian buffers. Of the 15 studies, 14 were empirical site studies, and one a derivative statistical analysis.

We used the mean of the results taken from all 15 studies as the best available estimate of net CH$_4$ production in forested and multi-species buffers. Using this mean, forested riparian buffers are estimated to emit 28.16 kg CH$_4$ per hectare per year (25.12 lbs. CH$_4$ per acre) on an annual basis. As noted elsewhere, since most of the science on emissions and emissions-avoidance was developed in metric units, this estimate is given in kilograms per hectare and then converted to CO$_2$-equivalent short tons per acre for use in summary Table 27.

Care should be taken with these estimates, given the number of studies that report net CH$_4$ uptake in forested riparian buffers. In addition, CH$_4$ flux estimates from studies that report emissions on an annual basis are 65-fold lower than those that report on a shorter, growing season basis, although on the basis of very few observations. Many more empirical site studies may be needed for a better sense of the true size of net CH$_4$ emissions from forested and multi-species riparian buffers. With the use of a lower CH$_4$ emission rate for forested riparian buffers, or even net CH$_4$ uptake, the conversion of cropland to riparian forest buffer still results in large overall annual greenhouse gas emissions reductions, only more so.

The descriptive statistics for the 15 studies that were reviewed are shown in Table 30.

**Table 30. Descriptive statistics: Forested and multispecies riparian buffers - CH$_4$**

<table>
<thead>
<tr>
<th>Emissions (kg CH$_4$/hectare/yr)</th>
<th>Number of study results</th>
<th>Ratio, positive to negative results: study numbers</th>
<th>Standard error of mean (±)</th>
<th>Lower 95% confidence interval</th>
<th>Upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>28.16</td>
<td>15</td>
<td>9/6</td>
<td>18.13 (7.38)</td>
<td>63.69</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>30.19</td>
<td>14</td>
<td>9/5</td>
<td>19.35 (7.74)</td>
<td>68.12</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries</td>
<td>(0.28)</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>1.04</td>
<td>8</td>
<td>4/4</td>
<td>0.74 (0.42)</td>
<td>2.50</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>69.78</td>
<td>6</td>
<td>5/1</td>
<td>41.49 (11.54)</td>
<td>151.10</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>41.88</td>
<td>7</td>
<td>3/4</td>
<td>37.49 (31.60)</td>
<td>115.36</td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>15.81</td>
<td>8</td>
<td>7/1</td>
<td>11.65 (7.02)</td>
<td>38.65</td>
</tr>
</tbody>
</table>

*a negative emissions = removal from atmosphere and destruction in soils
*b statistical summaries or derivative statistical analyses other than meta-analyses
*c 15 study results, 15 studies
G. Winter cover crop/Catch crop

Winter cover crops or catch crops are crops, typically cereal rye, perennial rye grass, or winter wheat, that are planted to scavenge excess nitrate from cropland soils, thereby reducing the potential for nitrate leaching into groundwater and, through groundwater flows, to surface waters. Winter cover crops typically are sown after fall harvest of principal cropland cash crops like corn or soybeans, and are chemically or mechanically killed in early spring within a few weeks of the planting of the coming year’s cash crops. Typically, winter cover crops are unharvested; residues from winter cover crops either are incorporated into soil by plowing or are left on the surface to decompose.

Winter cover cropping can use leguminous-type cover crops like hairy vetch or Austrian pea or nonleguminous cereal grains like cereal rye. The residues from leguminous cover crops are rich in organic nitrogen. Leguminous cover crops often are planted as a source of nitrogen to the cash crop that in the spring follows cover crop termination. (Blanco-Canqui et al., 2015) With additional nitrogen from a biological source, agricultural producers can limit or wholly eliminate nitrogen-based mineral fertilizer applications to cropland.

Non-leguminous cover crops have deep, extensive rooting systems, which allows for efficient scavenging of excess nitrate from soils. Because of high carbon-to-nitrogen ratios in roots, non-leguminous cover crop residues are somewhat more resistant to decomposition than are leguminous cover crops, and, of the two cover crops types, produce the most biomass per acre planted. (Sainju et al., 2018).

By extending the period of active photosynthetic activity into the winter months, cover crops produce large amounts of organic carbon in crop residues that, when added to soils, lead to the accumulation of organic carbon in soils. While both leguminous and non-leguminous cover crops act to build soil carbon, of the two cover crop types, non-leguminous cover crops like cereal rye are more effective in this role. (Kuo et al., 1997; Sainju et al., 2018) Cereal rye is cold tolerant which, in a cool climate like that of Minnesota, is of importance.

In addition to nitrate scavenging and carbon sequestration, the use of winter cover crops acts to: improve soils structure, reduce water and wind erosion of soils, decrease soil compaction, suppress weeds, and increase biodiversity. (Blanco-Canqui et al., 2015; Poeplau et al., 2015) As of 2012, four percent of cropland in the US lake states (Minnesota, Wisconsin and Michigan) that was planted with corn was also cropped with cover crops. (Baranski et al., 2018)

In the US Midwest, most cover cropping uses nonleguminous cover crops, particularly cereal rye.

Table 31 shows the estimated net annual greenhouse gas balance from the use of cover crops on 100,000 acres of cropland. For each 100,000 acres of cropland in winter cover crops, an estimated 20,000 CO₂-equivalent short tons of GHGs are avoided annually. Of this, most derives from biogenic carbon sequestration in cover crop soils. Also important are reduced N₂O emissions from surface water and groundwater resulting from reduced leaching. Emissions of N₂O from cropped soils increase under cover crops, offsetting some of otherwise avoided-emissions through reduced nitrate leaching and soil carbon sequestration. About 95 percent of emissions-avoided are from in-state sources, and the remainder is from the avoided out-of-state manufacture of fertilizer, other agricultural chemicals and fuels.

As elsewhere in this report, in developing the estimates shown in Table 31, it was assumed that 20 years was the longest period of time over which sustained terrestrial carbon storage, once initiated, safely
could be assumed. Under this assumption, avoided-emissions are an estimated 20,000 CO₂-equivalent short tons, as noted above. Had a 40-year period of assured storage been assumed, avoided-emissions from the use of cover crops would have totaled 41,000 CO₂-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 101,000 CO₂-equivalent short tons (see Table 31). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II) of this report.

Table 31. Winter cover crops/Catch crops: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year) a</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>7,511</td>
<td>no cover crop</td>
</tr>
<tr>
<td>N₂O-indirect</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>not known</td>
<td>no cover crop</td>
</tr>
<tr>
<td>volatilization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N₂O-indirect</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(7,329)</td>
<td>no cover crop</td>
</tr>
<tr>
<td>leaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH₄ b</td>
<td>soils</td>
<td>131</td>
<td>no cover crop</td>
</tr>
<tr>
<td>CO₂ c,d</td>
<td>carbon accumulation in soils</td>
<td>(20,118)</td>
<td>no cover crop</td>
</tr>
<tr>
<td>CO₂</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>no cover crop</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossile fuel and electricity use in crop production</td>
<td>519</td>
<td>no cover crop</td>
</tr>
<tr>
<td>Out-of-State</td>
<td>upstream agricultural chemicals and fossil</td>
<td>(1,187)</td>
<td>no cover crop</td>
</tr>
<tr>
<td>Upstream GHGs</td>
<td>fuel production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(20,474)</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with leguminous cover crops-only:

| GHGS            | all sources and sinks                                     | (9,022)                                                  | no cover crop  |

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

| 40 year storage | all sources and sinks                                     | (40,592)                                                 | no cover crop  |
| 100 year storage| all sources and sinks                                     | (100,946)                                                | no cover crop  |

a positive = emissions increase, negative = emissions reduction
b a reduction in soil CH₄ oxidation = a relative increase in CH₄ emissions
c carbon accumulation in soils = a net removal of CO₂ from the atmosphere = net emission reduction
d assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass

An additional calculation was done specific to the use of leguminous cover crops, essentially to account for the emissions-avoided effects of less required usage of mineral nitrogen fertilizers. With leguminous winter cover crops, like hairy vetch, an estimated 9,000 CO₂-equivalent short tons of GHGs would be avoided annually on 100,000 acres. The use of leguminous winter cover crops acts to increase direct N₂O emissions from cropland soils, more than offsetting any emission reduction resulting from reduced use and manufacture of synthetic fertilizer.

A small number of published studies have estimated net GHG-avoidance under cover cropping. Estimates from these studies of net GHG-avoidance are shown below in Table 32. Taken together, these studies report an average annual rate of avoidance of 0.60 CO₂-equivalent short tons per acre (1.35 CO₂-equivalent metric tons per hectare).
Table 32. Published estimates of greenhouse gas-avoidance from cover crop use

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of study</th>
<th>CO₂-eq. short tons per acre per year</th>
<th>CO₂-eq. short tons per 100,000 acres per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gelfand and Robertson (2015)</td>
<td>site study</td>
<td>0.50</td>
<td>49,953</td>
</tr>
<tr>
<td>Robertson et al. (2000)</td>
<td>site study</td>
<td>0.23</td>
<td>22,747</td>
</tr>
<tr>
<td>DeGryze et al. (2010)</td>
<td>modeling study</td>
<td>0.60</td>
<td>59,840</td>
</tr>
<tr>
<td>DeGryze et al. (2011)</td>
<td>modeling study</td>
<td>0.53</td>
<td>53,465</td>
</tr>
<tr>
<td>Kaye and Quemada (2017)</td>
<td>literature review/expert judgment</td>
<td>0.67</td>
<td>67,125</td>
</tr>
<tr>
<td>Swan et al. (2015) b</td>
<td>literature review/expert judgment</td>
<td>0.41</td>
<td>40,778</td>
</tr>
<tr>
<td>Abdalla et al. (2019)</td>
<td>derivative statistical analysis</td>
<td>0.92</td>
<td>91,878</td>
</tr>
<tr>
<td>Eagle et al. (2012)</td>
<td>derivative statistical analysis</td>
<td>0.86</td>
<td>85,634</td>
</tr>
<tr>
<td>This report</td>
<td>literature review</td>
<td>0.20</td>
<td>20,474</td>
</tr>
</tbody>
</table>

a results as reported without adjustments
b partial difference, accounting for direct soils emissions and soil carbon sequestration-only

Terrestrial carbon sequestration resulting from the use of winter cover crops is discussed below, as are avoided direct emissions of N₂O and the effects of winter cover crop emissions on soil CH₄ oxidation. The methods and sources used to estimate avoided indirect N₂O emissions from nitrate leaching and ammonia volatilization, avoided emissions from fuel use, and avoided emissions from foregone agricultural chemicals and fuels manufacture were discussed above in Section II, Subsection E.

a. Carbon sequestration in soils

Carbon accumulates in soils as a result of reduced decomposition of soil organic matter or, with decomposition rates held constant, increased inputs of organic carbon to soils. Reduced soil erosion and reduced leaching of dissolved organic carbon also can contribute to increasing stocks of soil organic carbon. Through extensive root systems, cover crops add substantial amounts of soil organic matter to soils. Soil aggregate formation is enhanced by soil organic matter. (Blanco-Canqui et al., 2015; Ruis and Blanco-Canqui, 2017) Soil aggregates act to physically protect soil organic matter from bacterial decomposition. In addition, fungi and bacteria associated with cover crop rhizodeposits produce organic acids, like lactate and acetate, and other polymers, which act to bind organic matter to mineral surfaces, adding another, biochemical, layer of protection to soils. (Austin et al., 2017; Sainju et al., 2003)

By enhancing the physical and biochemical protection of soil organic matter from decomposition, cover crops act to length the residence time of carbon in soils, thereby increasing soil carbon stocks. (Wang et al., 2012)

In itself, the extra carbon input to soils from decomposing cover crop residues acts to increase soil organic carbon stocks. At a constant rate of decomposition, any increase in carbon inputs will result in an increase in soil carbon stocks. With cover crops, carbon is added to soils in the form of crop residues, mostly in the form of belowground roots and rhizodeposits. As noted above, of now available cover crops, cereal rye produces the most plant biomass, hence adds the most organic carbon back to soils.

The sequestration effects of cover crops are limited to the top two to eight inches (5 to 20 centimeters) of cropland soils. (Blanco-Canqui et al., 2011; Poepplau and Don, 2015) The potential for sequestration on global soils is an estimated 7.45 short tons of carbon per acre (16.7 metric tons per hectare) realizable over 155 years. (Poepplau and Don, 2015) Of this, about half, or 3.8 short tons per acre (8.5 metric tons per
per hectare) might be realizable in 23 years, or at an average annual rate of 0.17 short tons per acre (0.37 metric tons per hectare). Erosive losses of soil may be reduced by 50 percent by the introduction of cover crops. (Basche et al., 2016)

Due to the high spatial variability of soil organic carbon, it is often difficult to detect small changes in soil carbon. Because of this, it is thought that experiments lasting at least ten years may be necessary to determine whether and the degree to which the introduction of cover crops promotes carbon sequestration in cropland soils. (Mbuthia et al., 2015; Moore et al., 2013) Because of this, it is not uncommon for studies of short duration to be unable to detect cover crop effects on soil organic carbon. (Ruis and Blanco-Canqui, 2017) Meta-analysis and biogeochemical modeling have been suggested as alternative mean to understand long-term soil dynamics. (Poepplau and Don, 2015; Necpalova et al., 2018)

The estimates shown in Table 31 for winter cover crops on 100,000 acres were developed using meta-analysis estimates of average annual sequestration rates, discounted to account for an assumed 20-year persistence of newly sequestered organic carbon in soil. We reviewed 75 studies with 114 study results, including one meta-analysis, seven other derivative statistical summaries or analyses, 37 empirical site studies (67 study results), 19 modeling studies (25 study results), and eleven literature reviews or studies that report results developed on the basis of expert judgment (twelve study results). In certain instances, more than one observation was reported per study to accommodate multiple study results by type of tillage (conventional tillage, reduced tillage and no-till) and cover crop type (nonleguminous and leguminous). To derive maximum soil carbon benefits from cover cropping, cover cropping practice can be combined with less intrusive or no tillage. We track the results of cover cropping for different tillage practices with this consideration in mind.

Using the results from the meta-analysis, the introduction of cover crops to 100,000 acres of cropland would result in 20,000 CO$_2$-equivalent short tons of annual sequestration. As noted in the Methodology section of this report, formal meta-analysis is a powerful tool for aggregating estimates across study types with differing designs. Using the meta-analysis estimate, winter cover crops are estimated to annually sequester 0.32 metric tons of carbon per hectare (0.52 short tons of CO$_2$). This is the estimated rate prior to truncation to accommodate 20-year assumed persistence of carbon in cropland soils.

The descriptive statistics for the 75 studies that were reviewed are shown in Table 33. These are given in metric tons of carbon, but converted to short CO$_2$-equivalent tons for inclusion in the summary Table 31. The average of all studies reviewed (0.33 metric tons per hectare per year) is nearly identical to what is given in the Poepplau and Don (2015) meta-analysis. By study type, the estimates range from 0.19 to 0.46 metric tons per hectare per year (0.31 to 0.76 short tons of CO$_2$ per acre). Estimated annual sequestration from the 37 empirical site studies is some 0.36 ± 0.06 metric tons per hectare (0.59 ± 0.1 short tons of CO$_2$ per acre), or quite similar to the meta-analysis estimate. Excluding the estimates drawn from the modeling studies, the estimates cluster in a tight range of 0.32 to 0.46 metric tons of carbon per hectare per year.

Overall, in roughly nine out of ten study results, cropland soil accumulated organic carbon under cover crops. The rate was slightly lower in empirical site studies, 8.5 out of 10. In a marked difference to the results for many of the practices considered in this report, confidence internals for cover crops across study type were not excessive.
Contrary to conclusions drawn from the scientific literature, sequestration on hectares with leguminous cover crops was slightly higher than that for nonleguminous cover crops or a mix of legumes and nonleguminous cover crops. The differences were not substantial. Soil sampling depth did not play a role in the results; sequestration rates for soil depths of 4 to 12 inches (10 to 30 centimeters) and 16 inches (40 centimeters) and deeper were virtually identical. In the scientific literature, sequestration rates often are said to peak in the first decade after the change in practice, declining thereafter. (Necpalova et al., 2018) This is borne out by sequestration rates reported in Table 33 by decade after initiation of cover crop practices.

Differences in sequestration rates by tillage type are evident, which might suggest it might be possible to increase the effectiveness of cover crops in sequestering soil carbon by roughly 30 to 40 percent by simultaneously adopting less intensive tillage practices and cover cropping (see Table 33).

In total, the weight of the evidence supports a generally positive response rate of soil carbon sequestration under cover crops, with a best estimate, before truncation for 20-years of assumed storage, of 0.3 metric tons of carbon per hectare per year (0.13 short tons of carbon per acre per year).
b. Nitrous oxide

$\text{N}_2\text{O}$ is produced in cropland by nitrification and denitrification processes. $\text{N}_2\text{O}$ production is controlled by adequacy of nitrate and ammonium in soils, subject to other limitations imposed by soil temperature, soil wetness, texture, bulk density, and other factors. (Venterea et al., 2012) These factors often interact non-linearly, rendering broad generalizations somewhat problematical.

Having said that, cover crops impact $\text{N}_2\text{O}$ emissions during the cover crop period by scavenging nitrogen from soils and immobilizing it in plant biomass. This acts to reduce the abundance of nitrogen that is available in soils for nitrification or denitrification. (Baggs et al., 2000) Following termination, cover crop residues are usually incorporated in the soils, where rapid decomposition of residues acts to consume soil oxygen, creating anaerobic microsites for denitrification. $\text{N}_2\text{O}$ is produced in these anaerobic microsites by denitrifying bacteria. (Mitchell et al., 2013; Petersen et al., 2011; Sardokie-Addio et al., 2003) Large $\text{N}_2\text{O}$ emissions often follow cover crop termination and residue incorporation.

On an annual basis, these two processes are roughly equal in effect, leading to only small changes in $\text{N}_2\text{O}$ emissions after the introduction of winter cover crops. (Basche et al., 2014; Blanco-Canqui et al., 2015; Gillette et al., 2018; Guardia et al., 2016)

Due to higher nitrogen content of plant tissues, leguminous cover crops may be more emitting on an annual basis than nonleguminous cover crops like cereal rye. (Basche et al., 2014; Gomes et al., 2009)

In this study, avoided-emissions from the use of cover crops are calculated as the product of the estimated percentage change in emissions resulting from use of cover crops and average Minnesota cropland $\text{N}_2\text{O}$ emissions. Average Minnesota cropland $\text{N}_2\text{O}$ emissions are taken from the MPCA Greenhouse Gas Inventory. To estimate the percentage change in $\text{N}_2\text{O}$ emissions under cover crops we reviewed 34 studies with 57 study results across cover crop type and tillage practice. Of these, 24 studies (34 study results, again across cover crop type and tillage practice) were full-year studies, spanning cover crop and cash crop periods. Of the full-year studies, two were meta-analyses (2 study results), four were modeling studies (8 study results), 16 were empirical site studies (22 study results), and two were literature reviews or studies that report estimates on the basis of expert judgment (2 study results).

We used the mean estimate from the two meta-analyses as the best estimate of the percentage change in $\text{N}_2\text{O}$ emission with cover crops. Using the meta-analysis mean estimate, the use of winter cover crops is estimated to increase $\text{N}_2\text{O}$ emissions by 12 ± 1 percent, a relatively minor change. By study type, the estimate percentage change ranged from +12 to +81 percent. The mean value for all 24 full-year studies that were reviewed was +26 ± 8 percent, the same as for the 16 empirical site studies that were reviewed.

Of the 24 full-year studies that were reviewed, one-third reported emission reductions, while two-thirds reported increases. In the empirical site studies, half of all the studies reported emissions reductions, which is nearer the larger sense of the scientific literature that, once the results are averaged, the percentage change in $\text{N}_2\text{O}$ emissions will prove muted.

By cover crop type, the increase in full-year $\text{N}_2\text{O}$ emissions ranged from 8 percent, in the case of nonleguminous cover crops, to 39 percent for leguminous cover crops. In the US Midwest, most current cover cropping involves the use of nonleguminous cover crops, particularly cereal rye. In the studies, emissions under no-till tillage increased substantially more than did $\text{N}_2\text{O}$ emissions under conventional or reduced tillage, although on the basis of only a handful of observations for conventional and reduced
tillage. The measured increase in $\text{N}_2\text{O}$ emissions in empirical site studies with one to two years of results was more than double the more subdued rate suggested by the two meta-analyses. The percent increase in emissions in site studies with three years or more of results was less dramatic, but still about 15 percent.

The mean percentage change in the rate of $\text{N}_2\text{O}$ emissions from all cover crop studies was much larger than for those studies reporting results only on an annual basis, reflecting the large percentage increase in $\text{N}_2\text{O}$ emissions that often occurs during cover crop residue decomposition.

The descriptive statistics for the studies that were reviewed are shown in Table 34.

The general sense of the analysis presented here, and of the large scientific literature, is that the effects of cover crops on $\text{N}_2\text{O}$ soil emissions are likely to be muted. Best available evidence suggests a slight increase in emissions from the introduction of this practice.

Table 34. Descriptive statistics: Winter cover crops/Catch crops - $\text{N}_2\text{O}$

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of study results</th>
<th>change in emissions, ratio positive-to-negative: numbers of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>full crop studies: a,b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>meta-analyses</td>
<td>12%</td>
<td>2</td>
<td>2/0</td>
<td>1%</td>
<td>9%</td>
<td>14%</td>
</tr>
<tr>
<td>all studies</td>
<td>26%</td>
<td>34</td>
<td>23/11</td>
<td>8%</td>
<td>10%</td>
<td>42%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>27%</td>
<td>22</td>
<td>11/11</td>
<td>11%</td>
<td>5%</td>
<td>49%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>14%</td>
<td>8</td>
<td>5/0</td>
<td>6%</td>
<td>1%</td>
<td>26%</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>81%</td>
<td>2</td>
<td>2/0</td>
<td>44%</td>
<td>-6%</td>
<td>168%</td>
</tr>
<tr>
<td>nonleguminous cover crop</td>
<td>8%</td>
<td>16</td>
<td>9/7</td>
<td>8%</td>
<td>-8%</td>
<td>23%</td>
</tr>
<tr>
<td>leguminous and mixed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>leguminous/nonleguminous cover crop</td>
<td>39%</td>
<td>16</td>
<td>15/4</td>
<td>13%</td>
<td>14%</td>
<td>64%</td>
</tr>
<tr>
<td>no-till tillage</td>
<td>46%</td>
<td>11</td>
<td>9/2</td>
<td>18%</td>
<td>11%</td>
<td>82%</td>
</tr>
<tr>
<td>reduced tillage</td>
<td>25%</td>
<td>4</td>
<td>1/3</td>
<td>31%</td>
<td>-36%</td>
<td>86%</td>
</tr>
<tr>
<td>conventional tillage</td>
<td>5%</td>
<td>4</td>
<td>3/1</td>
<td>3%</td>
<td>-1%</td>
<td>11%</td>
</tr>
<tr>
<td>1-2 years of observations or simulations</td>
<td>36%</td>
<td>12</td>
<td>7/5</td>
<td>12%</td>
<td>11%</td>
<td>60%</td>
</tr>
<tr>
<td>3 years or more of observations or simulations</td>
<td>15%</td>
<td>18</td>
<td>12/6</td>
<td>11%</td>
<td>-7%</td>
<td>38%</td>
</tr>
<tr>
<td>partial and full crop-year studies:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>meta-analyses</td>
<td>76%</td>
<td>9</td>
<td>8/1</td>
<td>54%</td>
<td>-31%</td>
<td>183%</td>
</tr>
<tr>
<td>all studies</td>
<td>37%</td>
<td>57</td>
<td>42/15</td>
<td>10%</td>
<td>17%</td>
<td>58%</td>
</tr>
</tbody>
</table>

a 34 study results, 24 studies (2 meta-analysis, 4 modeling studies, 16 empirical site studies, 2 expert reviews)
b 3 studies report multiple results by cover crop type (leguminous, nonleguminous), crop cover treatment (residues incorporated, nonincorporated), and/or tillage (no-till, reduced tillage, conventional tillage)

c. Methane

The estimated change in methane soil oxidation resulting from the use of winter cover crops on 100,000 acres is miniscule, 131 CO$_2$-equivalent tons annually. The calculation of net greenhouse gas-avoidance from the use of winter cover crops is largely unaffected by changes in CH$_4$ emission from or oxidation in soils.

Methane is oxidized in soils by methanotrophic bacteria and is produced in cropland soils in anaerobic microsites by methanogenic bacteria. The balance between the two processes determines whether CH$_4$
is emitted from soils on a net basis or is consumed and whether a change in CH₄ from cropland, described in terms of CH₄ oxidation, enhances or reduces CH₄ oxidation.

In evaluating the effect of winter cover crops on CH₄ soil oxidation, we reviewed seven studies with 13 discrete observations, including five empirical site studies (eight study results) and one modelling study (four study results). Using the average value from all 13 studies, we estimate that the use of winter cover crops will reduce CH₄ soil oxidation by 6 percent, which applied on 100,00 acres, results in the reported 131 CO₂-equivalent tons of reduction in cropland CH₄ soil oxidation. As noted above, in some cases, more than one observation was reported per study to accommodate results developed for specific important parameters, in the case of cover crops, multiple types of tillage (conventional tillage, reduced tillage and no till practice) and two cover crop types (nonleguminous and leguminous).

Care should be taken with this estimate. Of the 13 studies, 40 percent favor an increase in CH₄ soil oxidation with cover cropping, 60 percent a reduction, so the studies as a group are largely inconclusive as to the direction of the change. The 95 percent confidence intervals for this estimate are broad and bracket a set of outcomes ranging from a 26 percent increase in CH₄ soil oxidation to a 39 percent decrease.

The descriptive statistics for the studies that were reviewed are shown in Table 35, including standard errors and 95 percent confidence intervals.

### H. No-till tillage

In conventional tillage, cropland soils are disturbed by mixing and overturning. In its most extreme form, full inversion tillage using a moldboard plow, soil is inverted and mixed down to 8 inches (20 centimeters) or even deeper. By contrast, with no-till, cropland soils go completely untilled, as the name implies. Seeding is done through direct drilling. Weeds are controlled with herbicides. Crop residues are left on the soil surface to decompose.

**Table 35. Descriptive statistics: Winter cover crops/Catch crops - CH₄**

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Change in Oxidation</th>
<th>Number of Study Results</th>
<th>Change in Oxidation, Ratio Positive-to-Negative</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Crop Studies: a,b</td>
<td>-6%</td>
<td>13</td>
<td>5/8</td>
<td>17%</td>
<td>-39%</td>
<td>26%</td>
</tr>
<tr>
<td>All Studies</td>
<td>-6%</td>
<td>8</td>
<td>3/5</td>
<td>28%</td>
<td>-60%</td>
<td>49%</td>
</tr>
<tr>
<td>Empirical Site Studies</td>
<td>-10%</td>
<td>4</td>
<td>2/2</td>
<td>7%</td>
<td>-24%</td>
<td>5%</td>
</tr>
<tr>
<td>Modeling Studies</td>
<td>-38%</td>
<td>6</td>
<td>4/2</td>
<td>20%</td>
<td>-8%</td>
<td>69%</td>
</tr>
<tr>
<td>Legume Cover Crop</td>
<td>31%</td>
<td>7</td>
<td>1/6</td>
<td>20%</td>
<td>-77%</td>
<td>1%</td>
</tr>
<tr>
<td>Nonleguminous Cover Crop</td>
<td>-38%</td>
<td>7</td>
<td>3/4</td>
<td>22%</td>
<td>-67%</td>
<td>20%</td>
</tr>
<tr>
<td>1 Year of Observations or Simulations</td>
<td>16%</td>
<td>5</td>
<td>2/3</td>
<td>30%</td>
<td>-43%</td>
<td>76%</td>
</tr>
<tr>
<td>Partial and Full Crop-Year Studies</td>
<td>-9%</td>
<td>7</td>
<td>3/4</td>
<td>16%</td>
<td>-40%</td>
<td>22%</td>
</tr>
</tbody>
</table>

a 13 study results, 7 studies (1 modeling study, 5 empirical site studies, 1 expert review)
b 2 studies report multiple results by cover crop type (leguminous, nonleguminous), crop cover treatment (residues incorporated, nonincorporated), and/or tillage (no-till, reduced tillage, conventional tillage)
In Minnesota, relatively little cropland is in no-till cultivation, six percent according to the last available survey. (US Department of Agriculture, 2019). As of 2016, ten percent of all cropland in the US lake states (Minnesota, Wisconsin and Michigan) was in continuous no-till practice and another 13 percent in occasional no-till. (Baranski et al., 2018)

Tillage acts to disrupt soil structure by breaking apart soil aggregates, removing physical and biochemical protections against the microbial decomposition of organic carbon. Physical disruptions to soils are avoided under no-till, allowing soils that under conventional tillage had become carbon-depleted, to reaccumulate carbon. Accumulating soil carbon is carbon that, having been photosynthetically removed from the atmosphere and incorporated into plant biomass, is introduced to soils through root-turnover and rhizodeposits and stabilized there.

No-till may or may not increase soil N₂O emissions. The best available information supports a small increase in emissions, although this is subject to large uncertainties. With fewer field operations, fuel use is reduced under no-till practice, reducing emissions of CO₂ from fossil fuel use in crop production.

A budget of avoided greenhouse gas emissions from no-till cultivation is given in Table 36. For each 100,000 acres of cropland converted from full inversion tillage to no-till practice, an estimated 14,000 CO₂-equivalent short tons of emissions are avoided. All of this, plus some, is accounted for by enhanced soil organic carbon sequestration in soils. Increased soil emissions of N₂O act to offset about one-quarter of the sequestration effects. About 95 percent of emissions-avoided are from in-state sources, with the remainder from the avoided out-of-state manufacture of fertilizer, other agricultural chemicals and fuels.

In quantifying avoided-emissions, we assumed that carbon stored in soils would remain there for 20 years, followed by microbial decomposition and emission to the atmosphere as CO₂. This is the longest period over which, in our opinion, sustained storage safely can be assumed. Under this assumption, avoided-emissions are estimated 14,000 CO₂-equivalent short tons. Had a 40-year period of assured storage been assumed, avoided-emissions from the use of no-till practice would have totaled 28,000 CO₂-equivalent short tons. Had 100-years of assured storage been assumed, avoided-emissions would have totaled 72,000 CO₂-equivalent short tons (see Table 36).

The amount of time in storage determines the degree to which, for any particular project, sequestered carbon offsets CO₂ emissions from fossil fuel combustion elsewhere in the economy. This determines the present-day offset value of sequestration. The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II) of this report.

The published literature contains a number of studies of the integrated effect of no-till practice across all greenhouse gases and all emissions sources. The results of these, shown in Table 37, all support a positive emissions effect of conventional tillage to no-till conversions, with reductions per 100,000 acres of conversions ranging 18,000 to 121,000 CO₂-equivalent short tons.
Table 36. No-till tillage: Emissions-avoided *

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO\textsubscript{2}-e, short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N\textsubscript{2}O-direct</td>
<td>soils</td>
<td>3,815</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>N\textsubscript{2}O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>553</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>N\textsubscript{2}O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>-</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>CH\textsubscript{4}</td>
<td>soils</td>
<td>(283)</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>CO\textsubscript{2}</td>
<td>carbon accumulation in soils</td>
<td>(14,589)</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>CO\textsubscript{2}</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(2,704)</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(599)</td>
<td>conventional tillage</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(13,807)</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils

| 40 year storage | all sources and sinks | (28,396) | conventional tillage |
| 100 year storage | all sources and sinks | (72,162) | conventional tillage |

* conventional tillage counterfactual
\( b \) positive = emissions increase, negative = emissions reduction
\( c \) increase in soil CH\textsubscript{4} oxidation = relative decrease in emissions
\( d \) carbon accumulation in soil and biomass = net removal of CO\textsubscript{2} from the atmosphere = net emission reduction
\( e \) assumes 20 years of sustained storage of newly sequestered organic carbon in soils

Biogenic carbon sequestration from the use of no-till on cropland soils is discussed below, as are avoided direct emissions of N\textsubscript{2}O from soils and the effects of no-till on soil CH\textsubscript{4} oxidation. The methods and sources used to estimate avoided indirect N\textsubscript{2}O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed above in Section II, Subsection E.

a. Carbon sequestration in soils

No-till is a crop production practice in which cropland soils are untilled. This acts to restore to soils some of the physical and chemical protections against the decomposition of soil organic matter that is lost when soil undergoes intensive tillage.

In an undisturbed soil, biogenic carbon is deposited in the soil profile through the growth and decay of plant roots and rhizodeposition in the form of sloughed-off plant cells or root exudates. Some biogenic carbon is also deposited into deep soil layers in the form of leached dissolved organic carbon. In undisturbed soils, organic carbon is physically protected from decomposition by soil bacteria by soil macroaggregates, mostly in soil pores that, due to small size, are inaccessible to bacteria and fungi (or water-soluble enzymes) or too anaerobic for aerobic soil bacteria. (Jones and Donnelly, 2004) Most protected or ‘stabilized’ soil organic carbon is found occluded in these sites, bound by polysaccharides produced by fungi during the decomposition of crop residue. (Govaerts \textit{et al.}, 2009; Kane, 2015) Soil carbon is also chemically protected by clay and silt particles, which bind to soil organic matter, and, in
the very long-term, by various metals and mineral anions and cations which biochemically bind to organic matter to form organomineral complexes. (Balesdent et al., 1990; Hassink et al., 1997; von Lutzow et al., 2006) Once adsorbed on to mineral surfaces, organic matter is highly recalcitrant and remains resident in the soil profile for hundreds to thousands of years.

Table 37. Published studies of the integrated impacts of no-till practice on greenhouse gases from all sources of emissions-avoidance a

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of study</th>
<th>emissions-avoided CO₂-equivalent short tons per acre per year</th>
<th>emissions-avoided CO₂-equivalent short tons per 100,000 acres per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archer and Halvorson (2010)</td>
<td>site study</td>
<td>0.89</td>
<td>88,711</td>
</tr>
<tr>
<td>Gelford and Robertson (2015)</td>
<td>site study</td>
<td>0.51</td>
<td>51,291</td>
</tr>
<tr>
<td>Krauss et al. (2017)</td>
<td>site study</td>
<td>0.79</td>
<td>78,632</td>
</tr>
<tr>
<td>Mosier et al. (2005)</td>
<td>site study</td>
<td>0.71</td>
<td>71,495</td>
</tr>
<tr>
<td>Mosier et al. (2006)</td>
<td>site study</td>
<td>1.21</td>
<td>120,958</td>
</tr>
<tr>
<td>Robertson et al. (2000)</td>
<td>site study</td>
<td>0.45</td>
<td>44,601</td>
</tr>
<tr>
<td>Sainju et al. (2014)</td>
<td>site study</td>
<td>0.18</td>
<td>17,796</td>
</tr>
<tr>
<td>Tellez et al. (2017)</td>
<td>site study</td>
<td>0.64</td>
<td>63,811</td>
</tr>
<tr>
<td>Del Grosso et al. (2005)</td>
<td>modeling study</td>
<td>0.78</td>
<td>78,052</td>
</tr>
<tr>
<td>Grant et al. (2004)</td>
<td>modeling study</td>
<td>0.27</td>
<td>27,207</td>
</tr>
<tr>
<td>Eagle et al. (2012)</td>
<td>other derivative statistical analysis c</td>
<td>0.66</td>
<td>65,563</td>
</tr>
<tr>
<td>Six et al. (2004)</td>
<td>other derivative statistical analysis c</td>
<td>0.31</td>
<td>30,772</td>
</tr>
<tr>
<td>Swan et al. (2015) b</td>
<td>literature review/expert judgment</td>
<td>0.34</td>
<td>34,166</td>
</tr>
<tr>
<td>Sainju et al. (2016)</td>
<td>meta-analysis</td>
<td>0.69</td>
<td>69,265</td>
</tr>
<tr>
<td>This report</td>
<td>literature review</td>
<td>0.14</td>
<td>13,807</td>
</tr>
</tbody>
</table>

a results as reported without adjustments
b change in soil N₂O and soil organic carbon only
c other than formal meta-analysis

Intensive tillage acts to disrupt soil structure, breaking up protective soil macroaggregates and exposing soil organic carbon to microbial decomposition. (Six et al., 1999; Six et al., 2002a) Tillage accelerates soil macroaggregate turnover, shortening macroaggregate lifetime, and limiting the number of microaggregates that, over that shortened lifetime, can form within macroaggregates. (Denef et al., 2004; Six et al., 2002a) Unprotected organic matter is subject to rapid oxidation in intensively tilled soils, which are more highly aerated than untilled soils, creating the necessary aerobic conditions for rapid microbial decomposition of soil organic matter that, with intensive tillage, is unprotected.

In addition, in intensive tillage crop residues also are incorporated into the plow layer of soils, 6 to 10 inches deep (15 to 25 centimeters), which brings organic matter in residues more fully into contact with decomposing bacteria. (Alvaro-Fuentes et al., 2008) Intensively tilled soils are warmer, which additionally promotes microbial decomposition of soil organic matter. Tilled soils are less compacted, allowing for rapid diffusion of trapped CO₂, the principal gaseous product of microbial decomposition, to the atmosphere. Intensively tilled soils also are more prone to soil losses through wind and water erosion. Once removed from cropland, eroded sediments may enter inland surface waters, where some soil carbon may be mineralized and emitted to the atmosphere as CO₂. Inland waters are known be to larger emitters of CO₂. (Butman et al., 2016)

No-till practice reverses the processes of soil degradation, slowly building carbon in soils through renewed physical and biochemical protection of soil organic matter. (Balesdent et al., 2000) This returns
soils to a condition somewhat analogous to that of undisturbed soil. In no-till soils, soil organic carbon is increased by reducing the respiratory loss of carbon from soils, all the while holding constant the input of organic carbon to soils in the form of roots, rhizodeposits and aboveground crop residues. (Ogle et al., 2005)

Observationally, no-till soils lose much less CO\textsubscript{2} to the atmosphere in the form of emissions than intensive tillage (21 percent), and have much lower mineralization rates for organic carbon (35 to 45 percent less). (Abdalla et al., 2016; Clay et al., 2015) Again, observationally speaking, the mean residence time of organic carbon in no-till soils is about 15 percent longer than in intensively tilled soils. (Ogle et al., 2012) The conversion from intensive tillage to no-till practice is associated with enhanced aggregate stability. (Jastrow et al., 1996) Meta-analyses of data from published site studies are uniform, or nearly so, in their conclusion that, while there is substantial variability in the estimates, no-till stores more organic carbon in soils than do the more intensive forms of tillage. (Angers and Eriksen-Hamel, 2008; Bai et al., 2018; Congreves et al., 2014; Du et al., 2017; Luo et al., 2010; Ogle et al., 2005; Ogle et al., 2010; Puget and Lal, 2005; Six et al., 2002a; Virto et al., 2012; West and Post, 2002)

Soils under no-till practice have a finite carbon storage capacity. No-till soils cease to accumulate carbon once the surfaces of clay and silt particles become saturated and the pool of protected soil aggregates is at a maximum, usually within 25 to 30 years of no-till initiation. (Alvarez et al., 2005; Marland et al., 2004; West and Six, 2007) Carbon sequestration in no-till soils is slow initially and, in the initial decade following conversion to no-till practice from conventional tillage, is difficult to detect. (Al-Kaisi et al., 2005) Soil carbon sequestration generally peaks 10 to 20 years after no-till practice is begun, falling off linearly thereafter until long-term equilibrium is reached. (West and Post, 2002)

There are a large number of controls on carbon sequestration in no-till soils, including: crop rotation, climate, soil fertility, nutrient and water management, soil clay and silt fractions, and the degree of SOC depletion and nearness of soils to saturation. Soils that are highly depleted with respect to SOC and are further from saturation are able to store large amounts of soil carbon for extended periods of time. (Stewart et al., 2009) Soils high in clay content are more capable of organic carbon storage that soils low in clay content. The amount of crop residue that is returned to soils is controlled by crop rotation, soil fertility, and management practices. Crop rotations and management practices that produce large amounts of crop residue generally have higher levels of SOC under no-till practice than do rotations and practices with minimal crop residue return to soils.

This is especially true of deep-rooted crops like corn, which deliver organic carbon in the form of dead roots and rhizodeposits deep into the subsoil. By rotation, continuous corn under no-till sequesters substantially more carbon that do soybeans or corn and soybeans in rotation. (Cambardella et al., 2012)

In general, no-till soils in humid temperate climates tend to sequester more organic carbon than no-till soils in semi-arid temperate climates, mainly due to constraints on crop productivity and residue inputs to soils. (Ogle et al., 2005) Soils in humid, cool climates with short growing seasons and fine textured, poorly drained soils tend to respond poorly to no-till, probably due to otherwise slow rates of soil organic matter decomposition and climate-imposed constraints to plant growth and residue return to soils. (Yang and Wander, 1999; Ogle et al., 2012)

Finally, besides increasing total soil organic carbon mass, no-till practice also acts to redistribute SOC throughout the soil column, concentrating it near the surface. (Shi et al., 2012) At some sites, this has been accompanied by a decrease in soil organic carbon mass in soil near the bottom of the plow layer, resulting in no net change in SOC from the conversion to no-till. (Anger et al., 1995; Yang et al., 2008)
Greenhouse gas reduction potential of agricultural best management practices

This is not the general rule; as noted above, most statistical analyses of data from the published literature support an overall positive response rate of SOC to no-till practice.

As discussed in the section on Methodology (see Section II above), the methods used to sample and analyze changes in soil carbon under different management practices, including changed tillage, continue to evolve and improve. In most early studies, soil carbon usually was not measured at the start of the experiments, but rather, in the analysis of management-induced changes in SOC, it was assumed to have been identical across all plots used to measure the response of soils to different practices, including the control plots. This may have affected the reported results, though whether any significant bias might have been involved is not evident. Most soil sampling of no-till soils excludes surface residues, which have been estimated at 1 metric ton of carbon per hectare (1.6 short CO₂-equivalent tons). (Paustian et al., 1997) By contrast, crop residue carbon is implicitly included in the measurement of SOC under more intensive forms of tillage, as incorporated residues. This may act to bias low estimates of the response of SOC to no-till. Methods for evaluating changes of soil carbon that measure carbon across a fixed depth may, due to changes in bulk density with changed tillage practice, overestimate the effectiveness of no-till in sequestering carbon. (Du et al., 2017) Sampling of carbon deep in the soil column is inherently difficult due to the large variability of soil carbon at these levels. (Kravchenko et al., 2011) At this time, no objective analysis has addressed the relative effects of these difficulties or omissions on estimates of sequestration drawn from the literature.

A number of studies have examined the effect on soil organic carbon of an occasional year of full inversion tillage interspersed in a general no-till regimen. Empirical site studies have found limited or no effect on soil carbon. (Yang et al., 2008; Wortman et al., 2010; Dimassi et al., 2013) In a modeling study, Conant et al. (2007) found substantial impacts of periodic tillage on SOC on a 100-year time frame.

In Table 36, we estimate that conversion to no-till from conventional tillage on 100,000 acres would result in 15,000 CO₂-equivalent short tons (4,000 short tons of carbon) of sequestration. The results shown in Table 36 were developed using sequestration estimates for conventional tillage to no-till conversion from seven meta-analyses, discounted for an assumed 20-year persistence of storage. A simple arithmetic average of the meta-analyses results was employed, resulting in an estimated average annual rate of soil carbon sequestration of 0.23 ± 0.06 metric tons of carbon per hectare (0.38 ± 0.1 CO₂-equivalent short tons). Meta-analysis is a powerful statistical tool for aggregating estimates across studies with different designs. The estimate just given – 0.23 metric tons per hectare – is the estimated annual rate of sequestration prior to truncation to accommodate an assumed 20-year persistence of newly stored organic carbon in soils.

Overall, 117 studies of no-till were reviewed with 122 reported study results. The average annual rate of soil carbon sequestration from the seven meta-analyses is in fairly good agreement with the estimate developed for other study types. We reviewed eight statistical summaries or derivative analyses other than formal meta-analyses, 19 modeling studies, 69 empirical site studies, and 11 literature reviews or studies that develop analyses based on expert judgment. Using a simple arithmetic average, sequestration rates for the conversion of conventional tillage to no-till practice were, for other derivative statistical analyses or summaries, modeling studies, empirical site studies and literature reviews, 0.27 ± 0.06, 0.20 ± 0.06, 0.41 ± 0.08 and 0.29 ± 0.03 metric tons of carbon per hectare per year, respectively.

The descriptive statistics for all the studies that were reviewed are shown in Table 38 by study type, sampling depth, and study duration. Conventional tillage, the counterfactual in these studies is usually
full inversion tillage using the moldboard plow or its equivalent, although in some instances no description beyond ‘conventional tillage’ was provided in the studies. Since much or most of the science of terrestrial carbon sequestration is developed in metric units, the values given in Table 38 are in metric tons of carbon per hectare, and subsequently are converted to CO\textsubscript{2}-equivalent short tons for use in summary Table 36.

Table 38. Descriptive statistics: No-till tillage–carbon sequestration in soils a

<table>
<thead>
<tr>
<th>Description</th>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of study results d,e</th>
<th>ratio of sequestration to emission: number of study results f</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>0.23</td>
<td>7</td>
<td>0.06</td>
<td>0.11</td>
<td>0.35</td>
<td>0.39</td>
</tr>
<tr>
<td>other derivative statistical analyses or statistical summaries</td>
<td>0.27</td>
<td>8</td>
<td>0.06</td>
<td>0.15</td>
<td>0.36</td>
<td>0.56</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>0.41</td>
<td>76</td>
<td>0.08</td>
<td>0.25</td>
<td>0.56</td>
<td>0.66</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.20</td>
<td>20</td>
<td>0.06</td>
<td>0.08</td>
<td>0.32</td>
<td>0.37</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>0.29</td>
<td>11</td>
<td>0.03</td>
<td>0.23</td>
<td>0.39</td>
<td>0.45</td>
</tr>
<tr>
<td>40 cm-plus soil sampling/modeling depth b</td>
<td>0.35</td>
<td>39</td>
<td>0.11</td>
<td>0.14</td>
<td>0.57</td>
<td>0.66</td>
</tr>
<tr>
<td>10 to 30 cm soil sampling/modeling depth b</td>
<td>0.34</td>
<td>65</td>
<td>0.07</td>
<td>0.21</td>
<td>0.48</td>
<td>0.57</td>
</tr>
<tr>
<td>10 to 20 year annual sequestration rate</td>
<td>0.32</td>
<td>60</td>
<td>0.07</td>
<td>0.19</td>
<td>0.45</td>
<td>0.57</td>
</tr>
<tr>
<td>20 to 30 year annual sequestration rate</td>
<td>0.24</td>
<td>24</td>
<td>0.06</td>
<td>0.12</td>
<td>0.35</td>
<td>0.45</td>
</tr>
<tr>
<td>0 to 10 year annual sequestration rate</td>
<td>0.49</td>
<td>26</td>
<td>0.17</td>
<td>0.15</td>
<td>0.83</td>
<td>0.94</td>
</tr>
<tr>
<td>No-till with cover crop</td>
<td>0.40</td>
<td>9</td>
<td>0.10</td>
<td>0.21</td>
<td>0.60</td>
<td>0.71</td>
</tr>
<tr>
<td>no-till on former conventional till/reduced till acres: meta-analyses c</td>
<td>0.24</td>
<td>8</td>
<td>0.05</td>
<td>0.14</td>
<td>0.35</td>
<td>0.40</td>
</tr>
</tbody>
</table>

a conventional tillage counterfactual
b results for lowest reported sampling depth
c counterfactual either conventional tillage or undifferentiated between conventional tillage and reduced till
d,e 122 study results, 117 studies (7 meta-analyses, 8 statistical summaries or other derivative statistical analyses, 19 modeling studies, 3 IPCC-inventory studies, 69 empirical site studies, 11 expert reviews)

As noted above, results from the different study types are generally supportive of the mean estimate drawn from the seven meta-analyses, although estimates from the empirical site studies might support a higher value. Soil sampling depth does not appear to be a factor. Thirty-six studies with sampling depths at or below 16 inches (40 centimeters) were reviewed. These yielded average annual sequestration rates, averaged across the 36 studies, of 0.35 metric tons of carbon (0.58 CO\textsubscript{2}-equivalent short tons), or the same as the mean rate for studies with sampling depths of 4 to 12 inches (10 to 30 centimeters).

Seven studies reported multiple results by cover crop treatment, which we track due to the importance increasingly accorded cover-cropping practice in tillage analysis in the scientific literature. (Dimassi et al., 2014; Mbuthia et al., 2015; Olson et al., 2014) These studies yielded sequestration rates slightly higher than the mean estimate for the seven meta-analyses, but based on only a handful of studies.

Consistent with what was noted above about site-to-site variability of results, about 20 percent of the site studies that were reviewed reported SOC losses with no-till. As others have noted, no-till does not always sequester carbon in soils. (Minasny et al., 2017; Ogle et al., 2012) About half of these were studies of soils from eastern Canada. This 20 percent also included three Minnesota-based studies, but with the thinness of the sample, with uncertain implications. In a statistical analysis using published data
from Minnesota sites, supplemented by data from sites from other Upper Midwest states and eastern Canadian, Anderson et al. (2008) and Fissore et al. (2010) suggest 0.25 and 0.1 metric tons per hectare per year, respectively, as a likely rate of sequestration for no-till conversion in Minnesota.

Overall, five empirical site studies have been conducted on Minnesota soils, along with one modeling study and two statistical analyses with a mix of Minnesota and other Upper Midwest and Canadian soils. (Almaras et al., 2004; Anderson et al., 2008; Clapp et al., 2000; Dolan et al., 2006; Fissore et al., 2010; Huggins et al., 2007; Kwon et al., 2013; Venterea et al., 2006)

In total, the weight of the evidence points to a positive response rate for sequestration from no-till, before truncation for 20-years of assumed storage, in the range of 0.2 to 0.4 metric tons of carbon per hectare per year (0.09 to 0.18 short tons of carbon per acre per year).

b. Nitrous oxide

Nitrous oxide is produced in cropland soils primarily through microbial activity during nitrification and denitrification. Ammonium (NH$_4^+$) and nitrate (NO$_3^-$) abundance is the primary control on the production and emissions of N$_2$O from cropland, modulated by soil physical and chemical properties, including structure and porosity, soil bulk density, SOC content, soil texture and pH, soil temperature, and water-filled pore space, along with weather. Soil management practices also play a role, particularly with respect to the timing of specific management practices like irrigation or crop residue incorporation. Synthetic nitrogen fertilizer is the principal source of NH$_4^+$ and NO$_3^-$ in soils, along with organic forms of nitrogen like soil organic nitrogen and crop residue nitrogen.

Tillage affects the physical properties of soils, thereby influencing the production of N$_2$O in soils. No-till soils are often wetter with higher bulk densities and greater concentrations of residues at the soil surface, leading in at least some soils and some experiments, to the formation of anaerobic soil conditions. (Regina and Alukku, 2010; Gregorich et al., 2008) The formation of anaerobic conditions acts to stimulate N$_2$O production through denitrification. Generally, denitrification is the dominant source of N$_2$O in soils prone to anaerobic conditions through excessive wetness. Measured against water filled pore space (WFPS), a measure of soil wetness, denitrification is the dominant source of N$_2$O once WFPS passes 60 to 65 percent. (Liu et al., 2007; Metivier et al., 2009) Rates of N$_2$O formation through denitrification generally increase exponentially as soil water filled pore space increases beyond 60 percent. (David et al., 2009) Maximum N$_2$O production in soils typically occurs at water filled pore space of somewhere between 60 and 85 percent, which also generally coincides with soil wetness at which N$_2$O production is mostly or entirely through denitrification. (Almaraz et al., 2009; Davidson et al., 1991; Liu et al., 2007)

Multiple effects of no-till on N$_2$O emissions have been observed, often moving in opposing directions. (Venterea and Stanenas, 2008) For instance, no-till soils are often cooler than tilled soils, due to the presence of surface residues. This acts to depress the rate of microbial activity in the soil, leading to rates of N$_2$O production lower than they would be otherwise with warmer soils. (Liu et al., 2005) With less aeration and reduced soil temperature, mineralization rates in no-till topsoils also are lower than in soils under conventional tillage, reducing the supply of nitrate available for denitrification, and presumably N$_2$O production. (Bayer et al., 2015; Venterea and Stanenas, 2008) In the long-term, no-till practice should act to increase the rate of formation of soil aggregates, leading potentially to enhanced soil porosity, and increased, rather than reduced, soil aeration. (Plaza-Bonilla et al., 2014; Six et al., 2004)
Much effort has been directed to verifying the long-term effect of no-till practice on N₂O through enhanced soil aggregate formation. All other things equal, with enhanced aggregate formation and enhanced soil aeration, anaerobic conditions are less likely to form in no-till soils, reducing rather than increasing denitrification rates, and presumably N₂O production. (van Kessel et al., 2013) Of four statistical analyses of results from the published literature that address this question (three formal meta-analyses, one other derivative statistical analysis), three have found reduced N₂O emissions from soils in no-till practice for longer than ten to twenty years, suggesting that such an effect may be operative, albeit in the out-years of our 20-year window. (Huang et al., 2018; Mei et al., 2018; Six et al., 2004; van Kessel et al., 2013)

A reading of the scientific literature indicates that no-till practice on fine-textured soils, like clay, tends to increase N₂O emissions. (Ball et al., 2014; Perego et al., 2016) On medium and coarse textured soils, like silt loam or sand, the reported effects of no-till are ambiguous, showing both increases, decreases or little change. (Mei et al., 2018; Rochette et al., 2008a; Rochette et al., 2008b)

Fluxes of nitrous oxide from cropland are highly variable both spatially and temporally. Due to the large number of controls on N₂O production in soils and its emission, a wide variety of results are possible and often occur at different sites or at the same site under different meteorological conditions. The interactions between the controls on N₂O emissions from tillage change are complex. Simple relationships between, on the one hand, N₂O emissions and, on the other hand, environmental conditions and the specifics of different agricultural practices have yet to be developed or revealed. Regarding the experimental data, it is extremely noisy and, depending on the data considered, can and often does yield contradictory results, whether for tillage or other agricultural practices. Because of this, to extract from the experimental data a firm understanding of the direction of the likely effect of no-till practices on N₂O emissions, and its magnitude, a very large data set is necessary, one now probably beyond our grasp.

The best that now might be done is to develop a sense of the response of N₂O emissions to no-till practice based on best available knowledge, accompanied by a commitment to update that understanding going forward as additional experimental data is developed.

In Table 36, we provided an estimate of emissions-avoided from a change in tillage practice from conventional to no-till on 100,000 acres of some -4,000 CO₂-equivalent short tons (4,000 CO₂-equivalent short ton emission increase). This was developed consistent with the approach outlined immediately above, using the mean response rates to this practice change given in nine published meta-analyses. The mean response rate of N₂O emissions to a change to no-till was positive in six of these nine meta-analyses, and negative in the remaining three. The specific emissions-avoidance value given in Table 36 was calculated as the product of the estimated percentage change in emissions resulting from the use of no-till practice in place of conventional tillage and average annual Minnesota cropland N₂O emissions on 100,000 acres. Average annual Minnesota cropland N₂O emissions are from the MPCA Greenhouse Gas Inventory. As noted in the Methodology section (Section II) of this report, meta-analysis is a powerful statistical used to integrate results from experiments of different designs and drawn overall conclusions at broad spatial scales.

Using the meta-analyses mean estimates, the conversion to no-till practice from conventional tillage is estimated to increase N₂O emissions by 6.0 ± 4.9 percent. The effect of a change in tillage from conventional tillage to no-till practice or reduced tillage has been studied in an additional three meta-
analyses. Taken together, these reported a mean increase in emissions from tillage change of 4.0 ± 3.8 percent.

Overall, we reviewed 82 studies with 88 study results. Of these, nine were meta-analyses, four were other derivative statistical summaries or analyses, 11 were modeling studies, 56 were empirical site studies, and two were literature reviews or studies that report estimates on the basis of expert judgment. As discussed in the section on Methodology, in some instances more than one observation was reported per study to accommodate multiple results developed using different study types or, in the case of tillage, comparative results for tillage change combined with and in absence of cover cropping. To derive the maximum soil benefits from tillage change, less intensive or no tillage can be combined with cover cropping practice. We track results for combinations of tillage and cover cropping practice with this in mind.

Emissions increased in 44 of the 88 observations of the larger database, and decreased in 44, suggesting that the median value for percentage change (and probably the mean value), however much the database is expanded, is unlikely to diverge much from a narrow range either side of zero. Of the empirical site studies, 53 percent reported reduced N$_2$O emissions with tillage change, while 47 percent reported increasing N$_2$O emissions.

The descriptive statistics for the studies that were reviewed are shown in Table 39. Calculated confidence intervals by study type all overlap the zero value. Thus, a slight nod might be given to a small emission increase under no-till on the basis of the twelve meta-analyses mean results, essentially as currently available information. However, generally, the body of experimental results generally does not support an estimate for a change in emissions in either direction that can be said to be significantly different zero in a statistical sense. (Gregorich et al., 2015; Omonode et al., 2011; Venterea et al., 2005) The results from the meta-analyses point to a trend or a tendency in the studies in the scientific literature, rather than a firm conclusion.

Finally, we stratified the empirical site studies based on the number of years in each experiment in which soils had been in no-till practice. For soils in no-till practice fewer than 10 years, N$_2$O emissions were 4.2 percent higher than paired soils in conventional tillage. For soils in no-till practice 10 or more years, N$_2$O emissions were 0.7 percent higher than paired soils in conventional tillage, based on the results from 60 studies. N$_2$O emissions generally declined in studies with annual monitoring of fluxes, as opposed to flux monitoring limited to growing seasons, but with wide confidence intervals, again overlapping the zero value. A change to no-till practice from conventional tillage generally yielded much larger percentage reductions when conducted in conjunction with cover crops than without cover crops—about 15 percent lower emissions—but based on relatively few observations.

### c. Methane

Atmospheric methane is oxidized in most uncultivated soils by methanotrophic bacteria. Methanotrophs are sensitive to soil disruption. Tillage, particularly full-inversion tillage, disrupts methanotrophic communities, leading to reduced soil CH$_4$ oxidation. (LeMer and Roger, 2001) Under no-till practice, disruption to soils is limited, leading generally, although not always, in the published studies to increased soil CH$_4$ oxidation under no-till. (Regina and Alukukku, 2010; Ussiri et al., 2009) No-till soils are often wetter, with increased bulk density. This may promote the formation of anaerobic soil conditions and stimulate CH$_4$ production by methanogens in surface soils, rather than CH$_4$ oxidation. (Alluvione et al., 2009)
The estimated annual change in soil CH$_4$ oxidation resulting from the use of no-till practice is small, an increase of 283 CO$_2$-equivalent short tons (see Table 36). This was calculated using the average percent change in soil CH$_4$ oxidation in four published meta-analyses with a change in upland soils from conventional tillage to no-till practice. As noted above, formal meta-analysis is a powerful statistical tool useful for aggregating estimates across study types with differing designs. Baseline CH$_4$ oxidation rates in temperate cropland soils were taken from Aronson and Helliker (2010).

The descriptive statistics from the four meta-analyses are shown in Table 40, along with descriptive statistics for modeling and empirical site studies that were reviewed. Using a simple arithmetic average of the mean results from the four meta-analyses, soil CH$_4$ oxidation is estimated to increase by 13.7 ± 5.5 percent with a change in tillage from conventional tillage to no-till practice. By contrast, using the results from the modeling and empirical site studies, soil CH$_4$ uptake and oxidation would be expected to decline 6 and 83 percent, respectively, but based on only a relatively few studies.

The contribution of CH$_4$ oxidation to overall GHG-avoidance from tillage change is small, with little effect on the larger budget totals developed in Table 36.
I. Reduced tillage

Instead of no-till, cropland in full inversion tillage can be converted to less intensive, reduced tillage. Variants of reduced tillage include: chisel till, ridge till, mulch till, sweep till, disk tillage, and subsoiling. As in the case of no-till, reduced tillage reverses the soil processes that, in full inversion conventional tillage, lead to microbial decomposition of soil carbon and soil carbon losses to the atmosphere as CO$_2$. Under reduced tillage, soils that have suffered large losses of soil organic carbon, accumulate carbon or, at least, lose less carbon than under full inversion tillage. Soils under full inversion tillage are less physically- and biochemically-protected against microbial degradation of organic matter, leading to rapid loss of organic carbon from these soils.

As of the last available state-level survey, 44 percent of Minnesota cropland was in one form or another of reduced tillage. (US Department of Agriculture, 2019) As of 2016, 38 percent of all cropland in the US lake states (Minnesota, Wisconsin, and Michigan) was in continuous reduced tillage and another 28 percent in occasional reduced tillage (Baranski et al., 2018)

Table 41 shows the estimated emissions-avoidance effects of the conversion of 100,000 acres of cropland from full inversion tillage to reduced tillage. For each 100,000 acres of cropland converted from full inversion tillage to reduced tillage, an estimated 15,000 CO$_2$-equivalent short tons of GHGs are avoided or offset, nearly all of it from in-state carbon sequestration in soils.

As discussed in the Introduction of this report, the amount of time in storage determines the degree to which, for any particular project, sequestered carbon offsets CO$_2$ emissions from fossil fuel combustion elsewhere in the economy. This determines the present-day offset value of sequestration. In calculating the emissions-avoidance effects of reduced tillage, we assumed a 20-year timespan of assured storage of carbon in soils, resulting in annual emissions-avoidance on 100,000 acres of cropland of 15,000 CO$_2$-equivalent tons. Had we instead assumed a 40-year period of assured storage of carbon in soils, GHG-avoidance from the use of reduced tillage in place of full inversion tillage on 100,000 acres of cropland would have totaled 28,000 CO$_2$-equivalent short tons. Had we assumed a 100-year timespan for sustained storage, estimated avoidance would have totaled 67,000 CO$_2$-equivalent short tons (see Table 41). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II) of this report.

As noted often in this report, sequestered soil carbon is carbon that, having been photosynthetically removed from the atmosphere in the form of CO$_2$, is incorporated into plant biomass and, eventually, soils.
A number of estimates have been published of the greenhouse gas-avoidance resulting from a change in tillage from conventional or full inversion tillage to reduced tillage. These include estimates by Eagle et al. (2012) and Swan et al. (2015), which report emissions-avoidance from a change to reduced tillage of 0.31 and 0.22 CO₂-equivalent short tons per acre per year, respectively. On 100,000 acres, these per acre estimates translate to reductions of 31,000 and 22,000 CO₂-equivalent short tons per year, or reductions that are quite similar, if somewhat higher, than the estimates given in this report.

Biogenic carbon sequestration from the use of reduced tillage on cropland soils is discussed below, as are avoided direct emissions of N₂O from soils and the effects of reduced tillage on soil CH₄ oxidation. The methods and sources used to estimate avoided indirect N₂O emissions from nitrate leaching and ammonia volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed above in the Methodology section of this report, Section II, Subsection E.

### a. Carbon sequestration in soils

The physical and biochemical processes through which organic carbon is sequestered in soils are discussed in the no-till section of this report (see Section IV, Subsection H). That discussion will not be repeated. Suffice it to say that the same processes that are in play during no-till are in play in reduced tillage, albeit to a lesser degree. In general, reduced tillage is considered to be of reduced effectiveness...
relative to no-till, storing more organic carbon than conventional tillage but less than no-till practice. (Chambers et al., 2016; Eagle et al., 2012; Eve et al., 2002; Swan et al., 2015)

In Table 41, reduced tillage on 100,000 acres is estimated to result in 13,000 CO₂-equivalent short tons of sequestration. This is an annual estimate and is the difference in soil carbon storage between conventional full inversion tillage and various forms of reduced tillage like chisel till or disk till. The results shown in Table 41 were developed using two meta-analyses sequestration estimates for conventional tillage to reduced tillage conversion, discounted for an assumed 20-year persistence of storage. A simple arithmetic average of the meta-analyses results was employed, resulting in an estimated average annual rate of soil carbon sequestration of 0.21 ± 0.01 metric tons of carbon per hectare (0.09 ± 0.004 short tons of carbon per acre).

In developing this estimate, 69 studies of reduced tillage were reviewed with 74 study results, including 44 empirical site studies, twelve modeling studies, six literature reviews or studies that develop analyses based on expert judgment, two statistical summaries or statistical analyses other than formal meta-analysis, and the two formal meta-analyses. One study gave results for two different study types, both of which are represented in the database. The results from the meta-analyses were selected in deference to the place meta-analyses increasingly has assumed in determinations of response rates for ecological process in the scientific literature. Estimated mean sequestration rates for the 69 studies reviewed range from 0.11 to 0.23 metric tons of carbon per hectare per year (0.05 to 0.1 short ton of carbon per acre per year).

The descriptive statistics for the studies that were reviewed are shown in Table 42 by study type, soil sampling depth and experiment duration. Following the practice followed in much or most of the science of terrestrial sequestration, these are given in metric units, and then converted to CO₂-equivalent short tons for use in summary Table 41. The estimates in Table 42 are estimates of annual sequestration prior to truncation to accommodate the assumed 20-year persistence of newly stored organic carbon in soils.

In general, there are many fewer analyses directed toward reduced tillage than no-till practice. Despite far fewer observations, the standard errors and confidence intervals reported in Table 42 are roughly similar in width to those reported in Table 38 for no-till. Of study types, the results from the empirical site studies and the literature reviews are in good agreement with the average developed from the results from the meta-analyses, the results from the modeling studies and statistical summaries and other derivative statistical analyses less so, though still indicating net sequestration in cropland soils.

The fraction of empirical site studies that report net losses of SOC during conversion from conventional tillage to reduced tillage is about one-third, up from about 20 percent under no-till. More troubling are the results at the 40 centimeter and below soil sampling depth, where the numbers of studies showing a negative SOC response to reduced tillage is the same as those showing a positive response. The mean rate of sequestration at these depths is 60 percent of the rate reported for the 10 to 30 centimeter soil layer, raising the possibility that, to some degree, the positive response rate developed from the meta-analyses results might be an artefact of inappropriately shallow soil sampling.

For this reason, caution is advised in how much certainty we ascribe to the sequestration rates shown in Table 42. A good deal more research may be needed to understand how the mass of soil organic carbon across the entire soil column changes under reduced tillage. Generally, the weight of the evidence supports a positive response rate for reduced tillage.
Table 42. Descriptive statistics: Reduced tillage - carbon sequestration in soils

<table>
<thead>
<tr>
<th>meta-analyses</th>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of study results</th>
<th>ratio of sequestration to emission: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>other derivative statistical analyses or summaries</td>
<td>0.21</td>
<td>2</td>
<td>2/0</td>
<td>0.10</td>
<td>0.00</td>
<td>0.41</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>0.11</td>
<td>49</td>
<td>32/16/1</td>
<td>0.08</td>
<td>0.03</td>
<td>0.34</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.12</td>
<td>12</td>
<td>11/0</td>
<td>0.05</td>
<td>0.03</td>
<td>0.21</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>0.23</td>
<td>6</td>
<td>6/0</td>
<td>0.07</td>
<td>0.09</td>
<td>0.37</td>
</tr>
<tr>
<td>40 cm-plus soil sampling/modeling depth b</td>
<td>0.12</td>
<td>25</td>
<td>12/12/1</td>
<td>0.15</td>
<td>(0.17)</td>
<td>0.41</td>
</tr>
<tr>
<td>10 to 30 cm soil sampling/modeling depth b</td>
<td>0.20</td>
<td>37</td>
<td>32/5</td>
<td>0.04</td>
<td>0.12</td>
<td>0.29</td>
</tr>
<tr>
<td>10 to 20 year annual sequestration rate</td>
<td>0.28</td>
<td>34</td>
<td>29/5</td>
<td>0.08</td>
<td>0.12</td>
<td>0.43</td>
</tr>
<tr>
<td>20 to 30 year annual sequestration rate</td>
<td>(0.06)</td>
<td>14</td>
<td>9/5</td>
<td>0.09</td>
<td>(0.23)</td>
<td>0.11</td>
</tr>
<tr>
<td>0 to 10 year annual sequestration rate</td>
<td>0.18</td>
<td>12</td>
<td>7/5</td>
<td>0.21</td>
<td>(0.23)</td>
<td>0.59</td>
</tr>
</tbody>
</table>

* conventional tillage counterfactual
b results for lowest reported sampling depth
c results for annual sequestration rate

b. Nitrous oxide

Avoided-emissions from the conversion from conventional tillage to reduced tillage are calculated as the product of the estimated percentage change in emissions resulting from use of reduced tillage in place of conventional tillage on 100,000 acres, and average Minnesota cropland N₂O emissions, again on 100,000 acres. As discussed in the Methodology section of this report, average Minnesota cropland N₂O emissions are from the MPCA Greenhouse Gas Inventory. To estimate the percentage change in N₂O emissions under reduced-till on cropland formerly in conventional tillage, we reviewed 42 studies with 43 study results. These include five meta-analyses, one other derivative statistical analysis, nine modeling studies and 27 empirical site studies.

We used the mean estimate from the five meta-analyses as the best estimate of the percentage change in N₂O emission with reduced tillage practice on croplands formerly under conventional tillage practice. Of the five meta-analyses, three reported N₂O emission increases with reduced tillage in place of conventional, while two reported reductions. Using the mean estimate for the five meta-analyses, the use of reduced tillage practice on cropland formerly under conventional tillage practice is estimated to reduce N₂O emissions by 0.2 ± 4.9 percent. As in the case of no-till on cropland formerly under conventional tillage, the estimated percentage N₂O change selected for the calculation of avoided-emissions should be seen as what is now best available information, but probably without larger statistical significance. As in the case of no-till, it is intended for use in developing tentative results, with full understanding that the underlying database for analysis is inadequate and that much yet needs to be done for a sound understanding of N₂O response to tillage change to be developed.

Descriptive statistics are shown in Table 43 for all the studies that have been reviewed. Calculated confidence intervals by study type are wide, and with the exception of those for the modeling studies, all overlap the zero value. Taken as a whole, the body of results taken from the published literature generally does not support an estimate for a change in emissions in either direction that can be said to be significantly different zero in a statistical sense.
There is no evident pattern in the results by number of study years. The mean of the results of empirical site studies that, in reporting N₂O fluxes, do so on an annual basis is negative, but again the confidence intervals are wide.

Of the 27 empirical site studies reviewed, N₂O emissions increased in 14 and decreased in 13, suggesting that the median result for the percentage change (and probably the mean value), however much the database is expanded, is unlikely to diverge much from a narrow range either side of zero.

Finally, in absence of an estimate for changed N₂O emissions, net greenhouse gas effects of reduced tillage in place of conventional tillage would remain almost unchanged from those shown in Table 41, about 15,000 CO₂-equivalent tons.

**Table 43. Descriptive statistics: Reduced tillage - N₂O**

<table>
<thead>
<tr>
<th></th>
<th>emissions: percentage change in emissions per hectare</th>
<th>number of study results</th>
<th>change in emissions, ratio positive-to-negative: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-0.2%</td>
<td>5</td>
<td>3/2</td>
<td>4.9%</td>
<td>-9.8%</td>
<td>9.5%</td>
</tr>
<tr>
<td>other derivative statistical analyses or summaries</td>
<td>-15.3%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-14.6%</td>
<td>9</td>
<td>1/8</td>
<td>6.3%</td>
<td>-27.0%</td>
<td>-2.3%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>7.8%</td>
<td>28</td>
<td>14/14</td>
<td>9.6%</td>
<td>-10.9%</td>
<td>26.4%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>-7.1%</td>
<td>27</td>
<td>9/18</td>
<td>4.3%</td>
<td>-15.4%</td>
<td>1.3%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>17.4%</td>
<td>16</td>
<td>9/7</td>
<td>15.4%</td>
<td>-12.9%</td>
<td>47.6%</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>21.8%</td>
<td>10</td>
<td>5/5</td>
<td>23.4%</td>
<td>-24.1%</td>
<td>67.8%</td>
</tr>
<tr>
<td>2 to 3 years of observations or simulations</td>
<td>-4.9%</td>
<td>24</td>
<td>9/15</td>
<td>6.1%</td>
<td>-16.9%</td>
<td>7.0%</td>
</tr>
<tr>
<td>3 yrs-plus of observations or simulations</td>
<td>2.4%</td>
<td>2</td>
<td>1/1</td>
<td>5.8%</td>
<td>-8.8%</td>
<td>13.7%</td>
</tr>
</tbody>
</table>

* conventional tillage counterfactual

| 43 study results, 42 studies (6 meta-analyses, 1 statistical summary or other derivative statistical analysis, 9 modeling studies, 27 empirical site studies)

| 1 study reports multiple results by cover crop treatment

**c. Methane**

Tillage acts to disrupt methanotrophic communities that oxidize CH₄ to CO₂. With no-till, some recovery in rates of soil oxidation is evident, but with conversion from conventional tillage to reduced tillage, less so. It is thought that CH₄ oxidation in cropland soils is about one-third of that of undisturbed grassland soils (Aronson and Helliker, 2010; Aronson et al., 2013). It is also thought that recovery of soil CH₄ oxidizing capacity might take up to several hundred years after disruptions cease. (Allen et al., 2009)

The estimated annual change in soil CH₄ oxidation resulting from the use of reduced tillage practice in is small, a 52 CO₂-equivalent short ton decrease in oxidation (see Table 41). This was calculated using the average percent change in soil CH₄ oxidation from a single available meta-analysis with a change in upland soils from conventional tillage to reduced tillage. Formal meta-analysis is probably the most powerful tool now available for aggregating estimates across study types with differing designs. Baseline CH₄ oxidation rates in temperate cropland soils were taken from Aronson and Helliker (2010).

Using the single meta-analysis estimate, developed by Feng et al. (2018) using a global database, the use of reduced tillage practice on cropland formerly under conventional tillage is estimated to reduce CH₄ oxidation slightly, by 2.5 percent (see Table 44). In perusing the scientific literature, we also reviewed ten empirical site studies. Using the results from the empirical site studies, soil CH₄ uptake and oxidation
might be expected to increase by 49 percent, but based on a very few number of studies showing widely scattered results (+217 to -50 percent change in soil CH₄ oxidation).

**Table 44. Descriptive statistics: Reduced tillage - CH₄**

<table>
<thead>
<tr>
<th></th>
<th>% change in oxidation per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-2.5%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>49.2%</td>
<td>10</td>
<td>6/3/1</td>
<td>30%</td>
<td>-10%</td>
<td>109%</td>
</tr>
</tbody>
</table>

---

**J. No till: Reduced tillage counterfactual**

No-till practice can be introduced to cropland already in reduced tillage. As noted above in Section IV, Subsection H, the use of no-till results in less disruption to cropland soil structure, restoring to soils some of the physical and biochemical protection against microbial decomposition of organic matter that is found in undisturbed native grassland. This is true in the case of conversion to no-till from either full inversion tillage or reduced tillage, only to a lesser extent in the case of reduced tillage. Soil organic carbon stocks in undisturbed or less disturbed soils tend to be higher than soils that are intensively disrupted by tillage.

The physical and biochemical processes involved in the accumulation of or sequestration of carbon in soils are discussed above in the No-till sections of this report (Section IV, Subsection Ha). That discussion will not be repeated. The same is true for changes in N₂O emissions from tillage change. No estimate is available for CH₄ oxidation in reduced tillage soils converted to no-till practice.

As of the last available tillage survey, six percent of Minnesota cropland was in no-till practice and 44 percent in some form of reduced tillage. (US Department of Agriculture, 2019) In 2016, an estimated 10 percent of cropland in the US lake States (Minnesota, Wisconsin, and Michigan) was in continuous no-till and 38 percent in continuous reduced tillage. (Baranski et al., 2018)

The estimated GHG emission-avoidance resulting from the conversion of cropland tillage from reduced tillage to no-till is shown in Table 45. From Table 45, an estimated 23,000 CO₂-equivalent short tons of emissions would be avoided from the conversion of 100,000 acres from reduced tillage to less impacting no-till. Of this, two-thirds is from enhanced carbon storage in no-till soils. Of the remainder, most of this is due to reduced direct N₂O soil emissions.

In quantifying avoided-emissions, we assumed that carbon stored in soils would remain there for 20 years, followed by microbial decomposition and emission to the atmosphere as CO₂. This is the longest period over which, in our opinion, sustained storage safely can be assumed. Under this assumption, avoided-emissions are estimated 23,000 CO₂-equivalent short tons (see Table 45). Had a 40-year period of assured storage been assumed, avoided-emissions from the use of no-till practice in place of reduced tillage would have totaled 36,000 CO₂-equivalent short tons. Had 100-year assured storage been assumed, avoided-emissions would have totaled 77,000 CO₂-equivalent short tons (again see Table 45).
The amount of time in storage determines the degree to which, for any particular project, sequestered carbon offsets CO$_2$ emissions from fossil fuel combustion elsewhere in the economy. This determines the present-day offset value of sequestration. The approach that we use in converting observed rates of sequestration to avoided emissions was addressed above in the Methodology section (Section II) of this report.

### a. Carbon sequestration in soils

In Table 45, an estimate for annual carbon sequestration in cropland formerly under reduced tillage and converted to no-till of 14,000 short tons of CO$_2$ or 3,705 tons of carbon was given, covering 100,000 acres. As discussed immediately above, this was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence of storage of newly sequestered carbon in soils. In cropland under no-till, CO$_2$ is removed from the atmosphere and incorporated into the roots and aboveground live crop biomass and, eventually, into cropland litter and soils. This offsets emissions of CO$_2$ from fossil fuel combustion.

In estimating the average annual sequestration rate in no-till soils converted from reduced tillage practice, we reviewed 93 studies with 103 study results. These included 80 empirical site studies, 10 modeling studies, and 3 statistical summaries or derivative statistical analyses. Of the 93 studies, ten studies reported multiple results, adding cover crop practice as a secondary factor influencing soil carbon. To derive maximum soil carbon benefits from tillage change, less intrusive or no-till practice is...
often combined with cover cropping practice. We track the results for combinations of tillage and cover cropping practice with this in mind.

An average value for all of the studies reviewed was selected to best represent annual sequestration rates in no-till soils converted from reduced tillage practice. No formal meta-analysis was available for sequestration rates in no-till soils converted from reduced tillage practice. No other study attribute clearly pointed to one study type over the rest as clearly superior or as uniquely indicative of the ‘true’ value of carbon sequestration in no-till soils converted from reduced tillage practice. Using the average value for the studies that were reviewed, no-till practice on former reduced tillage cropland is estimated to sequester on an annual basis 0.22 ± 0.07 metric tons of carbon per hectare (0.10 ± 0.03 short tons of carbon per acre). This is an estimate of average sequestration prior to truncation to accommodate the assumed 20-year persistence of newly stored carbon in soils.

In developing the sequestration estimates, the calculations were done initially in metric units and then converted to English or common units. By study type, annual sequestration rates for no-till soils converted from reduced tillage practice range from 0.11 to 0.33 metric tons of carbon per hectare (0.05 to 0.15 short tons of carbon per acre). The sum of the mean estimates plus standard error never straddles zero for any of the study types, although with several, the number of observations is exceedingly small. Soil organic carbon declined in about one-quarter of all the studies reviewed, increasing in about 75 percent, which is consistent with substantial site-to-site variability reported across all tillage studies.

The descriptive statistics for the various studies that were reviewed are shown in Table 46. About one-third more soil organic carbon is sequestered in reduced tillage studies in which soils are sampled to a depth of 4 to 12 inches (10 to 30 centimeters) than in those in which soils are sampled to a depth of 16 inches (40 centimeters). At the 95 percent confidence level, the possibility that sequestration might be negative cannot be excluded, particularly below the 16-inch (40 centimeter) sampling depth. By duration of experiment, studies that report on no-till soils formerly in reduced tillage practice in experiments lasting 10 to 20 years show little net sequestration in no-till soils. If the timeframe is lengthened to 20 to 30 years, this reverses and no-till soils sequester substantial amounts of carbon.

### Table 46. Descriptive statistics: No-till tillage - carbon sequestration in soils a

<table>
<thead>
<tr>
<th>Biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>Number of study results c,d</th>
<th>Ratio of sequestration to emission: number of study results e</th>
<th>Standard error of mean (+/-)</th>
<th>Lower 95% confidence interval</th>
<th>Upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All studies</td>
<td>0.22</td>
<td>103</td>
<td>79/23/1</td>
<td>0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>Empirical site studies</td>
<td>0.22</td>
<td>89</td>
<td>68/20/1</td>
<td>0.08</td>
<td>0.07</td>
</tr>
<tr>
<td>Modeling studies</td>
<td>0.11</td>
<td>10</td>
<td>8/2</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>Derivative statistical analyses or summaries</td>
<td>0.33</td>
<td>3</td>
<td>3/0</td>
<td>0.07</td>
<td>0.20</td>
</tr>
<tr>
<td>40 cm-plus soil sampling/modeling depth b</td>
<td>0.15</td>
<td>33</td>
<td>23/9/1</td>
<td>0.15</td>
<td>0.14</td>
</tr>
<tr>
<td>10 to 30 cm soil sampling/modeling depth b</td>
<td>0.22</td>
<td>58</td>
<td>44/14</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>10 to 20 year annual sequestration rate</td>
<td>0.09</td>
<td>40</td>
<td>32/8</td>
<td>0.10</td>
<td>(0.10)</td>
</tr>
<tr>
<td>20 to 30 year annual sequestration rate</td>
<td>0.26</td>
<td>14</td>
<td>10/3/1</td>
<td>0.13</td>
<td>0.01</td>
</tr>
<tr>
<td>0 to 10 year annual sequestration rate</td>
<td>0.31</td>
<td>39</td>
<td>27/12</td>
<td>0.13</td>
<td>0.05</td>
</tr>
</tbody>
</table>

- a reduced tillage counterfactual
- b results for lowest reported sampling depth
- c 103 study results, 93 studies (3 statistical summaries or derivative statistical analyses, 10 modeling studies, 80 empirical site studies)
- d 10 studies report multiple results by cover crop treatment
- e ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions
The study results by soil sampling depth and experiment duration suggest that caution be exercised with the numbers. Regarding experiment duration, the calculated confidence intervals for experiments lasting 10 to 20 years are quite broad. One or two very negative study results seem largely to account for the lack of sequestration in experiments with this length of study. A good deal more research may be needed to understand how experiment duration influences soil organic carbon changes in soils converting from reduced tillage to no-till practice.

The weight of the evidence now supports a positive response rate for no tillage on soils formerly in reduced tillage, but with the caveat that oddities in the data persist and that more experimental data could alter this judgment going forward.

b. Nitrous oxide

Avoided-emissions from the displacement of reduced tillage with no-till practice are calculated as the product of the estimated percentage change in emissions resulting from use of no-till in place of reduced tillage and average Minnesota cropland N\textsubscript{2}O emissions. Average Minnesota cropland N\textsubscript{2}O emissions are from the MPCA Greenhouse Gas Inventory. To estimate the percentage change in N\textsubscript{2}O emissions under no-till on cropland formerly in reduced tillage, we reviewed 49 studies with 50 study results. These included 4 modeling studies and 45 empirical site studies.

We used the mean estimate from all studies reviewed as the best estimate of the percentage change in N\textsubscript{2}O emission with no-till practice on croplands formerly under reduced tillage practice. No meta-analyses were available to support a calculation. Using the mean estimate for all reviewed studies, the use of no-till practice on cropland formerly under reduced tillage practice is estimated to reduce N\textsubscript{2}O emissions by 12.9 ± 4.9 percent. By study type, the estimate percentage change ranges from -10.9 to -35.9 percent.

Of the 49 studies reviewed, 14 reported increased N\textsubscript{2}O emissions with no-till on former reduced tillage cropland, 34 reported reductions, and one reported no change. The descriptive statistics for the reviewed studies are shown in Table 47, with standard errors and upper and lower 95 percent confidence intervals. The confidence interval for the percentage change for all studies is fairly broad, though solidly in negative territory. The change in mean N\textsubscript{2}O fluxes from the studies that report emissions on an annual, as opposed to growing season, basis is somewhat larger than the mean change in growing season-only fluxes, though not substantially. There is no evident pattern in the results by number of study years.

K. Cropland to hayland conversion

Cropland planted to alfalfa or perennial grasses for harvest is substantially less emitting than is cropland planted to row crops or small grains. A good stand of alfalfa lasts about five years before it is plowed under and replanted. Alfalfa usually is fertilized only at planting. Other perennial grasses also are fertilized, albeit at low rates. Because of the generally low rates of fertilization with either synthetic fertilizer or manure, soils in perennial grasses and alfalfa for hay harvest emit less N\textsubscript{2}O to the atmosphere. Fewer upstream emissions from the out-of-state manufacture of synthetic fertilizer also result.
Besides avoided direct N\(_2\)O soil emissions and avoided-emissions at fertilizer manufacture, cropland planted to perennial grasses and alfalfa also accumulates substantial amounts of soil organic carbon. Perennial grasses and alfalfa are untilled, excepting tillage at crop establishment. The organic carbon in untilled soils is physically and biochemically protected against microbial decomposition, which allows these soils to accumulate organic carbon. Large inputs of carbon below ground through root turnover and rhizodeposits also contribute to accumulating soil organic carbon.

Avoided-emissions from the conversion of cropland to hayland are an estimated 121,000 CO\(_2\)-equivalent short tons of GHGs. Table 48 gives the breakdown of avoided-emissions by gas and source. One-third of avoided-emissions result from biogenic carbon sequestration in former cropland soils planted to perennial grasses and alfalfa for harvest. Another 45 percent results from reduced direct N\(_2\)O emission from hayland soils. About 10 percent of avoided-emissions result from the avoided manufacture of synthetic fertilizer and other agricultural chemicals not applied to converted haylands. Organic carbon that is stored in soils is carbon that, having been photosynthetically fixed in plant biomass and later removed to soils in the form of roots and crop residues, was removed from the atmosphere.

In developing these estimates, we assumed that 20 years was the longest period of time over which sustained carbon storage, once initiated, safely could be assumed. The sequestration estimates given in Table 48 were calculated under that assumption. If instead a 40-year timespan had been assumed, annual GHG-avoidance from the conversion of 100,000 acres of cropland to hayland would have been higher, totaling 164,000 CO\(_2\)-equivalent short tons, rather than 121,000 CO\(_2\)-equivalent short tons, the total calculated under the 20-year assumption. Had we assumed a 100-year timespan of assured storage, estimated avoided-emissions would have totaled 294,000 CO\(_2\)-equivalent tons (see Table 48). The approach that we use in converting observed rates of sequestration to avoided-emissions was addressed above in the Methodology section (Section II) of this report.

A number of estimates have been developed of the net change in greenhouse gas emissions resulting from the conversion of cropland to hayland. These are shown below in Table 49 in CO\(_2\)-equivalent short tons per 100,000 acres. They support a range of emissions reductions of 37,000 to 298,000 short CO\(_2\)-equivalent tons for each 100,000 acres of conversions.

<table>
<thead>
<tr>
<th>emissions: % change in emissions per hectare</th>
<th>number of study results b,c</th>
<th>change in emissions, ratio positive-to-negative: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>-12.9%</td>
<td>50/35/1</td>
<td>4.9%</td>
<td>-22.6%</td>
<td>-3.2%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-35.9%</td>
<td>4/4</td>
<td>11.4%</td>
<td>-58.2%</td>
<td>-13.6%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-10.9%</td>
<td>46/32/1</td>
<td>5.1%</td>
<td>-20.9%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>-12.6%</td>
<td>23/16/1</td>
<td>8.0%</td>
<td>-28.3%</td>
<td>3.2%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>-10.7%</td>
<td>23/16/1</td>
<td>6.8%</td>
<td>-24.0%</td>
<td>2.6%</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>-31.3%</td>
<td>15/13/1</td>
<td>6.2%</td>
<td>-43.5%</td>
<td>-19.0%</td>
</tr>
<tr>
<td>2 to 3 years of observations or simulations</td>
<td>1.2%</td>
<td>28/16/1</td>
<td>6.8%</td>
<td>-12.1%</td>
<td>14.5%</td>
</tr>
<tr>
<td>3 yrs-plus of observations or simulations</td>
<td>-31.2%</td>
<td>6/6</td>
<td>8.2%</td>
<td>-47.3%</td>
<td>-15.0%</td>
</tr>
</tbody>
</table>

* reduced tillage counterfactual
b 50 study results, 49 studies (4 modeling studies, 45 empirical site studies)
c 1 study reports multiple results by cover crop treatment
Biogenic carbon sequestration in soils from the conversion of cropland to hayland is discussed below, as are avoided direct emissions of N$_2$O from soils. Little is known about the effects of cropland to hayland conversion on CH$_4$ oxidation rates, although these effects are likely to be minor. The methods and sources used to estimate avoided indirect N$_2$O emissions from nitrate leaching and ammonia...
volatilization, avoided-emissions from fuel use, and avoided-emissions from foregone agricultural chemicals and fuels manufacture were discussed above in Section II, Subsection E.

a. Carbon sequestration in soils

The biological and biochemical processes involved in the sequestration of carbon on former cropland in hay for harvest are the same as in soils of cropland converted to unmanaged grassland. That discussion (see Section IV, Subsection Aa) will not be repeated.

In Table 48, an estimate of 43,000 CO₂-equivalent short tons was given for annual carbon sequestration on 100,000 acres of cropland converted to hayland. As discussed above, this was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence time of newly stored carbon in soils and biomass. Since most of the science of terrestrial carbon sequestration is developed in metric units, this average annual rate is given first in metric tons of carbon per hectare (see Table 50 below) and converted to CO₂-equivalent short tons for inclusion in summary Table 48.

In developing this estimate, 35 studies were reviewed with 36 study results, including six modeling studies, 20 empirical site studies, three statistical summaries or derivative statistical analyses, one modeling/empirical site study, and five literature reviews or studies that report average sequestration rates based on expert judgment. In developing the estimate for sequestration given in Table 48 for 100,000 acres of hayland, we used a simple average of the results from all 35 studies, or 0.68 ± 0.17 metric tons of carbon per hectare per year (0.3 ± 0.08 short tons of carbon per acre per year). These are estimated rates prior to truncation to accommodate an assumed 20-year persistence of stored carbon in soils. One study reported multiple results produced with different study types. The descriptive statistics for these 35 studies are shown in Table 50. Of the 36 results that were reported in these 35 studies, 3 indicated soil carbon losses with cropland conversion to hayland and 33 net carbon sequestration. Average sequestration rates are shown in Table 50 by study type. Across study types, annual sequestration rates range from 0.43 to 1.3 metric tons of carbon per hectare (0.19 to 0.56 short tons of carbon per acre per year). No meta-analysis of published studies was available to support the calculation. The weight of the evidence points to a positive response rate for sequestration for cropland-to-hayland conversions, before truncation for 20-years of assumed storage, in the range of 0.5 to 1 metric tons of carbon per hectare per year (0.22 to 0.45 short tons of carbon per acre per year).

By forage type, annual sequestration in alfalfa soils in the reviewed studies was an estimated 0.74 metric tons of carbon per hectare, or not substantially different from the 0.64 metric tons per hectare for nonalfalfa perennial grasses and 0.78 metric tons per hectare for a mix of alfalfa and nonalfalfa grasses. Eighteen studies gave results for nonalfalfa perennial grasses, eleven for alfalfa and five for a mix of alfalfa and nonalfalfa grasses. Net sequestration in studies that sampled soils below 12 inches (30 centimeters) of depth was about a quarter lower than those sampling 12 inches (30 centimeters) or less, but based on only a handful of studies. Net sequestration rates were substantially lower in short duration studies of less than 10 years. Sequestration rates in studies that measured carbon stocks over periods of 10 to 20 years generally exceeded the mean sequestration rate for all 35 studies.
Table 50. Descriptive statistics: Cropland to hayland - carbon sequestration in soils

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Biogenic Carbon Sequestration (Mg C/ha/yr)</th>
<th>Number of Study Results</th>
<th>Ratio of Sequestration to Emission: Number of Study Results</th>
<th>Standard Error of Mean (×10⁻²)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Studies</td>
<td>0.68</td>
<td>36</td>
<td>33/3</td>
<td>0.17</td>
<td>0.35</td>
<td>1.02</td>
</tr>
<tr>
<td>Derivative Statistical Analyses or Statistical Summaries</td>
<td>1.30</td>
<td>3</td>
<td>3/0</td>
<td>1.08</td>
<td>(0.82)</td>
<td>3.42</td>
</tr>
<tr>
<td>Empirical Site Studies</td>
<td>0.72</td>
<td>21</td>
<td>18/3</td>
<td>0.25</td>
<td>0.23</td>
<td>1.21</td>
</tr>
<tr>
<td>Modeling Studies</td>
<td>0.51</td>
<td>7</td>
<td>7/0</td>
<td>0.12</td>
<td>0.28</td>
<td>0.74</td>
</tr>
<tr>
<td>Expert Judgment/Literature Review</td>
<td>0.43</td>
<td>5</td>
<td>5/0</td>
<td>0.11</td>
<td>0.21</td>
<td>0.64</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>0.74</td>
<td>11</td>
<td>9/2</td>
<td>0.45</td>
<td>(0.14)</td>
<td>1.63</td>
</tr>
<tr>
<td>Nonalfalfa Perennial Grasses</td>
<td>0.64</td>
<td>18</td>
<td>17/1</td>
<td>0.20</td>
<td>0.24</td>
<td>1.04</td>
</tr>
<tr>
<td>Mix of Alfalfa and Nonalfalfa Perennial Grasses or Unidentified</td>
<td>0.78</td>
<td>5</td>
<td>5/0</td>
<td>0.20</td>
<td>0.38</td>
<td>1.17</td>
</tr>
<tr>
<td>5 to 30 cm Soil Sampling/Modeling Depth</td>
<td>0.63</td>
<td>15</td>
<td>13/2</td>
<td>0.24</td>
<td>0.15</td>
<td>1.11</td>
</tr>
<tr>
<td>&gt;30 cm Soil Sampling/Modeling Depth</td>
<td>0.44</td>
<td>6</td>
<td>5/1</td>
<td>0.56</td>
<td>(0.66)</td>
<td>1.54</td>
</tr>
<tr>
<td>1 to 10 Year Annual Sequestration Rate</td>
<td>0.12</td>
<td>9</td>
<td>7/2</td>
<td>0.31</td>
<td>(0.49)</td>
<td>0.73</td>
</tr>
<tr>
<td>10 to 20 Year Annual Sequestration Rate</td>
<td>0.85</td>
<td>7</td>
<td>6/1</td>
<td>0.52</td>
<td>(0.17)</td>
<td>1.87</td>
</tr>
<tr>
<td>20 to 30 Year Annual Sequestration Rate</td>
<td>0.64</td>
<td>10</td>
<td>10/0</td>
<td>0.14</td>
<td>0.36</td>
<td>0.92</td>
</tr>
</tbody>
</table>

- a Statistical summaries or derivative statistical analysis other than meta-analyses
- b Results for lowest reported sampling depth
- c 36 study results, 35 studies (3 statistical summaries or derivative statistical analyses, 6 modeling studies, 20 empirical site studies, 5 expert reviews, 1 modeling/empirical site study)
- d 1 study reports multiple results by study type
- e Ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions

b. Nitrous oxide

N₂O is produced in cropland during nitrification and denitrification by soil bacteria that oxidize ammonia or reduce nitrate to gain energy. The processes and environmental controls on N₂O production in grasslands were discussed in the section on restored grassland (see Section IV, Subsection Ab). They are the same as occur in cropland planted to perennial grasses and alfalfa for harvest.

N₂O emissions from the conversion of cropland to hayland are calculated as the difference between average annual cropland emissions, as developed using data from the MPCA greenhouse gas emission inventory, and emissions estimated for cropland soils converted to perennial grasses and alfalfa for harvest. Mean cropland N₂O emissions in Minnesota are, on an annual basis, an estimated 4.81 kilograms per hectare (4.29 lbs. N₂O per acre). From a 2017 meta-analysis, we estimate annual N₂O emissions of 1.89 kilograms per hectare (1.69 lbs. N₂O per acre) from soils in alfalfa or perennial grass. (See Table 51)

In developing these estimates, we reviewed 28 studies with 33 study results, including 19 empirical site studies (20 study results), 5 modeling studies (8 study results), one meta-analysis and 3 statistical summaries or derivative statistical analyses (4 study results). Four of these studies reported multiple results across forage types, which we tracked. Across all 28 studies, annual N₂O emissions from hayland averaged 2.03 kilograms per hectare (1.81 lbs. N₂O per acre), or reasonably close to the meta-analysis estimate (see Table 51). The results of the meta-analysis were selected as the best estimate of hayland emissions due to the general statistical power of the meta-analysis technique.
By study type, in Table 51 N₂O emissions from hayland range from 1.22 to 3.56 kilograms per hectare per year, for almost a three-fold difference in mean estimates by study type. Because of this, some care should be taken in accepting without reservations the meta-analysis results. More studies of an empirical nature, spanning a wider array of environmental conditions, may be needed to reduce uncertainties.

By monitoring period, the studies that report emissions from hayland on an annual basis and also on a long-term (three-year or longer) basis yield results similar to, if slightly larger than, the meta-analysis results, which provides some measure of comfort.

L. Perennial grass added to annual crop rotation

The conversion of annual crops to perennial grasses or alfalfa can be implemented on a rotational basis by the introduction of one or more years of a perennial grass or alfalfa into an annual rotation. The conversion of cropland in annual crops to perennial grasses or alfalfa results in increased organic carbon in soils (see discussion in Section IV, Subsection K above). Organic carbon in soil is photosynthetically derived through root and crop residue inputs to soil during crop growth and after harvest. Additional carbon storage in soils results in CO₂ removal from the atmosphere.

Additionally, the conversion of cropland to perennial grasses or alfalfa, even on a rotational basis, results in reduced synthetic nitrogen applications to cropland, hence reduced soil emissions of N₂O, as well as reduced downstream N₂O emissions from surface waters from nitrate leached from cropped soils. Reduced greenhouse gas emissions from the avoided manufacture of nitrogen fertilizer, other agricultural chemicals and fuels used in crop production also result.

With several years of perennial grasses or alfalfa added to annual rotations, soil carbon increases and N₂O emissions, during cultivation, as well as upstream and downstream of cultivation, decline, albeit to a lesser degree than in the complete conversion of cropland to hayland without interspersed years of annual crops.
Table 52 shows the estimated net change in greenhouse gas emissions from the lengthening of annual crop rotation by adding to annual rotations two or more years of perennial grasses or alfalfa. For each 100,000 acres with extended rotations with perennial grasses or alfalfa, an estimated 50,000 CO₂-equivalent tons of greenhouse gas emissions would be avoided annually. Of this, about two-thirds percent derives from carbon sequestration in soils. The rest results from reduced direct emissions of N₂O from cropland soil and reduced indirect nitrate leaching-related emissions from surface waters. Reduced out-of-state emissions from the avoided manufacture of fertilizer and other agricultural chemicals also are important, accounting for about one-quarter of total avoided emissions.

Table 52. Add a perennial grass to crop rotation: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year) a</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>(2,897)</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect</td>
<td>indirect emission-Nitrogen volatilization,</td>
<td>(1,053)</td>
<td>crop production</td>
</tr>
<tr>
<td>volatilization</td>
<td>redeposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N₂O-indirect</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(6,826)</td>
<td>crop production</td>
</tr>
<tr>
<td>leaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>not known</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂ b,c</td>
<td>cultivated soils from lime or urea use</td>
<td>(32,490)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>soils</td>
<td>(1,393)</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>6,861</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State</td>
<td>upstream agricultural chemicals and fossil fuel</td>
<td>(11,886)</td>
<td>crop production</td>
</tr>
<tr>
<td>Upstream GHGs</td>
<td>production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(49,685)</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

<table>
<thead>
<tr>
<th></th>
<th>Emission (CO₂-e short tons per 100,000 acres per year)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 year storage</td>
<td>(82,175)</td>
<td>crop production</td>
</tr>
<tr>
<td>100 year storage</td>
<td>(179,646)</td>
<td>crop production</td>
</tr>
</tbody>
</table>

*a positive = emissions increase, negative = emissions reduction
*b carbon accumulation in soils = net removal of CO₂ from the atmosphere = net emission reduction
*c assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass

In this calculation, we assumed that biogenic carbon stored in cropland soils will persist in storage for 20 years, after which it will be reemitted to the atmosphere as CO₂. Twenty years is the longest period that, in our judgment, sustained terrestrial storage can be assumed for purposes of its present-day valuation. If instead of 20 years, we had assumed a 40-year timespan, the annualized total of greenhouse gas-avoidance on 100,000 acres would have totaled 82,000 CO₂-equivalent tons, up from 50,000 tons, the total calculated under the 20-year assumption. Had we assumed a 100-year timespan of assured storage, estimated annually avoided emissions would have totaled 180,000 CO₂-equivalent tons.

We developed these estimates using estimates from studies employing a wide variety of both annual rotations and perennial grasses and forages. Many of the studies included corn in monoculture or in two-year rotation with soybeans, often with two to three years of alfalfa added. Other perennial grasses that rotationally were included in the studies were non-alfalfa hay, timothy and other pasture grasses. Besides corn-based annual rotations, other base rotations treated in the studies included mostly small grains in various rotations with legumes, row crops like corn or other small grains.
In calculating emissions-avoided from avoided agricultural chemical use, for the base rotation, we used a two-year corn-soybean rotation, averaged with the results from corn in monoculture. For the extended rotation, we used two four-year rotations comprised of corn-corn-alfalfa-alfalfa and corn-soybeans-alfalfa-alfalfa.

**a. Carbon sequestration in soils**

In converting years three and four of either a corn-soybean-corn-soybean rotation or a continuous corn rotation (corn-corn-corn-corn) to alfalfa or a perennial grass, organic carbon is sequestered in soils. The biological and biochemical processes that are involved are the same as were discussed for the conversion of cropland to hayland and restored grassland (see Section IV, Subsection Aa and Section IV, Subsection Ka).

In Table 52, an estimate of 32,000 CO₂-equivalent tons was given for annual carbon sequestration on 100,000 acres of cropland converted from corn monoculture or corn-soybean rotation to a four-year rotation that includes alfalfa or a nonleguminous perennial grass in rotational years 3 and 4. As discussed above, this estimate was developed using an average rate of sequestration per acre, discounted to account for an assumed 20-year persistence of newly stored carbon in soils and biomass. Since most of the science of terrestrial carbon sequestration is developed in metric units, this average annual sequestration rate is given first in metric tons of carbon per hectare (see Table 53 below) and converted to CO₂-equivalent short tons for inclusion in summary Table 52.

In developing these estimates, 28 studies were reviewed, including five modeling studies, 15 empirical site studies, four statistical summaries or derivative statistical analyses, and three literature reviews or studies that report average sequestration rates based on expert judgment. In calculating the estimate for sequestration given in Table 52 for 100,000 acres with extended rotations with alfalfa or perennial grasses, we used a simple average of the results from these 29 studies, or 0.52 ± 0.17 metric tons of carbon per hectare per year (0.23 ± 0.08 short tons of carbon per acre per year). These are estimated rates prior to truncation to accommodate an assumed 20-year persistence of stored carbon in soils and biomass. No meta-analysis of published studies was available to support a calculation.

The descriptive statistics for these 29 studies are shown in Table 53. Of these, 26 studies reported net carbon sequestration, while three reported losses of carbon. The calculated confidence interval for the set of all studies that were reviewed was fairly broad, suggesting that, while the direction of the change in soil carbon in well understood more may need to be done to narrow the range of possible average annual sequestration rates. Across study types, annual sequestration rates range from 0.22 to 0.71 metric tons of carbon per hectare (0.10 to 0.31 short tons of carbon per acre per year).

By type of hay or perennial grass, there was relatively little difference in estimated rates of annual carbon sequestration. Sequestration in studies that sampled soil carbon below 16 inches (40 centimeters) was identical to estimated average sequestration in studies with more shallow sampling depths. By length of study, sequestration was extremely rapid in studies of ten years or less, but based only a few studies. Sequestration rates for studies that measured the change in carbon stocks over periods of 10 to 30 years were generally similar to the mean sequestration rate for all 29 studies that were reviewed.

**b. Nitrous oxide**

Nitrous oxide is produced microbially in soils in the presence of soil ammonium and nitrate. The processes and environmental controls on N₂O production in grasslands were discussed in the section on
restored grassland (see Section IV, Subsection Ab). They are the same as occur in cropland planted to perennial grasses and alfalfa for harvest in rotation with annual crops.

**Table 53. Descriptive statistics: Add a perennial grass or alfalfa to crop rotation – carbon sequestration in soils**

<table>
<thead>
<tr>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of study results</th>
<th>ratio of sequestration to emission: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>0.52</td>
<td>29/3</td>
<td>0.17</td>
<td>0.18</td>
<td>0.85</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries a</td>
<td>0.40</td>
<td>4/0</td>
<td>0.21 (0.02)</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>empirical site studies</td>
<td>0.71</td>
<td>16/3</td>
<td>0.30</td>
<td>0.11</td>
<td>1.30</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.22</td>
<td>6/0</td>
<td>0.05</td>
<td>0.12</td>
<td>0.32</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>0.27</td>
<td>3/0</td>
<td>0.12</td>
<td>0.04</td>
<td>0.50</td>
</tr>
<tr>
<td>alfalfa added to rotation</td>
<td>0.59</td>
<td>10/1</td>
<td>0.29</td>
<td>0.02</td>
<td>1.16</td>
</tr>
<tr>
<td>generic perennial added to rotation</td>
<td>0.51</td>
<td>4/0</td>
<td>0.19</td>
<td>0.14</td>
<td>0.87</td>
</tr>
<tr>
<td>other hay, unidentified hay or grass leys added to rotation</td>
<td>0.20</td>
<td>12/1</td>
<td>0.03</td>
<td>0.14</td>
<td>0.27</td>
</tr>
<tr>
<td>5 to 30 cm soil sampling/modeling depths</td>
<td>0.42</td>
<td>14/1</td>
<td>0.17</td>
<td>0.09</td>
<td>0.75</td>
</tr>
<tr>
<td>&gt;30 cm soil sampling/modeling depths</td>
<td>0.42</td>
<td>8/0</td>
<td>0.26 (0.09)</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>1 to 10 year annual sequestration rate</td>
<td>1.93</td>
<td>3/0</td>
<td>1.22 (0.45)</td>
<td>4.31</td>
<td></td>
</tr>
<tr>
<td>&gt;10 to 30 year annual sequestration rate</td>
<td>0.53</td>
<td>12/1</td>
<td>0.24</td>
<td>0.06</td>
<td>0.99</td>
</tr>
<tr>
<td>&gt;30 year sequestration rate</td>
<td>0.19</td>
<td>9/1</td>
<td>0.05</td>
<td>0.10</td>
<td>0.28</td>
</tr>
</tbody>
</table>

a statistical summaries or derivative statistical analyses other than meta-analyses
b 29 study results, 28 studies (4 statistical summaries or derivative statistical analyses, 5 modeling studies, 15 empirical site studies, 3 expert reviews, 1 modeling/empirical site study)
c 1 study reports multiple results by study type
d ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions

Avoided-emissions from the extension of annual rotations using several years of either perennial grasses or alfalfa are calculated as the product of the estimated percentage change in emission from extended rotations with perennials and the average Minnesota cropland emission. Estimated annual cropland emissions are from the MPCA greenhouse gas emission inventory. Using an average of the results from 15 studies with 16 study results that were reviewed, we estimate a 5 percent reduction in N\(_2\)O emissions from a change from annual rotations to extended rotations including several years of perennials. In the scientific literature, this is most often attributed to substantially reduced plant needs for synthetic nitrogen under a four-year rotation comprised of at least two years of either perennial grasses or alfalfa. (Benoit et al., 2015; Ellert and Janzen, 2008; MacKenzie et al., 1997; Osterholz et al., 2014) While alfalfa typically is fertilized at planting, it receives no nitrogen fertilizer during subsequent years of the stand. In addition, due to the buildup of organic nitrogen in soils under alfalfa, substantially less nitrogen is needed by annual crops following alfalfa in rotation. (Bierman et al., 2012) Perennial grasses in rotation also are unlikely to be fertilized.

The descriptive statistics for the studies that were reviewed are shown in Table 54 by study type. Ten empirical site studies were reviewed, as were three modeling studies, one statistical summary or derivative statistical analysis, and one a literature review. No formal meta-analysis was available to support a calculation. Of the 16 results from the 15 studies, in 14 N\(_2\)O emissions declined with extended rotations with perennials, while in two emissions increased. Directionally the results across studies agree, but often based on only a few studies and, as a group or set of groupings, with unsatisfactorily wide confidence intervals.
As in the case of many estimates of N\textsubscript{2}O change in this report, this is reason for some caution in using these estimates, even as they represent best available information. Presumably, more and better experimental data would shrink the confidence intervals to more acceptable widths. It is noteworthy that, regardless of how the N\textsubscript{2}O avoided-emission value develops, the aggregate change in greenhouse gas-avoidance is unlikely to diverge much from its estimated value. This is due to the relatively small contribution of N\textsubscript{2}O to the overall greenhouse gas budget shown in Table 52.

Finally, most of the studies that were reviewed focus on extended rotations with alfalfa, rather than nonleguminous hay or other perennial forages. The percentage reductions in N\textsubscript{2}O emissions for extended rotations with nonleguminous hay or other perennial forages are not substantially different from those for extended rotations with alfalfa. However, this is based on only a few studies of the former. A more robust dataset is needed to understand how N\textsubscript{2}O emissions might change under extended rotations with nonleguminous hay or other non-alfalfa perennial forages.

Table 54. Descriptive Statistics: Add a perennial grass or alfalfa to crop rotation - N\textsubscript{2}O

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of study results</th>
<th>change in emissions, ratio positive-to-negative: number of study results</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>-5%</td>
<td>16</td>
<td>2/14</td>
<td>9%</td>
<td>-22%</td>
<td>13%</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries (^a)</td>
<td>-3%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-1%</td>
<td>11</td>
<td>2/9</td>
<td>13%</td>
<td>-27%</td>
<td>24%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-18%</td>
<td>3</td>
<td>0/3</td>
<td>6%</td>
<td>-30%</td>
<td>-6%</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>-2%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>alfalfa</td>
<td>-3%</td>
<td>13</td>
<td>2/11</td>
<td>11%</td>
<td>-25%</td>
<td>18%</td>
</tr>
<tr>
<td>other hay or generic perennial</td>
<td>-10%</td>
<td>3</td>
<td>0/3</td>
<td>5%</td>
<td>-19%</td>
<td>0%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>6%</td>
<td>8</td>
<td>1/7</td>
<td>17%</td>
<td>-28%</td>
<td>39%</td>
</tr>
<tr>
<td>growing season flux monitoring/modeling</td>
<td>-14%</td>
<td>7</td>
<td>0/7</td>
<td>6%</td>
<td>-25%</td>
<td>-3%</td>
</tr>
</tbody>
</table>

\(^a\) statistical summaries or derivative statistical analyses other than meta-analyses
\(^b\) 16 study results, 15 studies (1 statistical summary or derivative statistical analysis, 3 modeling studies, 10 empirical site studies, 1 expert review)
\(^c\) 1 study reports multiple results by study type

M. Corn-soybean rotation in place of continuous corn

Generally, the conversion of cropland from monoculture to crops in rotation results in increased soil organic carbon sequestration and reduced greenhouse gas emissions. (Eagle \textit{et al.}, 2012; Varvel, 1994; West and Post, 2002) In Minnesota, about 13.5 million acres of cropland are planted in either corn or soybeans in two-year rotation with corn. (Bierman \textit{et al.}, 2012) Of this, about 10 percent or about 1.3 million acres are planted in corn in monoculture, also known as continuous corn. A corn-soybean rotation is favored by farmers due to generally higher corn yields, and generally higher per acre profitability. (Al-Kaisi \textit{et al.}, 2015)

Table 55 shows the estimated net annual greenhouse gas balance from converting cropland from continuous corn to a two-year corn-soybean rotation. For each 100,000 acres of cropland converted from continuous corn to corn and soybeans, an estimated additional 40,000 CO\textsubscript{2}-equivalent short tons of greenhouse gases would be emitted annually, or 0.4 short CO\textsubscript{2}-equivalent tons per acre. About 69,000 CO\textsubscript{2}-equivalent short tons would be emitted from soils in the form of CO\textsubscript{2}. A part of this emission would be offset by reductions in the direct emission of N\textsubscript{2}O from soils, an estimated 11,000 CO\textsubscript{2}-equivalent...
short tons. A further 17,000 would be offset by avoided upstream emissions from the manufacture of nitrogen fertilizer that would be avoided under a two-year corn-soybean rotation.

Table 55. Corn-soybean rotation replacing continuous corn: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year) (^a)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{N}_2\text{O})-direct</td>
<td>soils</td>
<td>(11,147)</td>
<td>crop production</td>
</tr>
<tr>
<td>(\text{N}_2\text{O})-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>not known</td>
<td>crop production</td>
</tr>
<tr>
<td>(\text{N}_2\text{O})-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>not known</td>
<td>crop production</td>
</tr>
<tr>
<td>(\text{CH}_4)</td>
<td>soils</td>
<td>not known</td>
<td>crop production</td>
</tr>
<tr>
<td>(\text{CO}_2) (^b)</td>
<td>carbon accumulation in soils and biomass</td>
<td>69,182</td>
<td>crop production</td>
</tr>
<tr>
<td>(\text{CO}_2)</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(909)</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(17,296)</td>
<td>crop production</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>39,830</strong></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) positive = emissions increase, negative = emissions reduction
\(^b\) carbon accumulation in soils = net removal of \(\text{CO}_2\) from the atmosphere = net emission reduction

Under soybean production, substantially less biogenic carbon in the form of crop residues is returned annually to soils than would be the case under corn production. With reduced carbon inputs, but unchanged respiration-related losses, soil carbon declines, implying a net emission of \(\text{CO}_2\) to the atmosphere. Direct emissions of \(\text{N}_2\text{O}\) decline in a corn-soybean rotation due to zero or near-zero synthetic nitrogen requirements of soybeans and reduced synthetic nitrogen applications to corn.

Out of state emissions from fertilizer manufacture decline as nitrogen, fertilizer needs contract. Regarding \(\text{CH}_4\) emissions and \(\text{N}_2\text{O}\) emissions downstream after nitrate leaching or ammonium volatilization, not enough is known to support an analysis of how emissions from these sources might change.

A number of estimates have been developed of the net change in greenhouse gas emissions resulting from use of a two-year corn-soybean rotation *in lieu* of corn following corn. These are shown below in Table 56 in \(\text{CO}_2\)-equivalent short tons per 100,000 acres. With one notable exception, they support a range of emissions increase of 21,000 to 78,000 short \(\text{CO}_2\)-equivalent tons for each 100,000 of conversions.

---

\(^{12}\) This assumes nitrogen fertilization rates, under continuous corn, of 162 lbs per acre, and 110 lbs per acre for corn and 0 lbs per acre for soybeans under a two-year corn-soybean rotation.
CO₂ emissions from cropland soils are discussed below, as are avoided direct emissions of N₂O from reduced mineral fertilizer needs under a two-year corn-soybean rotation. As noted just above, insufficient information is available to support an assessment of how soil CH₄ oxidation under continuous corn might change under a two-year corn-soybean rotation.

a. Carbon sequestration in soils

Crop residues contain substantial amounts of organic carbon in the form of biomass. After grain harvest, these are returned to the soil either as surface residues or, after incorporation, as buried crop residues. In soil in which the mass of soil organic carbon is stable, returned crop residues act to offset respiration losses of carbon. With reduced residue inputs to soils, a part of respiration losses are not offset, leading to a net loss of carbon from soils in the form of CO₂ emission to the atmosphere.

Soybeans produce substantially less crop residue than does corn, 60 to 70 percent less. Because of this, averaged over two years, a corn-soybean rotation produces and returns to soil 20 to 30 percent less biomass carbon than does continuous corn. (Gal et al., 2007; Pikul et al., 2008) As a result, soils under a two-year corn-soybean rotation lose soil organic carbon relative to soils under continuous corn, typically 0.1 to 0.3 short tons of carbon per acre per year. (West and Post, 2002; Pikul et al., 2008; Adviento-Borbe et al., 2007) Of this loss, most or all is incurred during the soybean year of the rotation, based on eddy covariance studies of net ecosystem carbon change under a corn-soybean rotation. (Baker and Griffis, 2005; Verma et al., 2005)

Generally, all other things being equal, soil organic carbon is positively correlated with residue returns to the soil, increasing linearly with residue return. (Clapp et al., 2000; Havlin et al., 1990; Huggins et al., 2007; Larson et al., 1972) Other factors that might play a role in the observed difference in soil organic carbon under continuous corn and the two-year corn-soybean rotation include possible decreased soil aggregation under the two year rotation and accelerated residue decomposition with high nitrogen soybean residues. (Coulter et al., 2009) With decreased soil aggregation, organic carbon in soils is less protected against microbial decomposition, leading to soil carbon loss. Soil aggregation is known to decline with decreased inputs of organic matter to soils. As discussed above in the cover crop section of this report (see Section IV, Subsection Ga), soil macroaggregates are bound together by organic acids and polymers derived from decomposing soil organic matter.

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of study</th>
<th>CO₂-eq. short tons per acre per year</th>
<th>CO₂-eq. short tons per 100,000 acres per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adviento-Borbe et al. (2007)</td>
<td>empirical site study</td>
<td>0.78</td>
<td>78,461</td>
</tr>
<tr>
<td>Archer and Halvorson (2010)</td>
<td>empirical site study</td>
<td>0.34</td>
<td>34,483</td>
</tr>
<tr>
<td>Doberman et al. (2007)</td>
<td>empirical site study</td>
<td>0.21</td>
<td>21,142</td>
</tr>
<tr>
<td>Mosier et al. (2005)</td>
<td>empirical site study</td>
<td>0.29</td>
<td>29,040</td>
</tr>
<tr>
<td>Mosier et al. (2006)</td>
<td>empirical site study</td>
<td>0.42</td>
<td>42,141</td>
</tr>
<tr>
<td>Robertson et al. (2011)</td>
<td>modeling study</td>
<td>(0.54)</td>
<td>(53,942)</td>
</tr>
<tr>
<td>Walters et al. (2007)</td>
<td>modeling study</td>
<td>0.47</td>
<td>47,208</td>
</tr>
<tr>
<td>Sainju et al. (2016)</td>
<td>meta-analysis</td>
<td>0.22</td>
<td>22,483</td>
</tr>
<tr>
<td>This report</td>
<td>literature review</td>
<td>0.40</td>
<td>39,830</td>
</tr>
</tbody>
</table>

* results as reported without adjustments
Soybean residues are rich in nitrogen, which, it is thought, promotes rapid decomposition of organic matter relative to decomposition of corn-derived residues that are relatively nitrogen poor. (Jagadamma et al., 2007)

By converting from corn monoculture to a two-year corn-soybean rotation, an estimated 0.69 short tons of CO₂ per acre would be emitted to the atmosphere annually (0.19 short tons of carbon per acre). This estimate was developed from a simple arithmetic average of 27 studies that were reviewed. These included: one derivative statistical study of literature estimates, two modeling studies, 23 empirical site studies and one literature review. No meta-analysis was available to support the calculation. In developing the emission rate estimates, the calculations were done initially in metric units and then converted to English or common units. On 100,000 acres, an estimated 69,000 short tons of CO₂ would be emitted annually.

The descriptive statistics for the studies that were reviewed are shown in Table 5.7. Of the two modeling studies, one showed a net gain in soil organic carbon under corn-soybean rotation on cropland formerly in corn monoculture. In the other 26 studies, SOC storage in cropland under corn-soybean rotation declined after conversion from continuous corn. Using the average value for all 27 studies that were reviewed, cropland soils formerly under corn monoculture but converted to a two-year corn-soybean rotation are estimated to lose 0.42 ± 0.1 metric tons of carbon per hectare (0.19 short tons of carbon per acre) annually. Excluding the one odd modeling result, estimates of SOC loss in the reviewed studies range from 0.19 to 0.64 metric tons of carbon per hectare per year (0.08 to 0.29 short tons of carbon per acre per year). The one available derivative statistical analysis of estimates from the published literature gives a slightly lower value (0.22 metric tons of carbon per hectare per year) than the mean value from the 27 studies, but is based on a set of somewhat older studies dating from the 1980s and 1990s.

By soil depth, per hectare emissions are somewhat larger with soil sampling at or below 12 inches (30 centimeters), but based on a relatively few study results. Emission rates in studies that average SOC change over periods longer than 20 years are somewhat less, suggesting that, beyond 20 years, soils may begin to approach a new equilibrium beyond which emissions cease.

### Table 5.7. Descriptive statistics: Corn-soybean rotation replacing continuous corn - carbon sequestration in soils

<table>
<thead>
<tr>
<th></th>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of studies</th>
<th>ratio of sequestration to emission: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>(0.42)</td>
<td>27</td>
<td>2/25</td>
<td>0.10</td>
<td>(0.62)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries a</td>
<td>(0.19)</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>(0.48)</td>
<td>23</td>
<td>1/22</td>
<td>0.11</td>
<td>(0.70)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.08</td>
<td>2</td>
<td>1/1</td>
<td>0.29</td>
<td>(0.50)</td>
<td>0.63</td>
</tr>
<tr>
<td>5 to 30 cm soil sampling/modeling depth b</td>
<td>(0.38)</td>
<td>18</td>
<td>1/17</td>
<td>0.09</td>
<td>(0.56)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>&gt; 30 cm soil sampling/modeling depth b</td>
<td>(0.64)</td>
<td>7</td>
<td>0/7</td>
<td>0.30</td>
<td>(1.22)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>1 to 10 year annual sequestration rate</td>
<td>(0.59)</td>
<td>9</td>
<td>0/9</td>
<td>0.16</td>
<td>(0.90)</td>
<td>(0.28)</td>
</tr>
<tr>
<td>10 to 20 year annual sequestration rate</td>
<td>(0.40)</td>
<td>12</td>
<td>2/10</td>
<td>0.19</td>
<td>(0.78)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>20 to 30 yr annual sequestration rate</td>
<td>(0.21)</td>
<td>7</td>
<td>0/7</td>
<td>0.04</td>
<td>(0.29)</td>
<td>(0.13)</td>
</tr>
</tbody>
</table>

a statistical summaries or derivative statistical analyses other than meta-analyses
b results for lowest reported sampling depth
c 27 studies, 27 study results
d ratio of the number of studies reporting net sequestration to the number of studies reporting net emissions
b. Nitrous oxide

$\text{N}_2\text{O}$ emissions generally decline in cropland converted from continuous corn to a corn-soybean rotation. In the US, soybeans are unfertilized with nitrogen or are fertilized at low levels of nitrogen fertilizer. Two-year nitrogen fertilizer totals for the corn-soybean rotation are often half of those for continuous corn. The rate of application of synthetic nitrogen to cropland is one of the dominant controls on $\text{N}_2\text{O}$ emission. Using the standard method, one percent of each unit of nitrogen applied as fertilizer to crops is converted to $\text{N}_2\text{O}$ in soils and emitted to the atmosphere. (IPCC, 2006) Based on the US national greenhouse gas inventory, emissions of $\text{N}_2\text{O}$ from fertilizer use on cropland account for about one-third of total cropland $\text{N}_2\text{O}$ emissions. (USEPA, 2017)

Reviewing the literature, $\text{N}_2\text{O}$ emission reductions under corn-soybean rotations are usually attributed to reduced synthetic nitrogen applications, generally during the soybean phase of the rotation. (Behnke et al., 2008; Drury et al., 2008; Gregorich et al., 2015; Osterholz et al., 2014) A contributing factor could be high amounts of incorporated crop residue that, in continuous corn, promote the formation of anaerobic conditions in the plow layer and promote $\text{N}_2\text{O}$ production and emission through enhanced rates of denitrification. (Ventera and Coulter, 2015) Where $\text{N}_2\text{O}$ emissions do not decline with a change to a corn-soybean rotation, this is sometimes attributed to the effect of confounding influences. (Decock, 2014) Where soil fertilization is a dominant control on $\text{N}_2\text{O}$ emissions, this control is substantially modulated by the influence of soil qualities like soil texture, clay content, water-holding capacity, aeration and SOC content, as well as weather and weather events, particularly in relation to fertilization events. At any one site in any one year, these influences can overwhelm the influence of nitrogen fertilizer on observed $\text{N}_2\text{O}$ emissions.

From Table 55, it is estimated that the conversion of 100,000 acres of cropland formerly in corn monoculture to a corn-soybean rotation would reduce $\text{N}_2\text{O}$ emissions by 11,000 CO$_2$-equivalent tons. This estimate was developed using the results from 17 published studies. Emission reductions are calculated as the product of the estimated average percentage change in emissions resulting from converting cropland formerly in corn monoculture to a corn-soybean rotation and average Minnesota cropland $\text{N}_2\text{O}$ emissions. As discussed in the section on methods, average Minnesota cropland $\text{N}_2\text{O}$ emissions are from the MPCA Greenhouse Gas Inventory. We used the mean estimate from all 17 studies reviewed as the best estimate of the percentage change in $\text{N}_2\text{O}$ emission with corn-soybean rotation on croplands formerly in corn monoculture. Using the mean estimate for all reviewed studies, the conversion of cropland formerly in corn monoculture to a two-year corn-soybean rotation is estimated to reduce $\text{N}_2\text{O}$ emissions by 17.5 ± 8.3 percent.

The studies that were reviewed included: 15 empirical site studies, one modeling study and one meta-analysis. Of the 17 studies reviewed, 13 reported reduced $\text{N}_2\text{O}$ emissions with corn-soybean rotation on cropland formerly in corn monoculture and 4 reported increases. The one available meta-analysis reported a slight reduction in emissions, the modeling study showed an increase in emissions. The average value of the results from all of the studies was selected as most consistent with observed rates of synthetic nitrogen usage by rotations and the consensus in the scientific literature on the response of $\text{N}_2\text{O}$ soil emissions to nitrogen use on croplands, both directionally and in its magnitude.\(^{13}\)

\(^{13}\) With fertilizer-based emissions comprising about 30 percent of average cropland emissions, and with a generally linear relationship between $\text{N}_2\text{O}$ and nitrogen applications, a 50 percent reduction in nitrogen application rates should result in about a 15 percent overall reduction in emissions. Of the estimates given in Table 58, the estimate using the mean of all studies is most in agreement with this understanding.
The descriptive statistics for the reviewed studies are shown in Table 58, with standard errors and confidence intervals. The confidence interval for the percentage change for all studies is broad, though exclusively in negative territory. The width of the confidence interval provides adequate reason for caution. Clearly, a wide range of estimates are possible, though the weight of the evidence broadly supports a negative value.

Table 58. Descriptive statistics: Corn-soybean rotation replacing continuous corn - N$_2$O

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>-17%</td>
<td>17</td>
<td>4/13</td>
<td>8%</td>
<td>-34%</td>
<td>-1%</td>
</tr>
<tr>
<td>meta-analysis</td>
<td>-2%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-21%</td>
<td>15</td>
<td>3/12</td>
<td>9%</td>
<td>-38%</td>
<td>-3%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>15%</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>16%</td>
<td>6</td>
<td>4/2</td>
<td>14%</td>
<td>-11%</td>
<td>43%</td>
</tr>
<tr>
<td>growing season flux monitoring/modeling</td>
<td>-41%</td>
<td>10</td>
<td>0/10</td>
<td>5%</td>
<td>-50%</td>
<td>-31%</td>
</tr>
<tr>
<td>1 to 2 yrs of observations</td>
<td>-8%</td>
<td>7</td>
<td>2/5</td>
<td>18%</td>
<td>-45%</td>
<td>28%</td>
</tr>
<tr>
<td>3 years-plus of observations</td>
<td>-22%</td>
<td>8</td>
<td>2/6</td>
<td>9%</td>
<td>-41%</td>
<td>-4%</td>
</tr>
</tbody>
</table>

*17 studies, 17 study results

Also troubling is the mean percent change estimated for studies that give results on an annual basis, rather than growing season basis. The number of studies is quite small, and if we limit the population of studies to empirical site studies, is but four studies. While this is far too few studies to conclude anything, particularly with respect to notoriously variable N$_2$O emissions estimates, the anomalous increase in N$_2$O emissions in these studies argues for caution. Clearly a good many more empirical studies of this question are required for a more certain quantitative estimate of response of N$_2$O emissions to rotation change.

V. Practices for which only preliminary estimates are available

In addition to the 13 practices for which we have final results for GHG-avoidance, we have developed preliminary analyses for an additional eight practices. These include:

- Restored and constructed wetlands
- Biochar
- Nitrification and urease inhibitors
- Controlled release nitrogen fertilizers
- Split nitrogen fertilizer application
- Subsurface nitrogen fertilizer application
- Spring nitrogen fertilizer application *in lieu* of fall application
- Fifteen percent per acre nitrogen fertilizer use reduction

Construct wetlands are engineered wetlands constructed on former croplands to intercept the flow of nutrients and sediments from croplands to lakes, rivers and streams. Restored wetlands are drained wetlands that have been hydrologically restored, typically by blocking drainage ditches or disconnecting drainage piping.
Biochar is a charcoal-like soil amendment produced through pyrolysis using, among other feedstocks, crop residues. Biochar is highly resistant to microbial degradation in soils. As a soil amendment, biochar acts to rapidly build soil organic carbon in soils, in the process, offsetting CO$_2$ emissions elsewhere in the economy.

Nitrification inhibitors are chemical additives to nitrogen fertilizers that act to impede the operation of the soil enzyme responsible for nitrification, delaying nitrification until later in the growing season when crop nitrogen needs are greatest. Urea inhibitors act to impede the operation of the urease enzyme, which plays the central role in the hydrolysis of urea fertilizer to ammonium and CO$_2$. Urease inhibitors act similarly to nitrification inhibitors, delaying the availability of nitrogen, in the form of ammonium in the case of urease inhibitors, to crops until the time of greatest crop nitrogen needs.

Controlled release fertilizers are a polymer-coated granular form of nitrogen fertilizer that, through diffusion through the polymer coating, only slowly releases nutrients to the soil and plant roots. The rate of diffusion is controlled by soil temperature and moisture, allowing its rate of release to be coordinated with the time of greatest crop nutrient needs.

It is conventional to apply nitrogen fertilizer in a single application at, before or immediately after planting. In split fertilizer application, fertilizer is applied to soils in two or three applications spaced throughout the crop-growing season to coincide with crop nutrient needs. Nitrogen applied near the plant root zone is readily available to the plant. With subsurface application, nitrogen fertilizer is placed below the soil surface near the root zone through injection in a liquid form or surface broadcast followed by incorporation by tillage. Granular fertilizer also can be placed near the root zone with an air drill.

Finally, some crop producers apply fertilizer in the fall, a slower time of the year when there are fewer competing demands on farm labor. Fall fertilizer application can result in substantial losses of nitrogen to the environment through leaching and ammonia volatilization. With spring fertilizer application, nitrogen is applied closer in time to plant needs, lessening the risk of loss. With a 15 percent per acre nitrogen fertilizer reduction, average rates of application are brought nearer to agronomic rates. In the US, as much as 50 percent of applied nitrogen fertilizer is lost to the environment, in part due to over-application.

Preliminary analyses have been developed for these eight practices. The results of those analyses are provided in Appendices A through H in table form. For each practice, we provide preliminary results in the form of an itemized budget of emissions-avoidance by emissions source, along with descriptive statistics for the body of published literature on which those results reside.

Of these eight practices, the most effective in reducing GHG emissions, at least on a preliminary basis, are, in order: biochar, controlled release nitrogen fertilizers (CRFs), nitrification inhibitors (NIs) and urease inhibitors (UIs) as a group, and split nitrogen fertilizer application. GHG emissions are mitigated with a 15 percent nitrogen fertilizer reduction, but the overall effect on emissions is small on an area basis. In the case of biochar, the emissions-avoidance effect is principally a soil carbon effect. CRFs, NIs, UIs and split application all act to improve the nutrient use efficiency of crop production, lowering the availability of soil nitrate and ammonium at times when crop needs are least, and reducing N$_2$O emissions as a result.

GHG emissions rise substantially with continuously inundated constructed and restored wetlands. Wetlands of any type are CH$_4$ producers. In continuously inundated constructed and restored wetlands,
the effects of increased CH$_4$ production in wetland sediments tend to overwhelm all other effects, including enhanced carbon sequestration in wetlands soils. By contrast, wetlands that are seasonally inundated may act similarly to riparian buffers, resulting in net GHG reductions upon restoration. A wet meadow might be a good example of a seasonally inundated wetland. The preliminary results given in Appendix D suggest that subsurface nitrogen application and spring fertilizer application may lead to increased GHG emissions, although again these results are preliminary.

There is a general dearth of research results for these eight practices, excepting nitrification and urease inhibitors, controlled release fertilizers, and biochar. This inhibits the effort to form firm conclusions on emissions-avoidance for many of these practices.

For constructed and restored wetlands, there are interesting design question to be explored, including possible use of specific types of vegetation and inundation regimes to minimize CH$_4$ production and to maximize sediment carbon storage.

As these explorations are completed, we will amend this report to provide updated, finalized emissions-avoidance estimates.
# Appendix A. Constructed and restored wetlands

Table A1. Constructed and restored wetlands: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO$_2$-e short tons per 100,000 acres per year) $^a$</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N$_2$O-direct</td>
<td>soils or sediments</td>
<td>(4,856)</td>
<td></td>
</tr>
<tr>
<td>N$_2$O-indirect</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(2,169)</td>
<td></td>
</tr>
<tr>
<td>leaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CH$_4$</td>
<td>soils or sediments</td>
<td>218,640</td>
<td></td>
</tr>
<tr>
<td>CO$_2$</td>
<td>carbon accumulation in wetland sediments and biomass</td>
<td>(109,022)</td>
<td></td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>(6,892)</td>
<td></td>
</tr>
<tr>
<td>Out-of-StateGHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>(20,190)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>65,517 $^c$</td>
<td></td>
</tr>
</tbody>
</table>

Emissions with Alternative Number of Years of Assumed Carbon Storage in Soils and Biomass

| 40 year storage      | all sources and sinks                                       | (43,505)                                                     |                |
| 100 year storage     | all sources and sinks                                       | (370,571)                                                    |                |

$^a$ positive = emissions increase, negative = emissions reduction  
$^b$ carbon accumulation in soil and biomass = net removal of CO$_2$ from the atmosphere = net emission reduction  
$^c$ assumes 20 years of sustained storage of newly sequestered organic carbon in soils and biomass
### Table A2. Descriptive statistics: Constructed and restored wetlands – carbon sequestration in soils and biomass

<table>
<thead>
<tr>
<th></th>
<th>biogenic carbon sequestration (Mg C/ha/yr)</th>
<th>number of studies</th>
<th>ratio of sequestration to emission: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>total ecosystem carbon (NECB/NBP)</td>
<td>1.73</td>
<td>38</td>
<td>32/6</td>
<td>0.44</td>
<td>0.88</td>
<td>2.59</td>
</tr>
<tr>
<td>soil organic carbon (SOC) only</td>
<td>1.92</td>
<td>38</td>
<td>25/3</td>
<td>0.32</td>
<td>1.28</td>
<td>2.55</td>
</tr>
<tr>
<td>eddy covariance empirical site studies (NECB/NBP)</td>
<td>1.78</td>
<td>19</td>
<td>18/1</td>
<td>0.55</td>
<td>0.70</td>
<td>2.86</td>
</tr>
<tr>
<td>chamber empirical site studies (NECB/NBP)</td>
<td>1.50</td>
<td>18</td>
<td>13/5</td>
<td>0.72</td>
<td>0.10</td>
<td>2.91</td>
</tr>
<tr>
<td>empirical site studies-soil sampling</td>
<td>2.16</td>
<td>32</td>
<td>30/2</td>
<td>0.38</td>
<td>1.41</td>
<td>2.91</td>
</tr>
<tr>
<td>meta-analyses</td>
<td>1.69</td>
<td>1</td>
<td>1/0</td>
<td>0.05</td>
<td>1.59</td>
<td>1.78</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries</td>
<td>1.78</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>modeling studies</td>
<td>0.18</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>expert judgment/literature review</td>
<td>1.38</td>
<td>19</td>
<td>18/1</td>
<td>0.25</td>
<td>0.88</td>
<td>1.87</td>
</tr>
<tr>
<td>freshwater mineral wetlands</td>
<td>2.12</td>
<td>57</td>
<td>55/2</td>
<td>0.31</td>
<td>1.51</td>
<td>2.72</td>
</tr>
<tr>
<td>peatlands</td>
<td>1.44</td>
<td>36</td>
<td>29/7</td>
<td>0.45</td>
<td>0.56</td>
<td>2.33</td>
</tr>
<tr>
<td>1 to 9 year old constructed/restored wetlands</td>
<td>2.88</td>
<td>37</td>
<td>33/4</td>
<td>0.50</td>
<td>1.85</td>
<td>3.91</td>
</tr>
<tr>
<td>10 year old-plus constructed/restored wetlands</td>
<td>1.59</td>
<td>33</td>
<td>28/5</td>
<td>0.39</td>
<td>0.83</td>
<td>2.35</td>
</tr>
</tbody>
</table>

- NECB = Net Ecosystem Carbon Balance; NBP = Net Biome Productivity
- 

### Table A3. Descriptive statistics: Constructed and restored wetlands – CH₄

<table>
<thead>
<tr>
<th></th>
<th>emissions (kg CH₄/hectare/yr)</th>
<th>number of studies</th>
<th>ratio, positive to negative results: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses and other derivative statistical analyses or statistical summaries</td>
<td>194</td>
<td>8</td>
<td>8/0</td>
<td>30.76</td>
<td>134</td>
<td>254</td>
</tr>
<tr>
<td>all studies</td>
<td>301</td>
<td>81</td>
<td>79/2</td>
<td>40.00</td>
<td>223</td>
<td>380</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>278</td>
<td>66</td>
<td>64/2</td>
<td>39.69</td>
<td>200</td>
<td>356</td>
</tr>
<tr>
<td>eddy covariance site studies</td>
<td>375</td>
<td>12</td>
<td>12/0</td>
<td>83.80</td>
<td>211</td>
<td>540</td>
</tr>
<tr>
<td>other site studies</td>
<td>253</td>
<td>52</td>
<td>50/2</td>
<td>46.34</td>
<td>162</td>
<td>344</td>
</tr>
<tr>
<td>modeling studies</td>
<td>100</td>
<td>1</td>
<td>1</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>379</td>
<td>50</td>
<td>49/1</td>
<td>53.47</td>
<td>274</td>
<td>484</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>195</td>
<td>33</td>
<td>32/1</td>
<td>56.22</td>
<td>47</td>
<td>343</td>
</tr>
<tr>
<td>constructed wetlands studies</td>
<td>395</td>
<td>29</td>
<td>29/0</td>
<td>75.56</td>
<td>308</td>
<td>483</td>
</tr>
<tr>
<td>restored wetlands studies</td>
<td>250</td>
<td>52</td>
<td>50/2</td>
<td>44.88</td>
<td>162</td>
<td>337</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>357</td>
<td>33</td>
<td>32/1</td>
<td>74.47</td>
<td>211</td>
<td>503</td>
</tr>
<tr>
<td>&gt; 1 year of observations or simulations</td>
<td>283</td>
<td>25</td>
<td>24/1</td>
<td>71.77</td>
<td>142</td>
<td>424</td>
</tr>
<tr>
<td>1 to 9 year old constructed/restored wetlands</td>
<td>178</td>
<td>29</td>
<td>27/2</td>
<td>42.02</td>
<td>96</td>
<td>260</td>
</tr>
<tr>
<td>10 year old-plus constructed/restored wetlands</td>
<td>365</td>
<td>40</td>
<td>40/0</td>
<td>62.29</td>
<td>243</td>
<td>487</td>
</tr>
<tr>
<td>studies with pre-restoration counterfactual</td>
<td>170</td>
<td>23</td>
<td>21/2</td>
<td>67.09</td>
<td>41</td>
<td>299</td>
</tr>
</tbody>
</table>

- Negative emissions = removal from atmosphere and destruction in soils
- 

---

Greenhouse gas reduction potential of agricultural best management practices  •  October 2019  Minnesota Pollution Control Agency
Table A4. Descriptive statistics: Constructed and restored wetlands – N₂O

<table>
<thead>
<tr>
<th>Emissions (kg N₂O/hectare/yr)</th>
<th>Number of studies</th>
<th>Ratio, positive to negative results: study numbers</th>
<th>Standard error of mean (+/-)</th>
<th>Lower 95% confidence interval</th>
<th>Upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>0.0020</td>
<td>31/0</td>
<td>1.31</td>
<td>1.87</td>
<td>7.01</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>0.0017</td>
<td>26/0</td>
<td>1.31</td>
<td>1.28</td>
<td>6.40</td>
</tr>
<tr>
<td>derivative statistical analyses or statistical summaries b</td>
<td>0.0000</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>constructed wetlands</td>
<td>0.0036</td>
<td>10/0</td>
<td>2.68</td>
<td>2.81</td>
<td>13.32</td>
</tr>
<tr>
<td>restored wetlands</td>
<td>0.0012</td>
<td>21/0</td>
<td>1.34</td>
<td>0.08</td>
<td>5.35</td>
</tr>
<tr>
<td>1 to 9 year old constructed/restored wetlands</td>
<td>0.0027</td>
<td>13/0</td>
<td>2.42</td>
<td>1.26</td>
<td>10.74</td>
</tr>
<tr>
<td>10 year old-plus constructed/restored wetlands</td>
<td>0.0036</td>
<td>14/0</td>
<td>2.13</td>
<td>3.98</td>
<td>12.34</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>0.0010</td>
<td>16/0</td>
<td>2.06</td>
<td>(1.72)</td>
<td>6.34</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>0.0023</td>
<td>12/0</td>
<td>2.09</td>
<td>1.06</td>
<td>9.24</td>
</tr>
<tr>
<td>1 year of observations or simulations</td>
<td>0.0024</td>
<td>16/0</td>
<td>1.85</td>
<td>1.69</td>
<td>8.93</td>
</tr>
<tr>
<td>&gt;1 year of observations or simulations</td>
<td>0.0021</td>
<td>13/0</td>
<td>2.15</td>
<td>0.47</td>
<td>8.91</td>
</tr>
<tr>
<td>studies with cropland counterfactuals</td>
<td>(0.0010)</td>
<td>7/1</td>
<td>1.92</td>
<td>(6.08)</td>
<td>1.43</td>
</tr>
</tbody>
</table>

a negative emissions = removal from atmosphere and destruction in soils
b derivative statistical studies other than meta-analyses

Appendix B. Biochar

Table B1. Biochar: Emissions-avoided a

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres per year) a</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>(17,996)</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>(325)</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(5,174)</td>
<td>crop production</td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>(572)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>carbon accumulation in soils</td>
<td>(138,936)</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>13,224</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>2,929</td>
<td>crop production</td>
</tr>
<tr>
<td>In-State Upstream GHGs</td>
<td></td>
<td>27,136</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(119,713)</td>
<td></td>
</tr>
</tbody>
</table>

a positive = emissions increase, negative = emissions reduction
Table B2. Descriptive statistics: Biochar - carbon sequestration in soils

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Studies</th>
<th>Change in Emissions, Ratio Positive-to-Negative: Study Numbers</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>biogenic carbon sequestration (Mg C/ha/yr)</td>
<td>0.85</td>
<td>10/10</td>
<td>0.03</td>
<td>0.79</td>
<td>0.91</td>
</tr>
<tr>
<td>meta-analyses-based mean residence time (MRT)</td>
<td>0.82</td>
<td>2/20</td>
<td>0.05</td>
<td>0.73</td>
<td>0.91</td>
</tr>
<tr>
<td>survey-based MRT</td>
<td>0.87</td>
<td>2/20</td>
<td>0.04</td>
<td>0.79</td>
<td>0.95</td>
</tr>
<tr>
<td>2 pool exponential model-based MRT</td>
<td>0.75</td>
<td>19/19</td>
<td>0.04</td>
<td>0.67</td>
<td>0.82</td>
</tr>
<tr>
<td>logarithmic degradation model-based MRT</td>
<td>0.82</td>
<td>3/30</td>
<td>0.02</td>
<td>0.78</td>
<td>0.86</td>
</tr>
<tr>
<td>literature review/expert judgment-based MRT</td>
<td>0.93</td>
<td>6/6</td>
<td>0.08</td>
<td>0.77</td>
<td>1.09</td>
</tr>
<tr>
<td>wood-derived biochar MRT</td>
<td>0.74</td>
<td>21/21</td>
<td>0.04</td>
<td>0.67</td>
<td>0.82</td>
</tr>
<tr>
<td>grassland bioenergy-derived biochar MRT</td>
<td>0.77</td>
<td>8/8</td>
<td>0.05</td>
<td>0.68</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Table B3. Descriptive statistics: Biochar – N₂O

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Studies</th>
<th>Change in Emissions, Ratio Positive-to-Negative: Study Numbers</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-28%</td>
<td>11/11</td>
<td>4%</td>
<td>-36%</td>
<td>-20%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-38%</td>
<td>25/23</td>
<td>7%</td>
<td>-52%</td>
<td>-25%</td>
</tr>
<tr>
<td>expert judgment/literature review</td>
<td>-25%</td>
<td>3/3</td>
<td>10%</td>
<td>-45%</td>
<td>-5%</td>
</tr>
<tr>
<td>wood-based biochar</td>
<td>-52%</td>
<td>4/4</td>
<td>12%</td>
<td>-75%</td>
<td>-30%</td>
</tr>
<tr>
<td>crop residue-based biochar</td>
<td>-59%</td>
<td>4/4</td>
<td>17%</td>
<td>-92%</td>
<td>-27%</td>
</tr>
<tr>
<td>0 to 10 Mg biochar per hectare</td>
<td>-21%</td>
<td>6/1</td>
<td>18%</td>
<td>-56%</td>
<td>14%</td>
</tr>
<tr>
<td>11 to 20 Mg biochar per hectare</td>
<td>-38%</td>
<td>7/1</td>
<td>13%</td>
<td>-63%</td>
<td>-13%</td>
</tr>
<tr>
<td>21 to 30 Mg biochar per hectare</td>
<td>-43%</td>
<td>9/1</td>
<td>8%</td>
<td>-59%</td>
<td>-27%</td>
</tr>
<tr>
<td>&gt;30 Mg biochar per hectare</td>
<td>-54%</td>
<td>6/6</td>
<td>12%</td>
<td>-78%</td>
<td>-30%</td>
</tr>
<tr>
<td>annual flux monitoring</td>
<td>-19%</td>
<td>7/2</td>
<td>15%</td>
<td>-48%</td>
<td>11%</td>
</tr>
<tr>
<td>growing season flux monitoring</td>
<td>-41%</td>
<td>17/17</td>
<td>7%</td>
<td>-55%</td>
<td>-28%</td>
</tr>
</tbody>
</table>

Table B4. Descriptive statistics: Biochar – CH₄

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of Studies</th>
<th>Change in Emissions, Ratio Positive-to-Negative: Study Numbers</th>
<th>Standard Error of Mean (±)</th>
<th>Lower 95% Confidence Interval</th>
<th>Upper 95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-28%</td>
<td>15/15</td>
<td>16%</td>
<td>-59%</td>
<td>4%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>56%</td>
<td>2/1</td>
<td>59%</td>
<td>-59%</td>
<td>170%</td>
</tr>
<tr>
<td>annual flux monitoring</td>
<td>-14%</td>
<td>13/4</td>
<td>14%</td>
<td>-68%</td>
<td>-13%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring</td>
<td>-45%</td>
<td>11/3</td>
<td>16%</td>
<td>-77%</td>
<td>-14%</td>
</tr>
<tr>
<td>0 to 20 Mg biochar application rate</td>
<td>-37%</td>
<td>6/2</td>
<td>19%</td>
<td>-73%</td>
<td>0%</td>
</tr>
<tr>
<td>&gt;20 Mg biochar application rate</td>
<td>-65%</td>
<td>5/0</td>
<td>25%</td>
<td>-115%</td>
<td>-15%</td>
</tr>
</tbody>
</table>
Appendix C. Split fertilizer application

Table C1. Split fertilizer application: Emissions-avoided \(^a\)

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO(_2)-e short tons per 100,000 acres) (^a)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\text{N}_2\text{O})-direct</td>
<td>soils</td>
<td>(13,125)</td>
<td>single application</td>
</tr>
<tr>
<td>(\text{N}_2\text{O})-indirect volatilization</td>
<td>indirect emission-Nitrogen volatilization, redeposition</td>
<td>108</td>
<td>single application</td>
</tr>
<tr>
<td>(\text{N}_2\text{O})-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(1,006)</td>
<td>single application</td>
</tr>
<tr>
<td>(\text{CH}_4)</td>
<td>soils</td>
<td>not known</td>
<td>single application</td>
</tr>
<tr>
<td>(\text{CO}_2)</td>
<td>carbon accumulation in soils</td>
<td>-</td>
<td>single application</td>
</tr>
<tr>
<td>(\text{CO}_2)</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>single application</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>568</td>
<td>single application</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>-</td>
<td>single application</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(13,455)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) positive = emissions increase, negative = emissions reduction

Table C2. Descriptive statistics: Split fertilizer application - \(\text{N}_2\text{O}\)

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-21%</td>
<td>5</td>
<td>2/3</td>
<td>12%</td>
<td>-31%</td>
<td>-10%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-8%</td>
<td>25</td>
<td>11/14</td>
<td>6%</td>
<td>-20%</td>
<td>3%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-2%</td>
<td>9</td>
<td>2/7</td>
<td>6%</td>
<td>-13%</td>
<td>8%</td>
</tr>
<tr>
<td>single split versus no splits</td>
<td>-11%</td>
<td>35</td>
<td>12/23</td>
<td>5%</td>
<td>-20%</td>
<td>-2%</td>
</tr>
<tr>
<td>more splits versus fewer splits</td>
<td>-1%</td>
<td>6</td>
<td>3/3</td>
<td>7%</td>
<td>-14%</td>
<td>12%</td>
</tr>
<tr>
<td>surface nitrogen application</td>
<td>-7%</td>
<td>11</td>
<td>3/8</td>
<td>6%</td>
<td>-19%</td>
<td>5%</td>
</tr>
<tr>
<td>subsurface nitrogen application</td>
<td>-8%</td>
<td>19</td>
<td>7/12</td>
<td>8%</td>
<td>-23%</td>
<td>8%</td>
</tr>
<tr>
<td>growing season and subgrowing season</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flux monitoring/modeling</td>
<td>-9%</td>
<td>17</td>
<td>5/12</td>
<td>7%</td>
<td>-23%</td>
<td>5%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>-7%</td>
<td>21</td>
<td>9/12</td>
<td>5%</td>
<td>-17%</td>
<td>3%</td>
</tr>
<tr>
<td>1 year or less of observations or simulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;1 to 2 years of observations or simulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>more than 2 years of observations or simulations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table C3. Descriptive statistics: Split fertilizer application - \(\text{CH}_4\)

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>-4%</td>
<td>8</td>
<td>3/5</td>
<td>9%</td>
<td>-22%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Greenhouse gas reduction potential of agricultural best management practices • October 2019

Minnesota Pollution Control Agency

104
### Appendix D. Subsurface fertilizer placement

#### Table D1. Subsurface fertilizer placement: Emissions-avoided *

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO$_{2}$-e short tons per 100,000 acres) *</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N$_2$O-direct</td>
<td>soils</td>
<td>36,750</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>N$_2$O-indirect</td>
<td>redeposition</td>
<td>(1,187)</td>
<td>fertilizer placement</td>
</tr>
<tr>
<td>N$_2$O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(4,999)</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>CH$_4$</td>
<td>soils</td>
<td>not known</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>carbon accumulation in soils</td>
<td>-</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>405</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>90</td>
<td>surface or shallow fertilizer placement</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>31,060</strong></td>
<td></td>
</tr>
</tbody>
</table>

* positive = emissions increase, negative = emissions reduction

#### Table D2. Descriptive statistics: Subsurface fertilizer placement – N$_2$O

<table>
<thead>
<tr>
<th>Influencing factor</th>
<th>Proportion (%)</th>
<th>Number of studies</th>
<th>change in emissions % change in emissions per hectare</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>58</td>
<td>7</td>
<td>52/32</td>
<td>37%</td>
<td>-1.5%</td>
<td>130%</td>
</tr>
<tr>
<td>meta-analyses (synthetic nitrogen-only)</td>
<td>10%</td>
<td>2</td>
<td>1/1</td>
<td>20%</td>
<td>-2.9%</td>
<td>49%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>61</td>
<td>53</td>
<td>38/15</td>
<td>18%</td>
<td>25%</td>
<td>97%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>21%</td>
<td>5</td>
<td>4/1</td>
<td>20%</td>
<td>-19%</td>
<td>61%</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>100%</td>
<td>1</td>
<td>1/0</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>synthetic nitrogen</td>
<td>30%</td>
<td>35</td>
<td>22/13</td>
<td>16%</td>
<td>-.1%</td>
<td>61%</td>
</tr>
<tr>
<td>manure nitrogen</td>
<td>125%</td>
<td>25</td>
<td>23/2</td>
<td>33%</td>
<td>60%</td>
<td>189%</td>
</tr>
<tr>
<td>conventional tillage</td>
<td>99%</td>
<td>13</td>
<td>8/5</td>
<td>66%</td>
<td>-30%</td>
<td>227%</td>
</tr>
<tr>
<td>reduced tillage</td>
<td>26%</td>
<td>7</td>
<td>5/2</td>
<td>14%</td>
<td>-1%</td>
<td>53%</td>
</tr>
<tr>
<td>no tillage</td>
<td>7%</td>
<td>12</td>
<td>7/5</td>
<td>12%</td>
<td>-17%</td>
<td>30%</td>
</tr>
<tr>
<td>surface versus deep application</td>
<td>78%</td>
<td>52</td>
<td>40/12</td>
<td>20%</td>
<td>40%</td>
<td>117%</td>
</tr>
<tr>
<td>shallow versus deep application</td>
<td>21%</td>
<td>18</td>
<td>13/5</td>
<td>11%</td>
<td>1%</td>
<td>42%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>41%</td>
<td>10</td>
<td>11/5</td>
<td>17%</td>
<td>7%</td>
<td>74%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>75%</td>
<td>43</td>
<td>33/10</td>
<td>23%</td>
<td>30%</td>
<td>121%</td>
</tr>
</tbody>
</table>
## Table D3. Descriptive statistics: Subsurface fertilizer placement – CH₄

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>2%</td>
<td>9</td>
<td>4/5</td>
<td>209%</td>
<td>-409%</td>
<td>412%</td>
</tr>
</tbody>
</table>

## Appendix E. Spring fertilizer placement

### Table E1. Spring fertilizer application: Emissions-avoided a

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO₂-e short tons per 100,000 acres) a</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N₂O-direct</td>
<td>soils</td>
<td>2,236</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect</td>
<td>redeposition</td>
<td>116</td>
<td>crop production</td>
</tr>
<tr>
<td>N₂O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(237)</td>
<td>crop production</td>
</tr>
<tr>
<td>CH₄</td>
<td>soils</td>
<td>not known</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>carbon accumulation in soils</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>CO₂</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>Out-of-State</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>-</td>
<td>crop production</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,115</td>
<td></td>
</tr>
</tbody>
</table>

a positive = emissions increase, negative = emissions reduction

### Table E2. Descriptive statistics: Spring fertilizer application - N₂O

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>4%</td>
<td>2</td>
<td>1/0/1</td>
<td>4%</td>
<td>-3%</td>
<td>10%</td>
</tr>
<tr>
<td>site studies</td>
<td>5%</td>
<td>19</td>
<td>10/9</td>
<td>12%</td>
<td>-18%</td>
<td>27%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-28%</td>
<td>4</td>
<td>0/4</td>
<td>12%</td>
<td>-51%</td>
<td>-5%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>-8%</td>
<td>17</td>
<td>6/11</td>
<td>9%</td>
<td>-27%</td>
<td>10%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>20%</td>
<td>6</td>
<td>4/2</td>
<td>28%</td>
<td>-35%</td>
<td>75%</td>
</tr>
<tr>
<td>1 to 2 years of observations</td>
<td>16%</td>
<td>10</td>
<td>5/5</td>
<td>20%</td>
<td>-24%</td>
<td>56%</td>
</tr>
<tr>
<td>3 years of observations</td>
<td>-9%</td>
<td>10</td>
<td>5/5</td>
<td>8%</td>
<td>-25%</td>
<td>7%</td>
</tr>
</tbody>
</table>
### Appendix F. Controlled release fertilizers

#### Table F1. Controlled release fertilizers: Emissions-avoided

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO(_2)-e short tons per 100,000 acres per year) (^a)</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N(_2)O-direct</td>
<td>soils</td>
<td>(21,152)</td>
<td>urea</td>
</tr>
<tr>
<td>N(_2)O-indirect</td>
<td>redeposition</td>
<td>(1,475)</td>
<td>urea</td>
</tr>
<tr>
<td>N(_2)O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(4,743)</td>
<td>urea</td>
</tr>
<tr>
<td>CH(_4)</td>
<td>soils</td>
<td>not known</td>
<td>urea</td>
</tr>
<tr>
<td>CO(_2)</td>
<td>carbon accumulation in soils</td>
<td>-</td>
<td>urea</td>
</tr>
<tr>
<td>CO(_2)</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>urea</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>-</td>
<td>urea</td>
</tr>
<tr>
<td>Out-of-State Upstream GHGs</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>-</td>
<td>urea</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>(27,369)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) positive = emissions increase, negative = emissions reduction

#### Table F2. Descriptive statistics: Controlled release fertilizer - N\(_2\)O

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses</td>
<td>-33%</td>
<td>9</td>
<td>0/9</td>
<td>10%</td>
<td>-53%</td>
<td>-13%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-7%</td>
<td>1</td>
<td>0/1</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-10%</td>
<td>54</td>
<td>15/39</td>
<td>8%</td>
<td>-26%</td>
<td>6%</td>
</tr>
<tr>
<td>surface nitrogen application</td>
<td>6%</td>
<td>18</td>
<td>5/13</td>
<td>16%</td>
<td>-25%</td>
<td>38%</td>
</tr>
<tr>
<td>subsurface nitrogen application</td>
<td>-6%</td>
<td>23</td>
<td>9/14</td>
<td>12%</td>
<td>-34%</td>
<td>22%</td>
</tr>
<tr>
<td>single nitrogen application</td>
<td>6%</td>
<td>29</td>
<td>11/18</td>
<td>13%</td>
<td>-18%</td>
<td>31%</td>
</tr>
<tr>
<td>split nitrogen application</td>
<td>-23%</td>
<td>16</td>
<td>4/15</td>
<td>10%</td>
<td>-43%</td>
<td>-3%</td>
</tr>
<tr>
<td>&lt;1 to 2 years of observations or simulations</td>
<td>-1%</td>
<td>32</td>
<td>12/20</td>
<td>11%</td>
<td>-22%</td>
<td>19%</td>
</tr>
<tr>
<td>3 years-plus of observations or simulations</td>
<td>-13%</td>
<td>2,120</td>
<td>3/18</td>
<td>12%</td>
<td>-36%</td>
<td>10%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>2%</td>
<td>11</td>
<td>4/7</td>
<td>17%</td>
<td>-31%</td>
<td>35%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>-13%</td>
<td>44</td>
<td>12/32</td>
<td>9%</td>
<td>-31%</td>
<td>5%</td>
</tr>
</tbody>
</table>

#### Table F3. Descriptive statistics: Controlled release fertilizer – CH\(_4\)

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>all studies</td>
<td>44%</td>
<td>7</td>
<td>3/4</td>
<td>107%</td>
<td>-165%</td>
<td>253%</td>
</tr>
</tbody>
</table>
# Appendix G. Nitrification and urease inhibitors

## Table G1. Nitrification and urease inhibitors: Emissions-avoided $^a$

<table>
<thead>
<tr>
<th>Greenhouse Gas</th>
<th>Emission Source or Sink</th>
<th>Emission (CO$_2$-e short tons per 100,000 acres per year) $^a$</th>
<th>Counterfactual</th>
</tr>
</thead>
<tbody>
<tr>
<td>N$_2$O-direct</td>
<td>soils</td>
<td>(20,415)</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>N$_2$O-indirect</td>
<td>redeposition</td>
<td>(995)</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>N$_2$O-indirect leaching</td>
<td>indirect emission-Nitrogen leaching or runoff</td>
<td>(2,012)</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>CH$_4$</td>
<td>soils</td>
<td>(612)</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>carbon accumulation in soils</td>
<td>-</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>CO$_2$</td>
<td>cultivated soils from lime or urea use</td>
<td>-</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>GHGs-energy</td>
<td>fossil fuel and electricity use in crop production</td>
<td>-</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>Out-of-State</td>
<td>upstream agricultural chemicals and fossil fuel production</td>
<td>-</td>
<td>no inhibitors</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>(24,033)</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ positive = emissions increase, negative = emissions reduction

## Table G2. Descriptive statistics: Nitrification and urease inhibitors - N$_2$O

<table>
<thead>
<tr>
<th></th>
<th>emissions: % change in emissions per hectare or acre</th>
<th>number of studies</th>
<th>change in emissions, ratio positive-to-negative: study numbers</th>
<th>standard error of mean (+/-)</th>
<th>lower 95% confidence interval</th>
<th>upper 95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>meta-analyses and other derivative statistical studies</td>
<td>-32%</td>
<td>23</td>
<td>2/21</td>
<td>5%</td>
<td>-41%</td>
<td>-23%</td>
</tr>
<tr>
<td>empirical site studies</td>
<td>-31%</td>
<td>130</td>
<td>18/112</td>
<td>2%</td>
<td>-35%</td>
<td>-26%</td>
</tr>
<tr>
<td>modeling studies</td>
<td>-17%</td>
<td>4</td>
<td>0/4</td>
<td>9%</td>
<td>-35%</td>
<td>-2%</td>
</tr>
<tr>
<td>expert judgment/literature reviews</td>
<td>-26%</td>
<td>4</td>
<td>0/4</td>
<td>7%</td>
<td>-40%</td>
<td>-12%</td>
</tr>
<tr>
<td>nitrification inhibitors</td>
<td>-39%</td>
<td>88</td>
<td>5/83</td>
<td>3%</td>
<td>-44%</td>
<td>-34%</td>
</tr>
<tr>
<td>urease inhibitors</td>
<td>-15%</td>
<td>28</td>
<td>8/20</td>
<td>5%</td>
<td>-25%</td>
<td>-4%</td>
</tr>
<tr>
<td>nitrification plus urease inhibitors</td>
<td>-24%</td>
<td>42</td>
<td>6/36</td>
<td>3%</td>
<td>-30%</td>
<td>-18%</td>
</tr>
<tr>
<td>synthetic nitrogen</td>
<td>-28%</td>
<td>108</td>
<td>16/91/1</td>
<td>3%</td>
<td>-33%</td>
<td>-23%</td>
</tr>
<tr>
<td>manure/urine nitrogen</td>
<td>-36%</td>
<td>36</td>
<td>2/34</td>
<td>3%</td>
<td>-42%</td>
<td>-29%</td>
</tr>
<tr>
<td>surface nitrogen application</td>
<td>-33%</td>
<td>71</td>
<td>9/62</td>
<td>4%</td>
<td>-40%</td>
<td>-26%</td>
</tr>
<tr>
<td>subsurface nitrogen application</td>
<td>-27%</td>
<td>27</td>
<td>4/22/1</td>
<td>4%</td>
<td>-35%</td>
<td>-18%</td>
</tr>
<tr>
<td>growing season and subgrowing season flux monitoring/modeling</td>
<td>-31%</td>
<td>86</td>
<td>9/77</td>
<td>3%</td>
<td>-37%</td>
<td>-26%</td>
</tr>
<tr>
<td>annual flux monitoring/modeling</td>
<td>-25%</td>
<td>43</td>
<td>9/34</td>
<td>3%</td>
<td>-31%</td>
<td>-20%</td>
</tr>
</tbody>
</table>
Appendix H. Emissions-avoided from 15% reduction in nitrogen fertilizer use

Avoided-emissions = N₂O emissions from cropland fertilizer use * -0.15

Endnotes


P. Jacinthe and P. Vidon, "Hydro-geomorphic Controls of Greenhouse Gas Fluxes in Riparian Buffers of the White River Watershed, IN (USA)," Geoderma 301 (2017): 30-41


Database bibliography

Cropland retirement to grasslands or forested land–N₂O


**Cropland retirement to grasslands or forested land—CH\textsubscript{4}**


A. Mosier, et al., "Mitigating Net Global Warming Potential (CO₂, CH₄ and N₂O) in Upland Crop Production," Coalbed Methane Conference, 2005
http://www.coalinfo.net.cn/coalbed/meeting/2203/papers/agriculture/AG005.pdf


A. Prieme, et al., "Slow Increase in Rate of Methane Oxidation in Soils with Time Following Land Use Change from Arable Agriculture to Woodland," *Soil Biology and Biochemistry* 29 (1997): 1,269-1,273


A. Wile, *et al.*, "Effect of Nitrogen Fertilization Rate on Yield, Methane and Nitrous Oxide Emissions from Switchgrass (Panicum virgatum L.) and Reed Canary Grass (Phalaris arundinacea)," *Canadian Journal of Soil Science* 94 (2014): 129-137

Cropland retirement to grasslands-live biomass, SOC/CO₂


C. Cambardella, et al., Soil Carbon in Reconstructed Tallgrass Prairies, poster, annual meeting of the American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, November 15-18, 2015, Minneapolis, MN


Environmental Protection Agency, "CroplandGrassland_Carbon_1990-2015_CRF_Final (1).xlsx,” state-level spreadsheet provided upon request (received February 2017)


P. Gosling, et al. (2017) "Converting Highly Productive Arable Cropland in Europe to Grassland - A Poor Candidate for Carbon Sequestration," Scientific Reports 7: 10493 DOI:10.1038/s41598-017-11083-6


Greenhouse gas reduction potential of agricultural best management practices • October 2019 Minnesota Pollution Control Agency 137


P. Smith, et al., Quantifying the Change in Greenhouse Gas Emissions Due to Natural Resource Conservation Practice Application in Indiana. Final Report to the Indiana Conservation Partnership, Colorado State University Natural Resources Ecology Laboratory and USDA- NRCS, 2002


**Cropland retirement to forestland-live biomass, litter, SOC/CO₂**


C. Turner, et al., Assessing Forestation Opportunities for Carbon Sequestration in Minnesota, report prepared the Minnesota Forest Resources Council, January 2010


Shelterbelts/Hedges–N₂O

Shelterbelts/Hedges–CH₄

Shelterbelts/Hedges–living biomass, litter, SOC–CO₂


**Field borders, filter strips, contour buffer strips, vegetated barriers—N₂O**


Grassland references above in “Cropland Retirement to Grasslands or Forested land – N₂O”

**Field borders, filter strips, contour buffer strips, vegetated barriers—CH₄**

Grassland references above in “Cropland Retirement to Grasslands or Forested land – CH₄”
Field borders, filter strips, contour buffer strips, vegetated barriers—SOC/CO₂


Grassland references above in “Cropland Retirement to Grasslands- live biomass, SOC/CO₂”

Riparian buffers—N₂O


P. Jacinthe and P. Vidon, "Hydro-geomorphic Controls of Greenhouse Gas Fluxes in Riparian Buffers of the White River Watershed, IN (USA)," Geoderma 301 (2017): 30-41


U. Mander, "Dynamics of Greenhouse Gas Emissions from Riparian Buffer Zones and Wetlands as Hot Spots in Agricultural Landscapes," in Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture, Management and Area-Wide Evaluation of Water Conservation Zones in Agricultural


Riparian buffers–CH₄


P. Jacinthe and P. Vidon, "Hydro-geomorphic Controls of greenhouse Gas Fluxes in Riparian Buffers of the White River Watershed, IN (USA)," Geoderma 301 (2017): 30-41


**Riparian buffers–living biomass, litter, SOC–CO₂**


ICF International, Greenhouse Gas Mitigation Options and Costs for Agricultural Land and Animal Production within the United States, report prepared for the USDA, Climate Change Program Office, February 2013


D. Lewis, et al., Creek Carbon: Mitigating Greenhouse Gas Emissions through Riparian Revegetation, University of California Cooperative Extension, 2015


**Winter cover crops/catch crops–N₂O**


**Winter cover crops/catch crops–CH₄**


**Winter cover crops/catch crops–SOC-CO₂**


**No tillage and reduced tillage–\( \text{N}_2\text{O} \)**


**No tillage and reduced tillage—CH₄**


**No tillage and reduced tillage—SOC/CO₂**


J. Brenner, et al., Quantifying the Change in Greenhouse Gas Emissions due to Natural Resource Conservation Practice Application in Iowa, Final Report to the Iowa Conservation Partnership, Colorado State University Natural Resource Ecology Laboratory, and USDA Natural Resources Conservation Services, 2001


P. Smith, et al., *Quantifying the Change in Greenhouse Gas Emissions due to Natural Resource Conservation Practice Application in Indiana*, Final Report to the Indiana Conservation Partnership, Colorado State University Natural Resource Ecology Laboratory, and USDA Natural Resources Conservation Services, 2002


**Hay (alfalfa, nonleguminous perennial grasses) replacing annual crops: N₂O**


**Hay (alfalfa, nonleguminous perennial grasses) replacing annual crops: SOC/CO₂**


Extend rotation by adding alfalfa or nonleguminous hay: N\textsubscript{2}O


Extend rotation by adding alfalfa or nonleguminous hay: SOC/CO₂


**Corn-soybean rotation replacing continuous corn-N₂O**


Corn-soybean rotation placing continuous corn-SOC/CO₂


**Database references for practices for which only preliminary results are available**

**Constructed wetlands—CH₄**


**Constructed wetlands–N₂O**


**Constructed wetlands–SOC/CO₂**


B. Bernal and W. Mitsch, "Carbon Sequestration in Two Created Riverine Wetlands in the Midwestern United States," *Journal of Environmental Quality* 42 (2013): 1,236-1,244


**Restored wetlands—CH₄**


M. Cooper, et al., "Infilled Ditches Are Hotspots of Landscape Methane Flux Following Peatland Rewetting," *Ecosystems* 17 (2014): 1,227-1,241


F. Renou-Wilson, et al., "Rewetting Degraded Peatlands for Climate and Biodiversity Benefits: Results from Two Raised Bogs," Ecological Engineering 127 (2019): 547-560


**Restored wetlands—N₂O**


**Restored wetlands–SOC/CO₂**


K. Ballantine and R. Schneider, "Fifty-five Years of Soil Development in Restored Freshwater Depressional Wetlands," Ecological Applications 19 (2009): 1467-1480


F. Renou-Wilson, et al., "Rewetting Degraded Peatlands for Climate and Biodiversity Benefits: Results from Two Raised Bogs," *Ecological Engineering* 127 (2019): 547-560


**Controlled release fertilizer–N₂O**


N. Li, et al., "N₂O Emissions and Yield in Maize Field Fertilized with Polymer-Coated Urea under Subsoiling or Rotary Tillage," *Nutrient Cycling in Agroecosystems* 102 (2015): 397-410


A. Mosier, et al., "Mitigating Net Global Warming Potential (CO₂, CH₄ and N₂O) in Upland Crop Production," in *Proc. Third International Methane and Nitrous Oxide Mitigation Conference, Beijing, November 17-21, 2003*


**Controlled release fertilizer–CH₄**


**Nitrification and urease inhibitors—N₂O**


M. Bell., et al., "Quantifying N₂O Emissions from Intensive Grassland Production: The Role of Synthetic Fertilizer Type, Application Rate, Timing, and Nitrification Inhibitors," *Journal of Agricultural Science* 154 (2016): 812-827


C. de Klein, et al., "Repeated Annual Use of the Nitrification Inhibitor Dicyandiamide (DCD) Does Not Alter Its Effectiveness in Reducing N$_2$O Emissions from Cow Urine," *Animal Feed Science and Technology* 166/7 (2011): 480-491


H. Di and K. Cameron, "How Does the Application of Different Nitrification Inhibitors Affect Nitrous Oxide Emissions and Nitrate Leaching from Cow Urine in Grazed Pastures?" *Soil Use and Management* 28 (2012): 54-61


A. Mosier, et al., "Mitigating Net Global Warming Potential (CO₂, CH₄ and N₂O) in Upland Crop Production," in *Proc. Third International Methane and Nitrous Oxide Mitigation Conference, Beijing, November 17-21, 2003*


G. Schwenke, et al. (2016) "Greenhouse Gas (N\textsubscript{2}O and CH\textsubscript{4}) Fluxes Under Nitrogen-Fertilized Dryland Wheat and Barley on Subtropical Vertisols: Risk, Rainfall, and Alternatives," Soil Research 54. 10.1071/SR 15338


A. Vallejo, et al., "Comparison of N Losses (NO\textsubscript{3}, N\textsubscript{2}O, NO) from Surface Applied, Injected or Amended (DCD) Pig Slurry of an Irrigated Soil in a Mediterranean Climate," Plant and Soil 272 (2005): 313-325


Greenhouse gas reduction potential of agricultural best management practices • October 2019 Minnesota Pollution Control Agency 218


M. Yang, et al. (2016) "Efficiency of Two Nitrification Inhibitors (Dicyandiamide and 3,4-Dimethylpyrazole Phosphate) on Soil Nitrogen Transformations and Plant Productivity: a Meta-Analysis," *Scientific Reports* 6:22075.doi:10.1038/srep22075


**Nitrification and urease inhibitors—CH₄**


M. Yang, et al. (2016) "Efficiency of Two Nitrification Inhibitors (Dicyandiamide and 3,4-Dimethylpyrazole Phosphate) on Soil Nitrogen Transformations and Plant Productivity: a Meta-Analysis," Scientific Reports 6:22075.doi:10.1038/srep22075

**Fertilizer application timing: Split application–N₂O**


M. Bell., et al., "Quantifying N₂O Emissions from Intensive Grassland Production: The Role of Synthetic Fertilizer Type, Application Rate, Timing, and Nitrification Inhibitors," *Journal of Agricultural Science* 154 (2016): 812-827


**Fertilizer application timing: Delayed application—N₂O**


**Fertilizer application timing: Split or delayed application—CH₄**


**Fertilizer placement: Subsurface placement—N₂O**

D. Abalos, et al., "Micrometeorological Measurements over 3 Years Reveal Differences in N₂O Emissions between Annual and Perennial Crops," *Global Change Biology 22* (2016): 1,244-1,255


L. Bastos, *N Fertilizer Source and Placement Impacts Nitrous Oxide Losses, Grain Yield and N Use Efficiency in No Till Corn, MS Thesis, Kansas State, 2015*

G. Breitenbeck, *Emissions of Nitrous Oxide from Soils Fertilized with Anhydrous Ammonia,* PhD Dissertation, Iowa State University, 1984


C. Drury, et al., Improved Application Methods and N Sources for Corn in Southwestern Ontario, Final Report Project #CAN-4RCO2 (Bridge Funding), Agriculture and Agri-Food Canada, April 2015


X. Liu, et al., "The Impact of Nitrogen Placement and Tillage on NO, N_{2}O, CH_{4} and CO_{2} Fluxes from a Clay Loam Soil," *Plant and Soil* 280 (2006): 177-188


P. Perala, "Influence of Slurry and Mineral fertilizer Application Techniques on N_{2}O and CH_{4} Fluxes from a Barley Field in Southern Finland," *Agriculture, Ecosystems and Environment* 117 (2006): 71-78


Fertilizer placement: Subsurface placement—CH₄


Spring fertilizer application in lieu of fall application—N₂O

D. Abalos, *et al.*, "Micrometeorological Measurements over a 3 Years Reveal Differences in N₂O Emissions between Annual and Perennial Crops," *Global Change Biology* 22 (2016): 1,244-1,255


S. Ogle, “Data on N$_2$O Emissions from N Management Options by Crop and Region,” Colorado State University, Fort Collins, CO

P. Rochette, et al., "Carbon Dioxide and Nitrous Oxide Emissions Following Fall and Spring Applications of Pig Slurry to an Agricultural Soil," *Soil Society of America Journal* 68 (2004): 1,410-1,420


**Biochar – N$_2$O**


D. Woolf, et al. (2010) "Sustainable Biochar to Mitigate Global Climate Change," *Nature Communications* 1:56. doi.10.1038/ncomms1053


Biochar–CH₄


M. Johnson, et al. (2017) "Biochar Influences on Soil CO₂ and CH₄ Fluxes in Response to Wetting and Drying Cycles for a Forest Soil," *Scientific Reports* 7, 6780. doi:10.1038/s41598-017-07224-6


K. Karhu, et al., "Biochar Addition to Agricultural Soil Increased CH₄ Uptake and Water Holding Capacity - Results from a Short-Term Pilot Field Study," *Agriculture, Ecosystems and Environment* 140 (2011): 309-313


Biochar–Mean residence time-SOC/CO₂


A. Zimmerman, "Abiotic and Microbial Oxidation of Laboratory-Produced Black Carbon (Biochar)," *Environmental Science and Technology* 44 (2010): 1,295-1,301


**Biochar: Crop residue removal-SOC/CO₂**


**Biochar: Crop residue removal-\(\text{N}_2\text{O}\)**


Ms. Grosenheider,

Attached please find comments from the Minnesota Corn Growers Association on the Daley Farm supplement to the Environmental Assessment Worksheet.

Best-
Amanda

Amanda Bilek
Senior Public Policy Director
Minnesota Corn Growers Association
952-460-3604 (office)
612-669-3368 (mobile)
www.mncorn.org

This message may be from an external email source.
Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.
Dear Ms. Grosenheider:

The Minnesota Corn Growers Association submits the following comments regarding the environmental review and permitting for a dairy modernization and expansion project proposed by Daley Farm of Lewiston LLP in Winona County. The MPCA previously solicited and received public comments on this project in October and November 2018 but recently prepared and published a Supplement to Environmental Assessment Worksheet in response to a Minnesota Court of Appeals’ decision holding the agency failed to consider greenhouse gas emissions related to the project. Based on this context, as well as the language of the Notice and Supplement itself, the Minnesota Corn Growers Association understands that the scope of this comment period is limited to the greenhouse gas issue and that the MPCA is not accepting and will not consider comments on other issues related to the Daley Farm project. As such, we are limiting our comments and will not address other aspects of the environmental review on the Daley Farm project.

I. The MPCA’s Decision to Conduct a Second Comment Period on the Daley Farm Environmental Assessment Worksheet Is Improper.

As an initial matter, however, Minnesota law establishes specific procedural requirements that apply to the environmental review process. See generally Minn. Stat. ch. 116D (2019); Minn. R. ch. 4410. These laws and regulations establish one 30-day public comment period on an environmental assessment worksheet (focused on whether on environmental impact statement is required because the project has the “potential for significant environmental effects”). Minn. Stat. § 116D.04, subd. 2a(a), (d); accord Minn. R. 4410.1700, subps. 1-2. The statute also expressly limits the information upon which the responsible governmental unit must base its decision on the need for an environmental impact statement to “the environmental assessment worksheet and the comments received during the comment period.” Minn. Stat. § 116D.04, subd. 2a(d); accord Minn. R. 4410.1700, subp. 3.

As noted above, the MPCA held a public comment period on the Daley Farm project from October 1, 2018, through November 15, 2018, and the agency received 615 public comments on the project during that time. And although the Minnesota Court of Appeals reversed the MPCA’s original negative declaration on the need for an environmental assessment worksheet for the project due to a procedural error, neither the applicable statutes and regulations nor the court’s opinion authorize the
MPCA to conduct a second comment period on a project. Instead, the law requires the MPCA to make its decision on the need for an environmental impact statement on remand based solely on the environmental assessment worksheet itself and the comments received during the original comment period.

II. The MPCA’s Use of Population-Based Emission Factors to Estimate Greenhouse Gas Emissions Is Improper.

In its Supplement to Environmental Assessment Worksheet for Daley Farm’s project, the MPCA estimated the greenhouse gas emissions that would occur from Daley Farm’s facilities (both the current facilities and the facilities that would be constructed as part of this project) using population-based emission factors that were developed by the EPA to complete emissions inventories for large areas or groups of facilities. These emissions factors are based on average emissions that occur across the entire population of facilities for which the emission factor was developed. Within these populations, however, the EPA has acknowledged that actual emissions may vary from facility to facility. This variability is particularly prevalent in livestock facilities, where air emissions depend on numerous site- and operation-specific factors:

Generating reasonably accurate estimates of air emissions from AFOs [animal feeding operations] is difficult. The operating environment for these farms is complex. The species of animals are varied (e.g., swine, beef and dairy cattle, poultry), and farm practices differ not only between species, but also among farms for each species. The operations vary in size . . . and differ by region across the country. The chemical composition of the emissions varies depending on animal species, feeding regimes and practices, manure management practices, and the way in which the animals are housed. Much of the air emissions come from the storage and disposal of the manure . . . that is part of every AFO, but some also comes from dust produced by the handling of feed and the movement of animals on manure, as well as from the animals themselves. Meteorologic conditions, of course, are an important factor. Estimates of emission rates generated in one type of AFO may not translate readily into others.

National Research Council, *The Scientific Basis for Estimating Emissions from Animal Feeding Operations* 1 (National Academy Press 2002), available at https://www3.epa.gov/ttnchie1/ap42/ch09/draft/interimanimalfeed.pdf. In other words, a farm is not a factory, and an animal is not widget. While a widget factory may consistently operate in the same manner day after day—and thus produce consistent emissions—a farm is a complex environment involving biological processes that are constantly changing and that are highly dependent on the surrounding conditions.

Quite simply, population-based emissions factors are not intended, and have not been scientifically validated, to be used to estimate the emissions from any particular facility. And even if it were appropriate for certain types of facilities (such as factories) that are highly controlled environments, the use of population-based emissions factors is not appropriate to estimate emissions from a particular farm.
III. Daley Farm’s Proposed Project Does Not Have a Potential for Significant Environmental Effects from Greenhouse Gas Emissions.

An environmental impact statement is only required to be completed for a project if information received in connection with the environmental assessment worksheet demonstrates that the project has a “potential for significant environmental effects.” Minn. Stat. § 116D.04, subd. 2a(a) (emphasis added); Minn. R. 4410.1700, subp. 1. “The operative word here is ‘significant.’” Heartwood, Inc. v. U.S. Forest Service, 380 F.3d 428, 432 (8th Cir. 2004); see also In re Enbridge Energy, Limited Partnership, 930 N.W.2d 12, 19 (Minn. Ct. App. 2019) (recognizing that “Minnesota courts have in appropriate circumstances relied on federal caselaw applying [the National Environmental Policy Act]” in interpreting the Minnesota Environmental Policy Act). “Evaluating an action’s environmental ‘significance’ requires analyzing both the context in which the action would take place and the intensity of its impact.” American Rivers v. Federal Energy Regulatory Comm’n, 895 F.3d 32, 49 (D.C. Cir. 2018).

According to the Supplement to Environmental Assessment Worksheet, the MPCA estimates that Daley Farm’s proposed modernization and expansion will increase greenhouse gas emissions by 20,300 metric tons of CO$_2$-e per year as compared to the current facility. But this estimate (as discussed above) is calculated using a population-based emissions factors that reflects emissions from an “average” dairy farming operation. In other words, this estimate does not account for a number of manure management practices (including without limitation the timing of manure application, use of nitrogen stabilizing additives, planting of cover crops) that Daley Farm has voluntarily agreed to include in its permit and that the MPCA has recognized will decrease greenhouse gas emissions from a farming operation. See MPCA & Minn. Dep’t of Commerce, Greenhouse Gas Emissions in Minnesota: 1990-2016, available at https://www.pca.state.mn.us/sites/default/files/Iraq-2sy19.pdf. As a result, it is likely that Daley Farm’s facilities and operations would actually produce fewer greenhouse gas emissions than the MPCA estimates as a result of the enhanced BMPs that Daley Farm has agreed to implement.

Finally, recent scientific studies suggest that the CO$_2$-e standard that the MPCA used to estimate the greenhouse gas emissions in the Supplement to Environmental Assessment Worksheet does not accurately assess the impact of short-lived climate pollutants (such as methane) on global climate. Michael Cain et al., Improved Calculation of Warming Equivalent Emissions for Short-Lived Climate Pollutants (Sept. 2019), available at https://www.nature.com/articles/s41612-019-0086-4.

But even assuming, for the sake of argument, the accuracy of the MPCA’s estimate that Daley Farm’s proposed project would increase greenhouse gas emissions by 20,300 tons of CO$_2$-e, the MPCA and Minnesota Department of Commerce estimate that the total greenhouse gas emissions in Minnesota in 2016 were 154.2 million metric tons of CO$_2$-e. Greenhouse Gas Emissions in Minnesota: 1990-2016 (Jan. 2019), at p. 5, available at https://www.pca.state.mn.us/sites/default/files/Iraq-2sy19.pdf. And the EPA estimates that the total greenhouse gas emissions in the United States in 2018 were 6,677.8 million metric tons of CO$_2$-e. Draft Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018, at ES-4, available at https://www.epa.gov/sites/production/files/2020-02/documents/us-ghg-inventory-2020-chapter-executive-summary.pdf. Thus, Daley Farm’s
The proposed project would represent, at most, only 0.01 percent of the annual greenhouse gas emissions in Minnesota or less than 0.00003 percent of the annual greenhouse gas emissions in the United States.

The nature of the global dairy industry provides important context in considering the potential environmental effects of Daley Farm’s proposed project. Milk is a commodity for which there is a global demand that will be satisfied whether the cows producing the milk are located in Minnesota, Mexico, India, or anywhere else. Similarly, any greenhouse gas emissions resulting from dairy production will impact the global climate regardless of where the cows are located.

But dairy producers in the United States are far more efficient than dairy producers in other parts of the world—for example, the average dairy cow in the United States produces 22,248 pounds of milk per year, as compared to 10,500 pounds of milk per year for dairy cows in Mexico and 2,500 pounds of milk per year for dairy cows in India. In other words, dairy producers in the United States can produce the same amount of milk with fewer dairy cows. And because most greenhouse gas emissions from dairy production are based on the number of cows, increasing dairy production in the United States would result in a net decrease in the number of dairy cows—and thus the total amount of emissions—needed to supply the global demand for milk. See Frank Mitloehner, Livestock’s Contributions to Climate Change: Facts and Fiction, available at http://cekern.ucanr.edu/files/256942.pdf. In other words, Daley Farm’s proposal to expand its dairy herd in Minnesota can be expected to reduce the total number of dairy cows in the world and will result in a net reduction in greenhouse gas emissions.

Ultimately, however, the question before the MPCA is whether Daley Farm’s proposed modernization and expansion project—which may, at most, result in an increase of 20,300 metric tons of CO₂-e emissions per year—has a “potential for significant environmental effects.” The Supplement to Environmental Assessment Worksheet specifically addresses this question:

The assessment of GHG emissions and climate change is extremely complex. Currently it is not possible to model the physical impacts of global or regional climate change, such as storm frequency/intensity or temperature increases, caused by incremental GHG emissions, such as those from the Project. . . . [E]xisting scientific tools do not allow MPCA to quantify the specific effects of a particular feedlot or project on global or regional climate change impacts.

The Supplement also specifically acknowledges that “[t]he Project’s incremental contribution to global GHGs cannot be translated into effects on climate change globally or regionally.” In other words, the MPCA has already acknowledged that there is no scientific basis to conclude that a miniscule increase in greenhouse gas emissions such as the agency estimates for Daley Farm’s project will have any measurable effect—let alone any significant effect—on the global climate. The completion of an environmental impact statement will not provide any new information that would alter this fundamental reality. Accordingly, the MPCA should again issue a negative declaration on the need for an environmental impact statement for the Daley Farm project and re-issue the amended NPDES permit for the project.
IV. The MPCA Should Apply Existing Regulations to Establish Uniform Guidance for When Environmental Assessment Worksheets for Feedlot Projects Are Required to Consider Greenhouse Gas Emissions.

Existing standards would allow the agency to provide uniform guidance with current regulations. In this regard, Minnesota Rule 4410.4300, subpart 15(B), requires that an environmental assessment worksheet must be completed for a “stationary source facility” that generates 100,000 tons or more per year of greenhouse gas emissions. To the extent the MPCA intends to continue relying on emissions factors to estimate greenhouse gas emissions from individual feedlots, the agency could easily develop guidance to determine the number of animals for each species would exceed this threshold. For projects below that number, the MPCA could determine upfront that the project does not have the potential for significant environmental effects from greenhouse gas emissions and that such emissions need not be included in the environmental assessment worksheet—on the other hand, projects that exceed the number could include the calculation in the environmental assessment worksheet to allow the agency to further consider whether a potential for significant environment effects exists. This process would allow everyone—farmers and the public—to know the rules of the game in advance and would allow the MPCA to reasonably apply a uniform standard.

Thank you for your attention concerning this matter.

Sincerely,

Les Anderson
President
Minnesota Corn Growers Association
Kim, Hi! I grew-up in farm country. I have witnessed the slow demise of the diversified family farm. Today, too many seem to equate that "bigger is better!" It is not. There are too many unintended consequences……The air, water, and the quality of the soil all trump the need of a few to run ruff-shout over those who benefit from thoughtful stewardship of Minnesota farm country……Kim, please stand-up for the quality of life in Minnesota farm country. Thank you for your work, Gary Rettke, Blaine, Minnesota
Commissioner Bishop,
Thank you for your service to Minnesotans.
I am writing to express my gravest concerns about the Daley Farms' mega-dairy expansion application.

The breaking point for nitrogen pollution in our drinking water and greenhouse gas emissions in our climate system has been reached. We do not have any other way to approach the crisis without changing EVERYTHING that we do on this planet. Our food systems will not be sustainable under the current scenarios. Our drinking water will poison us without a comprehensive systems approach that protects everyone in Minnesota.
Yes, this is difficult. Yes, this is DO-ABLE. It will take leadership on the part of all of us to make the changes needed for environmental protection and climate mitigation.

You know what needs to be done. Your integrity has been a keystone of your work. I applaud the effort you are taking to hear from Minnesotans.
Begin now and make a decision that makes you a TRUE CHAMPION!

I am asking you to acknowledge the irreversibility of environmental effects that are already present in the area surrounding the proposed mega-dairy expansion, acknowledge the cumulative potential effects, and acknowledge the inadequacy of mitigation plans and enforcement.
In doing so, you have the power to order an EIS or deny the permit for this expansion.

Thank you for your attention to this matter.

Sincerely,

Kathryn J. Iverson
5410 York Ave So
Edina, MN 55410
Good Morning Kim,
As a long term resident of MN, and a parent of young kids, I am profoundly worried about the quality of our land, water and air in Minnesota. As if climate change is not big enough to tackle with, we are destroying our earth based on needs and demands by our mega dairy and agriculture industries. Wish we all could move to sustainable and small scale local farming which is better for the land and for our farmers.

I request you to order an EIS and/or deny the massive mega-dairy expansion application in the karst region. I believe these both are under your power and hoping that you would do what;s necessary for the future generations.

Thanks
Sri
Dear Ms. Grosenheider:

I am a resident of St. Paul, but grew up in La Crosse, Wisconsin. I have uncles who own farms in the La Crosse and La Crescent Minnesota areas; my extended family owns and operates an orchard in Winona County. My brother owns property in the heart of the driftless region in Vernon County Wisconsin which has a beautiful trout stream and several natural springs. I am very familiar with that landscape, its geology and vulnerabilities. I have also had some first-hand experience with how large scale animal production operations impact air and water quality: my ex-wife came from a farm family, and her brother went all in on a massive contained hog production operation on their family farm. The consequences were significant: days when the air quality was so poor it was nearly impossible to be outside, well water that became undrinkable. From my perspective the degradation of the quality of life on that century farm and for the farm’s neighbors was truly tragic.

Thus it is extremely important to me that Commissioner Laura Bishop correct the decision of her predecessor Commissioner Stine and require an Environmental Impact Statement on the Daley Farms proposal to expand its large scale dairy operation in Winona County. Apparently Daly Farms, already one of the largest dairy’s in the state, wants to nearly double the number of cows in its operation despite the fact that its current herd exceeds the maximum allowed under Winona County zoning ordinances. The fact that that area already has significant issues with nitrate-laden drinking water and areas of poor air quality should be reason enough to trigger an EIS. But the fact that Commissioner Stine in denying the need for an EIS ignored findings of fact from the DNR and geology experts, and failed to adequately address the lived experience and concerns of the many, many members of the public who weighed in on this issue is unconscionable.

Given that MPCA’s mission is “to protect and improve the environment and human health” and that there are so many potential negative consequences of the Daly Farm proposal, including:

- increasing greenhouse gas emissions when we are clearly in a climate crisis and need to significantly reduce such emissions;
- potential leakage from earthen-sided manure lagoons, let alone the possibility of such a lagoon bursting in an intense/heavy rain events, something occurring more frequently as the climate warms;
- potential ground water contamination given the karst geology of that region;
- reduced quality of life and health hazards for the neighbors of this operation;

and given that Minnesota statute states that MPCA has the authority “to decide whether a project has the potential for significant environmental effects” (including type, extent and reversibility of environmental effects as well as cumulative potential effects) how could the MPCA not require an EIS and the utmost scrutiny for a project so potentially damaging?

If Commissioner Bishop wants to restore public trust in the MPCA this is a perfect opportunity...
opportunity to take a step in that direction. I respectfully request her to use the power she has under the Minnesota Environmental Protection Act to insist on an EIS, or better yet, deny permitting on this massive proposal. The well being of Minnesota’s citizens, communities and fragile, already beleaguered environment deserve to be prioritized over the few who stand to profit from such an expansion.

Please forward these comments to Commissioner Bishop on my behalf.

Respectfully,

Greg Heberlein
1265 Edgcumbe Road
Saint Paul, MN 55105
651-341-8594
Do not permit large farms to operate in areas where they may contaminate drinking water. Contamination is inevitable I believe.
May three sisters and I rent the family farm in Kewaunee County Wisconsin to a good neighbor farmer. The area has an 1800 dairy cow herd with good operators, but limestone allows nitrate contamination for some people. This is a major problem for the area and nitrates are monitored well.
This problem will not go away so do not let it happen in the Minnesota karst region
Thanks,
Gerald Lelou
Hello Ms Grosenheider:

As a child of rural-born parents and a member of MN350, I urge you to deny Daley Farms expansion in Winona County. The expansion would create unfair competition with the smaller dairy farmers who are struggling now. These smaller farms need our support, or else they may go away completely. I had an uncle who was a dairy farmer, and the way he treated his free-ranging cows was certainly superior to the practices of this CAFO. I would hate to see farmers like him forced out of business.

But in addition to these concerns for the farmers, a CAFO such as Daley Farms is dangerous to the environment. I question the way the methane was measured: on a 100-year timeframe rather than a more-accurate 20-year timeframe. Also, the MPCA assessed the farm's greenhouse gas emissions in terms of its contribution to global climate change. No single project in Minnesota could measurably affect climate change on a global scale. This analysis appears faulty to me and flies in the face of Minnesota's climate goals.

Would you like to live near a big CAFO such as this? I am concerned about the manure that will be produced by such a big operation, and the risk of it polluting the community during storms. Certainly, the air will be polluted with its smell. Also, the scale of this big operation, involving energy use and transportation, is outsized compared to neighboring farms.

I am not at all opposed to dairy farms, but Minnesota should be looking at alternative systems that rely on well-managed grazing and protect soil health and water quality.

I say no to CAFOs that cause pollution and put additional stress on our farmers. Please deny Daley Farms the permit.

Thank you for your time.

Sincerely,

Irene Alderson
3414 Polk St NE
Minneapolis, MN 55418
Hi Kim -

I’m a farmer of diversified vegetables, currently living and growing food in Minneapolis. My husband, newborn son and I are looking to purchase farmland in Minnesota to grow our operations and our family. It is our hope that you leverage your authority as Commissioner under the MEPA to preserve the health of the land in Minnesota and the health of the community in Winona County. By ordering an EIS or denying permitting on the Daley Farm animal factory proposal you will protect the health of our drinking water from nitrates and prevent excessive greenhouse gas emissions which is so important in our current climate crisis. Please protect our environment and our citizens.

Thanks,
Ashley

------
Ashley Thorfinnson
Kim,
Please include “human health” in an full Environment Impact Statement Review replacing the inadequate worksheet review. Our current industrialized agriculture system is bad for human and ecological health in many ways which I’m sure you’re hearing about.

“Regenerative Agriculture” is what is needed for environmental and human health reasons and should be encouraged/supported by our government agencies. Larger CAFO’s are NOT regenerative agriculture. When you have the choice, please choose the “regenerative agriculture” option. We need our government agencies to put “urgency” behind helping change the current industrial agriculture industry. There’s no time to lose!

Thanks for you time and attention to this email.
Regards,
Ginny Halloran
612.210.7177
Hi Kim -

My wife and I are farmers, growing diversified vegetables currently in Minneapolis. Our young family (we have a 6 month old son) is looking to purchase farmland in rural Minnesota to grow our operations and our family. Winona County is one of the areas we are considering, so we wanted to write to you to express our hope that you leverage your authority as Commissioner under the MEPA to preserve the health of the land in Minnesota and the health of the community in Winona County. By ordering an EIS or denying permitting on the Daley Farm animal factory proposal you will protect the health of our drinking water from nitrates and prevent excessive greenhouse gas emissions, which is so important in our current climate crisis. Please protect our environment and our citizens.

Thanks,
Chris Barth
Hello,

I am a life long resident and farmer in southeastern Minnesota. As a MPCA worker you must know how our drinking water and environment in rural areas like mine is at risk.

My family and I are asking you to deny the permit for the Daley Dairy expansion.

We are very concerned about these type of farms massively increasing the risk of poisoning our wells and air with animal units that are far too large and concentrated in any area especially one like ours with a vulnerable sub-terrain. Why would we ever allow such a pollution risk?? There is good reason, sound science, and good traditional wisdom in maintaining caps on animal unit numbers and doing everything we can to make sure we protect rural residents and our precious air and water. Please, we need someone to stand up and do the right thing and protect us from these threats and ensure our children a future in rural Minnesota that isn't seriously contaminated.

Thank you,
Daniel Miller, along with Hannah Miller and our kids Paul, Anders, Ruth and Violet.
The expansion of Daley Farms in Winona County should be subject to a full Environmental Impact Statement, contrary to the decision of the preceding MPCA Commissioner Stine. The exemption of factory farms from such environmental review is not in the public interest.
Dear Commissioner Bishop;

When it comes to protecting Minnesotans from the significant, negative environmental effects of industrial-scale animal factories, the environmental review and feedlot regulatory, oversight, and enforcement system is BROKEN.

The October 2018 report linked nitrates in drinking water to health issues, including cancer. It's time to STOP pouring gasoline on a fire by ignoring the consequences we know are presented by the proposed Daley’s factory farm expansion.

Note that the MPCA’s new Supplemental EAW on greenhouse-gas emissions for Daley Farms' mega-dairy expansion application requires:

--An EIS according to Minnesota Statute 4410.1700, Subpart 2a. INSUFFICIENT INFORMATION

--The original EAW continues to require an EIS due to grossly inadequate treatment of Criteria within Minnesota Statute 4410.1700, Subpart 7.

I respectfully and fervently request that you order an EIS or deny a permit for this expansion. Know that once the water quality is gone, it’s gone. Forever. We will need to buy water - it will become a corporate-owned commodity, And the rich will get richer and we will all be poorer for it.

I was in Southwestern MN last weekend. Downtowns have disappeared. Building after building with For Rent For Sale signs. The successful businesses are corporate: Speedway, Culver’s, Walmart. Rural communities are the knots holding the hammock of a financially and socially healthy civilization together. When they unravel, we become acres and acres of despair. And we are all the worse for it.

Please strongly consider this request, for the future, for all of us.

Sincerely,

Peggy Endres
Dear Ms. Grosenheider,

I ask that you fight hard to maintain protections for our aquifers throughout MN. While the current issue is the large animal farms near Winona, here in Cass County, we have encroaching potato fields from corporation farms. Tainted water is already harming residents, allowing the corporations to further add pollutants is unacceptable.

I hope that you will ask Commissioner Bishop to act for the water, for the environment and protect our precious aquifers.

Thank you,

Kathy Wagner

PS- I am a volunteer stream monitor for the MPCA, as well as the president of the Wabedo/Little Boy/ Cooper/ Rice Lakes Association and membership director of the Cass County Lakes Associations. The Pine River watershed is being compromised with deep corporation wells and the chemicals. Water is life.
To whom it may concern,

I am writing you in support of Daley Farm’s proposed dairy expansion. As agriculture in general continues to progress and especially the dairy industry, it is exciting that Daley’s are interested in expanding their farm to allow more members of their family to return home after schooling. The Daley expansion would bring many benefits to our community and local economy. Not only will there be more jobs created on the farm, but also jobs in the community. Along with additional jobs, there will be a need for more resources for the additional people, generating more money movement in the local economy. There will also be more tax revenue for both local and state government with in increased movement of resources.

The Daley’s have always been very active in the community by volunteering at events and giving numerous donations to many great causes ranging the Fools Five Road Race, Lewiston- Altura Booster club, many high school fundraisers, and local agricultural events. Daley’s are always willing to teach and promote the dairy industry to anyone. In the past they have hosted Winona County Family night on the farm twice, been active with Minnesota Milk Producers Association, and both the Lewiston and Winona Chambers of Commerce. The community is always welcome at their farm.

I have known the Daley family for many years and they are top notch producers that take animal husbandry and environmental safety seriously. They have done their diligence with state agencies to follow all rules and regulations both in the past and in preparation for this dairy expansion. This family farm deserves the chance to continue business in a profitable way to allow the next generation the opportunity to follow their passion of farming.

Thank you much!

Eric Schultz
Manager, Ag Partners
p: (651) 923-4496 m: (507) 459-6598
a: 101 Broadway Ave., Goodhue, MN 55027
s: agpartners.net
Please do your job—order an EIS, or deny permit. I’m concerned about the water & air quality around Winona. All Minnesotans, from babies to adults, have a right to a healthy quality of life now and in the future. The review, oversight, and enforcement system of large scale animal factories is broken, and must be fixed for the health of people, animals, and the land.

Sincerely,
Carolyn McDonnell

Sent from my iPad
RE: Winona County Daley Farm

Dear Commissioner:

I request that MPCA order an EIS on the above project or reject the permit.

Clean water is the last, best resource we possess in Minnesota. The project in question has the potential for significant environmental effects; specifically based on the permeability of karst geology and the intense intended agricultural use.

As a rural resident, a farmer (on the historic Oliver Kelley farm along the Mississippi River), a member of Land Stewardship and an outdoors person for over half a century, I've seen our clean water heritage compromised for short-term gain. I consider it a duty to protect that heritage for future generations. My generation has taken more than its fair share.

This project wants more than its fair share of water and seeks to externalize the costs of its business - to be born by future generations. It's risk is too great and it's request for a permit should be denied. In the alternative, an EIS should be ordered.

Thank you for your consideration.

Sincerely,

John Hanson
12281 13th St NW
Spicer MN 56288
Attached please find correspondence dated March 6, 2020 from Matt Berger.

Erica L. Meurer  
Legal Administrative Assistant  
GISLASON & HUNTER LLP  
2700 S. Broadway  
P.O. Box 458  
New Ulm, MN  56073-0458  
Phone: (507) 354-3111  
Fax: (507) 354-8447  
Email: emeurer@gislason.com

Information contained in this e-mail transmission is intended only for the use of the addressee(s) named above and is privileged and confidential. If you are not the addressee, or the person responsible for delivering it to the addressee, you are hereby notified that any reading or dissemination, distribution or copying of this communication or any of its contents is strictly prohibited. If you have received this communication in error, please notify us immediately by replying to the message and immediately delete the original message and any copy of it. Thank you.
March 6, 2020

VIA EMAIL ONLY
kim.grosenheider@state.mn.us

Ms. Kim Grosenheider
Environmental Review
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Re: Public Comments for Daley Farm of Lewiston LLP
Our File No. 30344-002

Dear Ms. Grosenheider:

I represent Daley Farm of Lewiston LLP (“Daley Farm”) with respect to the Daley family’s on-going efforts to modernize and expand their existing dairy facilities and operation in Winona County. I submit the following comments on behalf of Daley Farm regarding (i) the Notice of Availability of a Supplement to Environmental Assessment Worksheet (EAW) that was published in The EQB Monitor on January 21, 2020; and (ii) the Public Notice of Intent to Modify Daley Farm’s NPDES permit that was published by the Minnesota Pollution Control Agency (“MPCA”) on January 21, 2020.

I. The MPCA Does Not Have Legal Authority to Solicit or Receive Additional Public Comments on the Daley Farm Environmental Assessment Worksheet.

The Minnesota Legislature has enacted specific laws, and the Minnesota Environmental Quality Board has adopted specific regulations, that set forth a precise and comprehensive environmental review process. See generally Minn. Stat. ch. 116D (2019); Minn. R. ch. 4410. Under these laws and regulations, the responsible governmental unit assigned for a project—which, in the case of the Daley Farm project, is the MPCA—must “promptly publish notice of the completion of an environmental
assessment worksheet.” Minn. Stat. § 116D.04, subd. 2a(d); accord Minn. R. 4410.1500. The publication of this notice begins “a 30-day period” during which “[c]omments on the need for an environmental impact statement may be submitted to the responsible governmental unit” (although this 30-day comment period may be extended one time for up to an additional 30 days). Minn. Stat. § 116D.04, subd. 2a(d); accord Minn. R. 4410.1600. Once the comment period closes, the responsible governmental unit must decide whether the project has the “potential for significant environmental effects” and whether an environmental impact statement is therefore necessary. Minn. Stat. § 116D.04, subd. 2a(a), (d); accord Minn. R. 4410.1700, subps. 1-2. Importantly, the statute specifically (and narrowly) limits the information upon which the responsible governmental unit must base its decision on the need for an environmental impact statement to “the environmental assessment worksheet and the comments received during the comment period.” Minn. Stat. § 116D.04, subd. 2a(d) (emphasis added); accord Minn. R. 4410.1700, subp. 3.

With respect to the Daley Farm project, the MPCA published a Notice of Availability of an Environmental Assessment Worksheet (EAW) on October 1, 2018, and accepted public comments on the environmental assessment worksheet for public comments from October 1, 2018, through November 15, 2018. During this extended 45-day comment period, the MPCA received 615 public comments related to Daley Farm’s proposed modernization and expansion project. After reviewing, considering, and responding to these comments, the MPCA issued Findings of Fact, Conclusions of Law, and Order dated January 4, 2019, in which the MPCA concluded that the Daley Farm project “does not have the potential for significant environmental effects” and therefore ordered “that there is no need for an Environmental Impact Statement” with respect to the project (the “2019 Negative Declaration”).

Two environmental activist organizations—Minnesota Center for Environmental Advocacy and Land Stewardship Project—subsequently challenged the 2019 Negative Declaration. The Minnesota Court of Appeals ultimately concluded that while the MPCA is not always required, as a matter of law, to evaluate greenhouse-gas emissions from a proposed feedlot project, the MPCA was required to consider whether greenhouse gas emissions from this particular project have a potential for significant environmental effects because the issue of greenhouse gas emissions had been raised in the comments submitted during the 45-day extended comment period. In re Proposed
Expansion of Daley Farms of Lewiston LLP, Nos. A19-0207 & A19-0209, 2019 WL 5106666, at *6-*8 (Minn. Ct. App., Oct. 14, 2019). Accordingly, the court reversed the 2019 Negative Declaration and remanded the matter back to the MPCA “for further proceedings consistent with this opinion.” Id. at *8.

Notably, the court of appeals did not hold that procedures that led up to the 2019 Negative Declaration—i.e., the publication of notice of availability of the environmental assessment worksheet or the receipt of public comments during the 45-day extended comment period—were improper in any way. To the contrary, the court’s decision that the MPCA should have evaluated greenhouse gas emissions from Daley Farm’s project was specifically based on the fact that greenhouse gas emissions had been raised in comments that were received during the comment period. Moreover, the court did not direct the MPCA to either supplement the environmental assessment worksheet or to re-open the environmental assessment worksheet for additional public comments. Instead, the court merely reversed the MPCA’s final action in the prior environmental review process (i.e., the issuance of the 2019 Negative Declaration) and remanded the matter for the MPCA to consider—based on the existing administrative record—whether greenhouse gas emissions from Daley Farm’s proposed modernization and expansion project create a potential for significant environmental effects that require an environmental impact statement.

Further, the applicable statutes do not provide any legal authority for the MPCA to solicit or receive additional public comments on the environmental assessment worksheet or the need for an environmental impact statement. Rather, the statute is clear that the MPCA is to collect public comments during one comment period and that the agency must make its decision on the need for an environmental impact statement based solely on the environmental assessment worksheet itself and the comments received during the comment period.

Daley Farm specifically raised these procedural issues in a letter to Stacey Person (the Assistant Attorney General who is representing the MPCA in this matter) dated October 23, 2019—a copy of this letter is attached hereto as Exhibit A. Nonetheless, the MPCA elected to ignore its statutory obligations to timely decide whether an environmental impact statement was needed based on the comments received during the original comment period and instead solicited additional public comments during a second comment period. Because the MPCA lacks any legal authority—either under
the applicable statutes or the court of appeals’ decision— to solicit or consider additional public comments during a second comment period, the new comment period is improper, and the MPCA may not properly consider any comments submitted during this second comment period. Instead, the agency must decide whether Daley Farm’s project has a potential for significant environmental effects from greenhouse gas emissions, and thus whether an environmental impact statement is required, based on the information properly in the administrative record.

II. The Scope of the MPCA’s Authority on Remand Is Limited to Deciding Whether There Is a Potential for Significant Environmental Effects from Greenhouse Gas Emissions from Daley Farm’s Proposed Modernization and Expansion Project.

As part of the 2019 Negative Declaration, the MPCA carefully considered the potential impact of the Daley Farm’s proposed modernization and expansion project on surface and groundwater quality, air quality, groundwater appropriation, and karst geology concerns. Ultimately, based on the information presented in the original environmental assessment worksheet and the comments received during the original 45-day public comment period, the MPCA made extensive factual findings that the Daley Farm project “does not have the potential for significant environmental effects” regarding surface and groundwater quality, air quality, groundwater appropriation, and karst geology concerns. (See 2019 Negative Declaration, at ¶¶ 53-57, 74-75, 93-97, 109-10, 141-42, 150, 159-60.)

As noted above, two environmental activist groups challenged the 2019 Negative Declaration, including the MPCA’s findings that Daley Farm’s proposed modernization and expansion project does not have a potential for significant environmental effects due to water quality or karst geology concerns. The Minnesota Court of Appeals, however, specifically considered and rejected the activists’ challenges to these other issues. Daley Farms, Nos. A19-0207 & A19-0209, 2019 WL 5106666, at *1, *8-*11.

Federal courts have considered the scope of an administrative agency’s authority on remand following judicial review of an administrative decision.
When an agency makes an error of law in its administrative proceedings, a reviewing court should remand the case to the agency so that the agency may take further action consistent with the correct legal standards. . . . However, where a court has considered the merits and remanded on certain issues, an agency or lower court is not permitted to review anew those issues already addressed by the reviewing court if they are not part of the remand because issues addressed on the merits and not within the scope of remand become the law of the case.

Saqr v. Holder, 580 F.3d 414, 420 (6th Cir. 2009) (internal citations omitted); accord Padilla-Caldera v. Holder, 637 F.3d 1140, (10th Cir. 2011) (“Although the law of the case and the mandate rule most typically concern higher and lower courts, they may also apply to courts and administrative agencies. Thus, when a court reviews the decision of an administrative agency, the doctrines generally require the administrative agency, on remand from a court, to conform its further proceedings in the case to the principles set forth in the judicial decision, unless there is a compelling reason to depart.”); Hulsey v. Astrue, 622 F.3d 917, 924 (8th Cir. 2010) (“The law-of-the-case doctrine generally prevents relitigation of an issue previously resolved, and requires courts to adhere to decisions rendered in earlier proceedings. This doctrine applies to administrative agencies on remand.”); Wilder v. Apfel, 153 F.3d 799, 803 (7th Cir. 1998) (recognizing that the law of the case doctrine “requires the administrative agency, on remand from a court, to conform its further proceedings in the case to the principles set forth in the judicial decision, unless there is a compelling reason to depart”).

In this case, the Minnesota Court of Appeals specifically considered and approved the MPCA’s prior findings in the 2019 Negative Declaration that Daley Farm’s proposed modernization and expansion project does not have a potential for significant environmental effects related to surface and groundwater quality, air quality, groundwater appropriation, or karst geology concerns. The court reversed the 2019 Negative Declaration on the narrow grounds that the MPCA did not adequately consider whether Daley Farm’s project has the potential for significant environmental effects due to greenhouse gas emissions and specifically remanded the matter to the MPCA “for further proceedings consistent with this opinion.” Daley Farms, Nos. A19-0207 & A19-0209, 2019 WL 5106666, at *8. Accordingly, the MPCA’s authority on remand is limited to the consideration of this narrow issue regarding greenhouse gas
emissions, and the agency may not reconsider the issues that were previously decided and adjudicated regarding surface and groundwater quality, air quality, groundwater appropriation, or karst geology concerns.

The Notice of Availability and the Supplement to Environmental Assessment Worksheet itself each recognize the limited scope of this comment period and expressly state that new comments should only “address the new information being provided about greenhouse gas emissions.” Consistent with these instructions and the narrow issues that are properly before the MPCA on remand, Daley Farm is limiting its comments to the greenhouse gas issue and is refraining from submitting comments on any other aspect of this project or any issues that were previously decided in the 2019 Negative Declaration.

III. The MPCA’s Use of a Population-Based Emission Factor to Estimate Greenhouse Gas Emissions from Daley Farm’s Proposed Facilities Is Not Scientifically Valid.

On page 5 of its Supplement to Environmental Assessment Worksheet for Daley Farm’s proposed modernization and expansion of dairy facilities and operation, the MPCA explains that it relied on emission factors that the United States Environmental Protection Agency (“EPA”) developed “from a large population of feedlots for use in estimating total feedlot GHG emissions” in order to estimate the greenhouse gas emissions from both Daley Farm’s existing facilities and operations and its proposed modifications to those facilities and operations. The Supplement to Environmental Assessment Worksheet acknowledges, however, that its estimates of greenhouse gas emissions from Daley Farm’s project are “population-based” emissions factors that are traditionally used to estimate emissions from areas or groups of facilities (e.g., statewide inventories of emissions).

The EPA publishes a Compilation of Air Pollutant Emissions Factors (AP-42) that provides information regarding a variety of emission factors. U.S. E.P.A., Compilation of Air Pollutant Emissions Factors (AP-42), available at https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors#5thed (last accessed Mar. 6, 2020). The introduction to this compilation (a copy of which is attached hereto as Exhibit B) states that “[a]n emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an
activity associated with the release of that pollutant” and that “[i]n most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i.e., a population average).” The introduction further cautions that emissions factors are appropriately used to estimate emissions for areawide inventories but are not recommended for estimating emissions from particular facilities.

The use of an emission factor that is calculated based on a population average—and that was calculated, intended, and validated to estimate total emissions of a broad population of facilities—to estimate emissions from one particular facility poses inherent problems that are clearly illustrated by an analogy. According to data from the United States Census Bureau, the mean income in the United States in 2018 was $90,021. U.S. Census Bureau, Table H-5: Race & Hispanic Origin of Householder – Households by Median & Mean Income: 1967-2018, available at https://www2.census.gov/programs-surveys/cps/tables/time-series/historical-income-households/h05.xls (last accessed Feb. 27, 2020). It is absurd, however, to assume from this statistic that every person in the United States earns $90,021 in income. In fact, the lowest 20 percent of households in the United States earned less than $25,600 in 2018, while the highest 20 percent of households earned more than $130,000, and the top 5 percent of households earned more than $248,728. U.S. Census Bureau, Table H-1: Income Limits for Each Fifth & Top 5 Percent of All Households: 1967 to 2018, available at https://www2.census.gov/programs-surveys/cps/tables/time-series/historical-income-households/h01ar.xls (last accessed Feb. 27, 2020). The MPCA’s use of population-based emission factors to estimate emissions from a particular facility is the equivalent of assuming that any particular household in the United States earned $90,021 in 2018 based on the average income reported by the Census Bureau.

In the Supplement to Environmental Assessment Worksheet, the MPCA attempted to justify its methodology for estimating greenhouse gas emissions from the Daley Farm facilities on the basis that this methodology “enhances comparison between this Project’s GHG emissions and other GHG emissions in Minnesota.” While this statement may be true, the comparison is only meaningful if the estimate accurately estimates emissions from an individual, particular facility. Daley Farm previously requested that the MPCA provide any scientific studies or information that validates the accuracy of the greenhouse gas emission factors it used in the Supplement to
Environmental Assessment Worksheet to accurately estimate emissions from a particular facility or operation. The MPCA did not provide any such studies or information, and Daley Farm has not identified any such studies in its research. Without establishing the underlying accuracy and validity of its methodology, however, the MPCA estimates of greenhouse gas emissions from Daley Farm’s facilities and operations are inherently arbitrary and capricious.

Instead, the MPCA’s attempt to use the emissions factors to estimate greenhouse gas emissions from specific facilities and operations—a purpose for which the emissions factors were not intended and have not been scientifically validated—reflects the inherent impossibility in estimating air emissions from specific farming operations based on existing science.

Generating reasonably accurate estimates of air emissions from AFOs [animal feeding operations] is difficult. The operating environment for these farms is complex. The species of animals are varied (e.g., swine, beef and dairy cattle, poultry), and farm practices differ not only between species, but also among farms for each species. The operations vary in size . . . and differ by region across the country. The chemical composition of the emissions varies depending on animal species, feeding regimes and practices, manure management practices, and the way in which the animals are housed. Much of the air emissions come from the storage and disposal of the manure . . . that is part of every AFO, but some also comes from dust produced by the handling of feed and the movement of animals on manure, as well as from the animals themselves. Meteorologic conditions, of course, are an important factor. Estimates of emission rates generated in one type of AFO may not translate readily into others.


Making scientifically credible estimates of air emissions from AFOs is complicated by various factors that affect the amounts and dispersion of emissions in the atmosphere. Such factors include the kinds and numbers of animals involved, their diets and housing, the management of their
manure . . . , topography, climatic and weather conditions, and actions taken to mitigate the emissions and their effects. Estimates of emissions generated for one set of conditions or for a single type of AFO may not translate readily to others.

National Research Council, Final Report: Air Emissions from Animal Feeding Operations: Current Knowledge, Future Needs 2 (National Academy Press 2002, available at https://www3.epa.gov/ttnchie1/ap42/ch09/related/nrcanimalfeed_dec2002.pdf. The MPCA affirms this basic point in its Supplement to Environmental Assessment Worksheet, expressly stating that “[i]n the context of a feedlot (such as the Project), the actual amount of GHG emissions that may be produced will depend on numerous variables, including without limitation the feed ration provided to the livestock, particular manure storage and application practices, designs of buildings and manure storage facilities, local climate and geography, and may other operational and site-specific factors.”

Recognizing the substantial difficulty and uncertainty in estimating emissions from animal feedlots, the EPA began a National Air Emissions Monitoring Study in 2005 to attempt to establish a standardized methodology or model for estimating air emissions from animal feedlots. U.S. EPA, National Air Emissions Monitoring Study, https://www.epa.gov/afos-air/national-air-emissions-monitoring-study (last accessed Mar. 6, 2020). More than 15 years later, however, no such methodologies or models have been completed. Id. This history teaches a simple lesson—there is no scientifically accepted model for estimating air emissions from a particular animal feedlot.

In short, the MPCA’s use of population-based emissions factors to calculate a purported estimate of greenhouse gas emissions from Daley Farm’s facilities and operations is not supported by sound science and is not accurate or valid. Instead of attempting to use a screwdriver to pound in a nail, the MPCA should simply acknowledge—as the court of appeals invited, see Daley Farms, Nos. A19-0207 & A19-0209, 2019 WL 5106666, at *8—that the current science does not provide an accurate or valid means to estimate or measure greenhouse gas emissions from a livestock farming operation.
IV. Daley Farm’s Proposed Does Not Have a Potential for Significant Environmental Effects as a Result of Greenhouse Gas Emissions.

Under the applicable statute and regulations, an environmental impact statement is only required to be completed for a project if information received in connection with the environmental assessment worksheet demonstrates that the project has a “potential for significant environmental effects.” Minn. Stat. § 116D.04, subd. 2a(a); Minn. R. 4410.1700, subp. 1. Federal courts applying a similar federal statute have emphasized that “[t]he operative word here is ‘significant.’” Heartwood, Inc. v. U.S. Forest Service, 380 F.3d 428, 432 (8th Cir. 2004); see also In re Enbridge Energy, Limited Partnership, 930 N.W.2d 12, 19 (Minn. Ct. App. 2019) (recognizing that “Minnesota courts have in appropriate circumstances relied on federal caselaw applying [the National Environmental Policy Act]” in interpreting the Minnesota Environmental Policy Act). “Evaluating an action’s environmental ‘significance’ requires analyzing both the context in which the action would take place and the intensity of its impact.” American Rivers v. Federal Energy Regulatory Comm’n, 895 F.3d 32, 49 (D.C. Cir. 2018).

According to the Supplement to Environmental Assessment Worksheet, the MPCA estimates that Daley Farm’s proposed modernization and expansion will increase greenhouse gas emissions by 20,300 metric tons of CO₂-e per year. As thoroughly discussed above, however, these estimates are calculated using population-based emissions factors that reflect emissions from an “average” dairy farming operation. But as the MPCA and Minnesota Department of Commerce acknowledged in Greenhouse Gas Emissions in Minnesota: 1990-2016, which was published in January 2019 and is available at https://www.pca.state.mn.us/sites/default/files/Iraq-2sy19.pdf (and a copy of which is attached hereto as Exhibit C), “many BMPs [best management practices] for nutrient use and sedimentation also act to decrease GHG emissions,” and “[s]ome of the more promising practices for reducing GHGs from agriculture include improved efficiency of nitrogen use (through optimized fertilizer application rates, timing, and placement), conservation cover, riparian buffers and related vegetative filter strips and field borders, and cover crops.” As the MPCA expressly recognized in the 2019 Negative Declaration, Daley Farm voluntarily agreed that implementation of such practices for its manure application would be added to its NPDES permit. See 2019 Negative Declaration, at ¶ 42. Thus, it is likely that Daley Farm’s facilities and operations would actually produce fewer greenhouse gas
emissions than the MPCA estimates as a result of the enhanced BMPs that Daley Farm has agreed to implement.

The MPCA also acknowledges in the Supplement to Environmental Assessment Worksheet that its estimate of 20,300 tons of CO\textsubscript{2}-e emissions per year for Daley Farm’s proposed modernization and expansion project does not include aspects of the project—including increased planting and use of alfalfa, pastures, and cover crops—that will actually remove carbon from the atmosphere and sequester it in the soil. The agency, however, does not quantify the benefits of these carbon sinks or deduct these benefits from its estimates of the overall emissions estimates for the project. Thus, the agency’s estimate of 20,300 tons of CO\textsubscript{2}-e emissions per year overstates the actual net impact of the Daley Farm project.

Finally, recent scientific studies suggest that the CO\textsubscript{2}-e standard that the MPCA used to estimate the greenhouse gas emissions in the Supplement to Environmental Assessment Worksheet does not accurately assess the impact of short-lived climate pollutants (such as methane) on global climate. Michael Cain et al., Improved Calculation of Warming Equivalent Emissions for Short-Lived Climate Pollutants (Sept. 2019), available at https://www.nature.com/articles/s41612-019-0086-4 (a copy of this study is attached hereto as Exhibit D).

Nonetheless, to place the MPCA’s estimate for the greenhouse gas emissions that would result from the Daley Farm project (overstated as they may be) in the proper context, the MPCA and Minnesota Department of Commerce estimate that the total greenhouse gas emissions in Minnesota in 2016 were 154.2 million metric tons of CO\textsubscript{2}-e. Greenhouse Gas Emissions in Minnesota: 1990-2016 (Ex. C hereto), at p. 5. And the EPA estimates that the total greenhouse gas emissions in the United States in 2018 were 6,677.8 million metric tons of CO\textsubscript{2}-e. Draft Inventory of Greenhouse Gas Emissions and Sinks: 1990-2018, at ES-4, available at https://www.epa.gov/sites/production/files/2020-02/documents/us-ghg-inventory-2020-chapter-executive-summary.pdf. Thus, the estimated emissions Daley Farm’s proposed project—even before considering any benefits the project would provide or the broader context of changes in the dairy industry—would represent only 0.01 percent of the annual greenhouse gas emissions in Minnesota or less than 0.00003 percent of the annual greenhouse gas emissions in the United States.
The overall contraction of the dairy industry and shrinking of the dairy herd also provides important context when considering the potential environmental effects of Daley Farm’s proposed modernization and expansion project. For example, data from the 2017 Census of Agriculture published by the United States Department of Agriculture (which is available at https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1_Chapter_2_County_Level/Minnesota/st27_2_0011_001_1.pdf) indicates that the number of milk cows in Winona County decreased from 28,515 in 2012 to 24,032 in 2017—this is a decrease of 4,483 dairy cows in the just 5 years. And data provided by the Minnesota Department of Agriculture indicates that the number of dairy cows in Winona County has continued to decrease since 2017 and was down to 23,500 head as of January 1, 2019 (the most recent data available). Thus, even with Daley Farm’s proposed addition of 2,900 head to their dairy operation, the total size of the dairy herd in Winona County will remain significantly lower than it was 8 years ago. And based on the MPCA’s methodology for estimating greenhouse gas emissions, this net decrease in the number of dairy cows would also result in a net decrease in the overall amount of greenhouse gas emissions from the dairy industry.

The nature of the global dairy industry also provides important context in considering the potential environmental effects of Daley Farm’s proposed project. Milk is a commodity for which there is a global demand that will be satisfied whether the cows producing the milk are located in Minnesota, Mexico, India, or anywhere else. Similarly, any greenhouse gas emissions resulting from dairy production will impact the global climate regardless of where the cows are located. But dairy producers in the United States are far more efficient than dairy producers in other parts of the world—for example, the average dairy cow in the United States produces 22,248 pounds of milk per year, as compared to 10,500 pounds of milk per year for dairy cows in Mexico and 2,500 pounds of milk per year for dairy cows in India. In other words, dairy producers in the United States can produce the same amount of milk with fewer dairy cows. And because most greenhouse gas emissions from dairy production are based on the number of cows, increasing dairy production in the United States result in a net decrease in the number of cows—and thus the total amount of emissions—in other areas of the world. See Frank Mitloehner, Livestock’s Contributions to Climate Change: Facts and Fiction, available at http://cekern.ucanr.edu/files/256942.pdf (a copy of which is attached hereto as Exhibit E).
Ultimately, however, the question before the MPCA is whether Daley Farm’s proposed modernization and expansion project—which may, at most, result in an increase of 20,300 metric tons of CO₂-e emissions per year—has a “potential for significant environmental effects.” Minnesota regulations provide that an environmental assessment worksheet must be completed for a facility that generates 100,000 tons or more per year of greenhouse gas emissions. Minn. R. 4410.4300, subp. 15(B). Because an environmental assessment worksheet is intended to assess whether a project may have a potential for significant environmental impacts, see Minn. Stat. § 116D.04, subd. 2a(e), the establishment of a 100,000 ton-per-year threshold in Minnesota Rule 4410.4300, subpart 15(B), reflects an administrative determination that facilities that emit less than 100,000 tons of greenhouse gases per year do not have any potential for significant environmental effects. Daley Farm’s proposed project is approximately five times less this threshold.

Further, the MPCA was the responsible governmental unit for other projects where estimated greenhouse gas emissions were calculated in the prepared environmental assessment worksheets. For example, on May 30, 2008, the MPCA published an environmental assessment worksheet for the proposed MinnErgy ethanol plant in Olmstead County and estimated a total of 311,465 metric tons of CO₂-e for Phase I and 394,845 metric tons of CO₂-e for Phase II of the project. And on September 26, 2016, the MPCA published an environmental assessment worksheet for the proposed Flint Hills Resources—Pine Bend refinery modernization project in Dakota County and estimated that the project would increase greenhouse gas emissions by 149,960 metric tons of CO₂-e per year. These projects estimated greenhouse gas emissions that were more than 34 times and more than 7 times greater, respectively, than Daley Farm’s proposed project. In each case, however, the MPCA concluded that these projects did not have a potential for significant environmental effects and did not require an environmental impact statement.

In the Supplement to Environmental Assessment Worksheet for Daley Farm’s proposed modernization and expansion project, the MPCA acknowledges that “[t]he Project’s incremental contribution to global GHGs cannot be translated into effects on climate change globally or regionally.” As set forth above, the facts and context surrounding this project demonstrate that Daley Farm’s proposal to add 2,900 head of dairy cows to their farm in Winona County, Minnesota, will not have any measurable
impact on the global climate. In short, there is no evidence that this project has any potential for significant environmental effects. The MPCA should therefore reissue the negative declaration and NPDES permit for this project.

Thank you for your attention concerning this matter.

Very truly yours,

Matthew C. Berger

MCB:elm
Enclosure
October 23, 2019

VIA EMAIL ONLY
stacey.person@ag.state.mn.us

Ms. Stacey W. Person
Assistant Attorney General
445 Minnesota Street, Suite 900
St. Paul, Minnesota 55101-2127

Re: Daley Farm of Lewiston LLP
Our File No. 30344-002

Dear Ms. Person:

This letter is submitted on behalf of Daley Farm of Lewiston LLP with respect to the pending environmental assessment worksheet (EAW) for Daley Farm’s planned dairy modernization and expansion project. As you are aware, notice of Daley Farm’s EAW was published on October 1, 2018, and public comments were accepted on the EAW (as well as the related permit application) through November 15, 2018. On January 4, 2019, the Minnesota Pollution Control Agency (MPCA) issued a negative declaration on the need for an environmental impact statement (EIS) for the project and granted Daley Farm’s permit. On October 14, 2019, the Minnesota Court of Appeals reversed the negative declaration because the MPCA “did not consider greenhouse-gas emissions before it denied an EIS” and remanded the matter to the MPCA for further proceedings.

Intent to Proceed with Project

As an initial matter, I understand that the MPCA has requested confirmation that Daley Farm still intends to proceed with its proposed dairy modernization and expansion project. Daley Farm has invested significant time and resources on this project—including submission of the EAW and permit application, participation in the...
proceedings before the Minnesota Court of Appeals, submission to Winona County of an application for a variance from certain requirements of the county’s zoning ordinance, and separate pending litigation against Winona County related to the denial of Daley Farm’s variance application. To the extent that Daley Farm’s commitment to proceed with this project is not self-evident from these actions, please consider this letter as written confirmation that Daley Farm still intends to proceed with its proposed dairy modernization and expansion project and that the EAW and permit application for this project have not been withdrawn and should still be considered to be pending before the MPCA.

Procedures on Remand

I also understand that the MPCA is still discussing the process that it intends to use to complete environmental review for Daley Farm’s proposed dairy modernization and expansion project following remand from the court of appeals. With due respect to the agency, the procedures for completing environmental review are set forth in detail in the applicable statutes and regulations, and nothing in the statutes, regulations, or court of appeals opinion suggests that the established procedures and deadlines in the statutes and regulations do not continue to apply on remand.

First, with respect to timing, Minnesota Statutes § 116D.04, subd. 2a(d) (2019), provides a specific schedule that must be followed in completing environmental review. Specifically, the statute expressly states that the MPCA’s “decision on the need for an [EIS] . . . must be made within 15 days after the close of the comment period,” but that this deadline may be extended by the chair of the Environmental Quality Board “by not more than 15 additional days upon the request” from the MPCA. Id.; accord Minn. R. 4410.1700, subp. 2. The mandatory nature of the timing requirements in this statute were confirmed during the most recent legislative session, when the Minnesota Legislature amended the language related to the 30-day comment period in response to prior litigation involving this same project to expressly limiting the MPCA’s authority to unilaterally extend the comment deadline. See 2019 Minn. Laws, 1st Sp. Sess. ch. 4, art. 3, § 105. On its face, this deadline cannot be met in this case because the comment period expired on November 15, 2018. But even assuming that the deadlines are restarted as a result of the remand from the court of appeals, the MPCA must make a new decision on the need for an EIS with respect to Daley Farm’s proposed dairy
modernization and expansion project by **November 13, 2019**, which is 30 days after the court of appeals issued its opinion in this matter.

Additionally, with respect to the information that may be considered on remand, Minnesota Statutes § 116D.04, subdivision 2a(d), also provides that the MPCA’s “decision on the need for an [EIS] must be based on [EAW] and the comments received during the comment period.” (Emphasis added.) Minnesota Rule 4410.1700, subpart 3, further provides that the MPCA “shall base its decision regarding the need for an EIS on the information gathered during the EAW process and the comments received on the EAW.” (Emphasis added.) In other words, the statute and regulations provide for one public comment period and only allows the MPCA to consider public comments that the MPCA received during that period in deciding on the need for an EIS.

The court of appeals decision does not alter these basic statutory and regulatory requirements. In this regard, the court of appeals expressly held that evaluation of greenhouse gas emissions for Daley Farm’s proposed dairy modernization and expansion was not required as a matter of law. Rather, the court merely held that the negative declaration was arbitrary and capricious because public comments that were submitted “raised concerns about the project’s potential for significant environmental effects” from greenhouse gas emissions and “[t]he MPCA’s response to the MCEA’s comment suggests that it did not consider greenhouse-gas emissions before it denied an EIS.” In this regard, the court specifically “acknowledge[d] Daley Farm[’s] assertion that there is no easy measure for determining the environmental impact from a feedlot permit because of the substantial difficulty and uncertainty in estimating emissions from animal feedlots” but noted that “the MPCA did not offer this as an explanation when it denied the EIS for Daley Farm[’s] project because it did not consider the issue.” Thus, the court of appeals’ decision actually supports the notion that on remand, the MPCA should merely consider and decide the issue based on the existing public comments that were previously received. The court did not hold that an entirely new environmental review process is required.

In summary, the applicable statutes and regulations require that on remand, the MPCA must decide on the need for an EIS with respect to Daley Farm’s dairy modernization and expansion project based on the existing public comments and must issue a new determination within 30 days after the court of appeals’ decision. The
applicable statute and regulations do not authorize the MPCA to reopen the first public comment period, establish a second public comment period, or consider any new public comments that may be submitted. Daley Farm urges and expects the agency to follow these legal and regulatory requirements in considering the pending EAW for its project.

Thank you for your attention concerning this matter.

Very truly yours,

Matthew C. Berger

cc: Mr. Ben Daley (via e-mail only)
    Ms. Shelly DePestel (via e-mail only)
INTRODUCTION

Emission factors and emission inventories have long been fundamental tools for air quality management. Emission estimates are important for developing emission control strategies, determining applicability of permitting and control programs, ascertaining the effects of sources and appropriate mitigation strategies, and a number of other related applications by an array of users, including federal, state, and local agencies, consultants, and industry. Data from source-specific emission tests or continuous emission monitors are usually preferred for estimating a source’s emissions because those data provide the best representation of the tested source’s emissions. However, test data from individual sources are not always available and, even then, they may not reflect the variability of actual emissions over time. Thus, emission factors are frequently the best or only method available for estimating emissions, in spite of their limitations.

The passage of the Clean Air Act Amendments Of 1990 (CAAA) and the Emergency Planning And Community Right-To-Know Act (EPCRA) of 1986 has increased the need for both criteria and Hazardous air pollutant (HAP) emission factors and inventories. The Emission Factor And Inventory Group (EFIG), in the U. S. Environmental Protection Agency’s (EPA) Office Of Air Quality Planning And Standards (OAQPS), develops and maintains emission estimating tools to support the many activities mentioned above. The AP-42 series is the principal means by which EFIG can document its emission factors. These factors are cited in numerous other EPA publications and electronic data bases, but without the process details and supporting reference material provided in AP-42.

What Is An AP-42 Emission Factor?

An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e. g., kilograms of particulate emitted per megagram of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (i. e., a population average).

The general equation for emission estimation is:

\[ E = A \times EF \times (1 - ER/100) \]

where:

- \( E \) = emissions,
- \( A \) = activity rate,
- \( EF \) = emission factor, and
- \( ER \) = overall emission reduction efficiency, \( \% \).

ER is further defined as the product of the control device destruction or removal efficiency and the capture efficiency of the control system. When estimating emissions for a long time period
(e. g., one year), both the device and the capture efficiency terms should account for upset periods as well as routine operations.

Emission factor ratings in AP-42 (discussed below) provide indications of the robustness, or appropriateness, of emission factors for estimating average emissions for a source activity. Usually, data are insufficient to indicate the influence of various process parameters such as temperature and reactant concentrations. For a few cases, however, such as in estimating emissions from petroleum storage tanks, this document contains empirical formulae (or emission models) that relate emissions to variables such as tank diameter, liquid temperature, and wind velocity. Emission factor formulae that account for the influence of such variables tend to yield more realistic estimates than would factors that do not consider those parameters.

The extent of completeness and detail of the emissions information in AP-42 is determined by the information available from published references. Emissions from some processes are better documented than others. For example, several emission factors may be listed for the production of one substance: one factor for each of a number of steps in the production process such as neutralization, drying, distillation, and other operations. However, because of less extensive information, only one emission factor may be given for production facility releases for another substance, though emissions are probably produced during several intermediate steps. There may be more than one emission factor for the production of a certain substance because differing production processes may exist, or because different control devices may be used. Therefore, it is necessary to look at more than just the emission factor for a particular application and to observe details in the text and in table footnotes.

The fact that an emission factor for a pollutant or process is not available from EPA does not imply that the Agency believes the source does not emit that pollutant or that the source should not be inventoried, but it is only that EPA does not have enough data to provide any advice.

Uses Of Emission Factors

Emission factors may be appropriate to use in a number of situations such as making source-specific emission estimates for areawide inventories. These inventories have many purposes including ambient dispersion modeling and analysis, control strategy development, and in screening sources for compliance investigations. Emission factor use may also be appropriate in some permitting applications, such as in applicability determinations and in establishing operating permit fees.

Emission factors in AP-42 are neither EPA-recommended emission limits (e. g., best available control technology or BACT, or lowest achievable emission rate or LAER) nor standards (e. g., National Emission Standard for Hazardous Air Pollutants or NESHAP, or New Source Performance Standards or NSPS). Use of these factors as source-specific permit limits and/or as emission regulation compliance determinations is not recommended by EPA. Because emission factors essentially represent an average of a range of emission rates, approximately half of the subject sources will have emission rates greater than the emission factor and the other half will have emission rates less than the factor. As such, a permit limit using an AP-42 emission factor would result in half of the sources being in noncompliance.

Also, for some sources, emission factors may be presented for facilities having air pollution control equipment in place. Factors noted as being influenced by control technology do not necessarily reflect the best available or state-of-the-art controls, but rather reflect the level of (typical) control for which data were available at the time the information was published. Sources often are
tested more frequently when they are new and when they are believed to be operating properly, and either situation may bias the results.

As stated, source-specific tests or continuous emission monitors can determine the actual pollutant contribution from an existing source better than can emission factors. Even then, the results will be applicable only to the conditions existing at the time of the testing or monitoring. To provide the best estimate of longer-term (e.g., yearly or typical day) emissions, these conditions should be representative of the source’s routine operations.

A material balance approach also may provide reliable average emission estimates for specific sources. For some sources, a material balance may provide a better estimate of emissions than emission tests would. In general, material balances are appropriate for use in situations where a high percentage of material is lost to the atmosphere (e.g., sulfur in fuel, or solvent loss in an uncontrolled coating process.) In contrast, material balances may be inappropriate where material is consumed or chemically combined in the process, or where losses to the atmosphere are a small portion of the total process throughput. As the term implies, one needs to account for all the materials going into and coming out of the process for such an emission estimation to be credible.

If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment, is a better source of information for permitting decisions than an AP-42 emission factor. When such information is not available, use of emission factors may be necessary as a last resort. Whenever factors are used, one should be aware of their limitations in accurately representing a particular facility, and the risks of using emission factors in such situations should be evaluated against the costs of further testing or analyses.

Figure 1 depicts various approaches to emission estimation, in a hierarchy of requirements and levels of sophistication, that one should consider when analyzing the tradeoffs between cost of the estimates and the quality of the resulting estimates. Where risks of either adverse environmental effects or adverse regulatory outcomes are high, more sophisticated and more costly emission determination methods may be necessary. Where the risks of using a poor estimate are low, and the costs of more extensive methods are unattractive, then less expensive estimation methods such as emission factors and emission models may be both satisfactory and appropriate. In cases where no emission factors are available but adverse risk is low, it may even be acceptable to apply factors from similar source categories using engineering judgment. Selecting the method to be used to estimate source-specific emissions may warrant a case-by-case analysis considering the costs and risks in the specific situation. All sources and regulatory agencies should be aware of these risks and costs and should assess them accordingly.

Variability Of Emissions

Average emissions differ significantly from source to source and, therefore, emission factors frequently may not provide adequate estimates of the average emissions for a specific source. The extent of between-source variability that exists, even among similar individual sources, can be large depending on process, control system, and pollutant. Although the causes of this variability are considered in emission factor development, this type of information is seldom included in emission test reports used to develop AP-42 factors. As a result, some emission factors are derived from tests that may vary by an order of magnitude or more. Even when the major process variables are accounted for, the emission factors developed may be the result of averaging source tests that differ by factors of five or more.
Air pollution control devices also may cause differing emission characteristics. The design criteria of air pollution control equipment affect the resulting emissions. Design criteria include such items as the type of wet scrubber used, the pressure drop across a scrubber, the plate area of an electrostatic precipitator, and the alkali feed rate to an acid gas scrubber. Often, design criteria are not included in emission test reports (at least not in a form conducive to detailed analysis of how varying process parameters can affect emissions) and therefore may not be accounted for in the resulting factors.

Before simply applying AP-42 emission factors to predict emissions from new or proposed sources, or to make other source-specific emission assessments, the user should review the latest literature and technology to be aware of circumstances that might cause such sources to exhibit emission characteristics different from those of other, typical existing sources. Care should be taken to assure that the subject source type and design, controls, and raw material input are those of the source(s) analyzed to produce the emission factor. This fact should be considered, as well as the age of the information and the user’s knowledge of technology advances.

Estimates of short-term or peak (e.g., daily or hourly) emissions for specific sources are often needed for regulatory purposes. Using emission factors to estimate short-term emissions will add further uncertainty to the emission estimate. Short-term emissions from a single specific source often vary significantly with time (i.e., within-source variability) because of fluctuations in process operating conditions, control device operating conditions, raw materials, ambient conditions, and other such factors. Emission factors generally are developed to represent long-term average emissions, so testing is usually conducted at normal operating conditions. Parameters that can cause short-term fluctuations in emissions are generally avoided in testing and are not taken into account in test evaluation. Thus, using emission factors to estimate short-term emissions will cause even greater
uncertainty. The AP-42 user should be aware of this limitation and should evaluate the possible effects on the particular application.

To assess within-source variability and the range of short-term emissions from a source, one needs either a number of tests performed over an extended period of time or continuous monitoring data from an individual source. Generally, material balance data are not likely to be sufficient for assessing short-term emission variability because the accuracy of a material balance is greatly reduced for shorter time intervals. In fact, one of the advantages of a material balance approach is that it averages out all of the short-term fluctuations to provide a good long-term average.

Pollutant Terminology And Conventions

The need for clearly and precisely defined terms in AP-42 should be evident to all. The factors in this document represent units of pollutants (or for ozone, precursors) for which there are National Ambient Air Quality Standards (NAAQS). These are often referred to as "criteria" pollutants. Factors may be presented also for HAPs ("hazardous" air pollutants designated in the Clean Air Act) and for other "regulated" and unregulated air pollutants. If the pollutants are organic compounds or particulate matter, additional species or analytical information may be needed for specific applications. It is often the case that the ideal measure of a pollutant for a specific application may not be available, or even possible, because of test method or data limitations, costs, or other problems. When such qualifications exist in AP-42, they will be noted in the document. If a pollutant is not mentioned in AP-42, that does not necessarily mean that the pollutant is not emitted.

Many pollutants are defined by their chemical names, which often may have synonyms and trade names. Trade names are often given to mixtures to obscure proprietary information, and the same components may have several trade names. For assurance of the use of the proper chemical identification, the Chemical Abstract Service (CAS) number for the chemical should be consulted along with the list of synonyms. Some pollutants, however, follow particular conventions when used in air quality management practices. The pollutant terminology and conventions currently used in AP-42 are discussed below.

Particulate Matter -

Terms commonly associated with the general pollutant, "particulate matter" (PM), include PM-10, PM-X, total particulate, total suspended particulate (TSP), primary particulate, secondary particulate, filterable particulate, and condensable particulate. TSP consists of matter emitted from sources as solid, liquid, and vapor forms, but existing in the ambient air as particulate solids or liquids. Primary particulate matter includes that solid, liquid, or gaseous material at the pressure and temperature in the process or stack that would be expected to become a particulate at ambient temperature and pressure. AP-42 contains emission factors for pollutants that are expected to be primary particulate matter. Primary particulate matter includes matter that may eventually revert to a gaseous condition in the ambient air, but it does not include secondary particulate matter. Secondary particulate matter is gaseous matter that may eventually convert to particulate matter through atmospheric chemical reactions. The term "total particulate" is used in AP-42 only to describe the emissions that are primary particulate matter. The term "Total PM-X" is used in AP-42 to describe those emissions expected to become primary particulate matter smaller than "X" micrometers (µm) in aerodynamic diameter. For example, "PM-10" is emitted particulate matter less than 10 µm in diameter. In AP-42, "Total Particulate" and "Total PM-X" may be divided into "Filterable Particulate", "Filterable PM-X", "Condensable Organic Particulate", and "Condensable Inorganic Particulate". The filterable portions include that material that is smaller than the stated size and is collected on the filter of the particulate sampling train.
Unless noted, it is reasonable to assume that the emission factors in AP-42 for processes that operate above ambient temperatures are for filterable particulate, as defined by EPA Method 5 or its equivalent (a filter temperature of 121°C (250°F)). The condensable portions of the particulate matter consist of vaporous matter at the filter temperature that is collected in the sampling train impingers and is analyzed by EPA Method 202 or its equivalent. AP-42 follows conventions in attempts to define Total Particulate and its subcomponents, filterable particulate, condensable particulate, and PM-10 and their interrelationships. Because of test method and data limitations, this attempt may not always be successful, and some sources may not generate such components.

Because emission factors in AP-42 are usually based upon the results of emission test reports, and because Method 202 was only recently developed, AP-42 emission factors often may adequately characterize only in-stack filterable PM-10. Recent parts of the AP-42 series have used a clearer nomenclature for the various particulate fractions. It is reasonable to assume that, where AP-42 does not define the components of particulate clearly and specifically, the PM-10 factor includes only the filterable portion of the total PM-10. Therefore, an evaluation of potential condensable particulate emissions should be based upon additional data or engineering judgment.

As an additional convention, users should note that many hazardous or toxic compounds may be emitted in particulate form. In such cases, AP-42 factors for particulate matter represent the total, and factors for such compounds or elements are reported as mass of that material.

Organic Compounds -

Precursors of the criteria pollutant "ozone" include organic compounds. "Volatile organic compounds" (VOC) are required in a State Implementation Plan (SIP) emission inventory. VOCs have been defined by EPA (40 CFR 51.100, February 3, 1992) as "any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric chemical reactions". There are a number of compounds deemed to have "negligible photochemical reactivity", and these are therefore exempt from the definition of VOC. These exempt compounds include methane, ethane, methylene chloride, methyl chloroform, many chlorofluorocarbons, and certain classes of perfluorocarbons. Additional compounds may be added to the exempt list in the future.

Though the regulatory definition of VOC is followed in ozone control programs, the exempt organic compounds are of concern when developing the complete emission inventory that is needed for broader applications. Therefore, this document strives to report the total organic emissions and component species, so that the user may choose those that are necessary for a particular application. In many cases, data are not available to identify and quantify either all the components (such as some oxygenated compounds that are not completely measured by many common test methods), the total organics, or other variations of the quantities desired. In such cases, the available information is annotated in an effort to provide the data to the user in a clear and unambiguous manner. It is not always possible to present a complete picture with the data that are available.

The term "total organic compounds" (TOC) is used in AP-42 to indicate all VOCs and all exempted organic compounds including methane, ethane, chlorofluorocarbons, toxics and HAPs, aldehydes, and semivolatile compounds. Component species are separately identified and quantified, if data are available, and these component species are included in TOCs. Often, a test method will produce a data set that excludes methane. In such cases, the term total nonmethane organic compound (TNMOC) may be used. Here, methane will be separately quantified if the data are available. Factors are nominally given in terms of actual weight of the emitted substance. However, in some cases where data do not allow calculation of the result in this form, factors may be given "as methane", "as
propane", etc. Once the species distribution is determined, actual mass can be calculated based on molecular weight of each compound represented. In an AP-42 table giving organic emission factors, the ideal table headings would be:

<table>
<thead>
<tr>
<th>TOC</th>
<th>Methane</th>
<th>Ethane</th>
<th>VOC</th>
<th>Other Species</th>
</tr>
</thead>
</table>

Many organic compounds are also HAPs. Where such species can be quantified, an emission factor representing their individual mass will be presented. This quantity will also be included in the total VOC and/or TOC factors, as appropriate. To avoid double counting regarding permit fees, etc., this fact should be taken into consideration.

Sulfur Dioxide -

The primary product from combustion of sulfur is sulfur dioxide, SO₂. However, other oxidation states are usually formed. When reported in this document, these compounds are jointly referred to as SOₓ, or oxides of sulfur. SO₂ means sulfur dioxide, and SOₓ means the combination of all such emissions reported on the basis of the molecular weight of SO₂.

Oxides Of Nitrogen -

The primary combustion product of nitrogen is nitrogen dioxide, NO₂. However, several other nitrogen compounds are usually emitted at the same time (nitric oxide or NO, nitrous oxide or N₂O, etc.), and these may or may not be distinguishable in available test data. They are usually in a rapid state of flux, with NO₂ being, in the short term, the ultimate product emitted or formed shortly downstream of the stack. The convention followed in AP-42 is to report the distinctions wherever possible, but to report total NOₓ on the basis of the molecular weight of NO₂.

Lead -

Lead is emitted and measured as particulate and often will be reported for a process both separately and as a component of the particulate matter emission factor. The lead may exist as pure metal or as compounds. The convention followed in AP-42 is that all emissions of lead are expressed as the weight of the elemental lead. Lead compounds will also be reported on the basis of the weight of those compounds if the information is available.

Toxic, Hazardous, And Other Noncriteria Pollutants -

Hazardous Air Pollutants are defined for EPA regulatory purposes in Title III of the CAAA. However, many states and other authorities designate additional toxic or hazardous compounds, organic or inorganic, that can exist in gaseous or particulate form. Also, as mentioned, compounds emitted as VOCs may be of interest for their participation in photochemical reactivity. Few EPA Reference Test Methods exist for these compounds, which may come from the myriad sources covered in this document. However, test methods are available to allow reasonably reliable quantification of many compounds, and adequate test results are available to yield estimates of sufficient quality to be included in this document. Where such compounds are quantified herein with emission factors, they represent the actual mass of that compound emitted. Totals for PM or VOC, as appropriate, are inclusive of the component species unless otherwise noted. There are a limited number of gaseous hazardous or toxic compounds that may not be VOCs, and whenever they occur they will be identified separately.

The Emission Factor And Inventory Group produces a separate series of reports that focus on a number of the more significant HAPs and related sources. Titles of these documents generally follow the format of Locating And Estimating Emissions From Sources Of . . . (Substance).
Examples Of Emission Factor Application -

Calculating carbon monoxide (CO) emissions from distillate oil combustion serves as an example of the simplest use of emission factors. Consider an industrial boiler that burns 90,000 liters of distillate oil per day. In Section 1.3 of AP-42, "Fuel Oil Combustion", the CO emission factor for industrial boilers burning distillate oil is 0.6 kilograms (kg) CO per $10^3$ liters of oil burned.

Then CO emissions

\[ \text{CO emissions} = \text{CO emission factor} \times \text{distillate oil burned/day} \]

\[ = 0.6 \times 90 \]

\[ = 54 \text{ kg/day} \]

In a more complex case, suppose a sulfuric acid ($\text{H}_2\text{SO}_4$) plant produces 200 Mg of 100 percent $\text{H}_2\text{SO}_4$ per day by converting sulfur dioxide ($\text{SO}_2$) into sulfur trioxide ($\text{SO}_3$) at 97.5 percent efficiency. In Section 8.10, "Sulfuric Acid", the $\text{SO}_2$ emission factors are listed according to $\text{SO}_2$-to-$\text{SO}_3$ conversion efficiencies in whole numbers. The reader is directed by footnote to an interpolation formula that may be used to obtain the emission factor for 97.5 percent $\text{SO}_2$-to-$\text{SO}_3$ conversion.

The emission factor for kg $\text{SO}_2$/Mg 100% $\text{H}_2\text{SO}_4$

\[ = 682 - [(6.82)(\% \text{SO}_2\text{-to-}\text{SO}_3 \text{ conversion})] \]

\[ = 682 - [6.82(97.5)] \]

\[ = 682 - 665 \]

\[ = 17 \text{ kg} \]

In the production of 200 Mg of 100 percent $\text{H}_2\text{SO}_4$ per day, $\text{SO}_2$ emissions are calculated thus:

$\text{SO}_2$ emissions

\[ = 17 \text{ kg} \text{SO}_2 \text{ emissions/Mg 100 percent } \text{H}_2\text{SO}_4 \times 200 \text{ Mg 100 percent } \text{H}_2\text{SO}_4/\text{day} \]

\[ = 3400 \text{ kg/day} \]

Emission Factor Ratings

Each AP-42 emission factor is given a rating from A through E, with A being the best. A factor’s rating is a general indication of the reliability, or robustness, of that factor. This rating is assigned based on the estimated reliability of the tests used to develop the factor and on both the amount and the representative characteristics of those data. In general, factors based on many observations, or on more widely accepted test procedures, are assigned higher rankings. Conversely, a factor based on a single observation of questionable quality, or one extrapolated from another factor for a similar process, would probably be rated much lower. Because ratings are subjective and only indirectly consider the inherent scatter among the data used to calculate factors, the ratings should be seen only as approximations. AP-42 factor ratings do not imply statistical error bounds or confidence intervals about each emission factor. At most, a rating should be considered an indicator of the accuracy and precision of a given factor being used to estimate emissions from a large number of sources. This indicator is largely a reflection of the professional judgment of AP-42 authors and reviewers concerning the reliability of any estimates derived with these factors.
Because emission factors can be based on source tests, modeling, mass balance, or other information, factor ratings can vary greatly. Some factors have been through more rigorous quality assurance than others.

Two steps are involved in factor rating determination. The first step is an appraisal of data quality, the reliability of the basic emission data that will be used to develop the factor. The second step is an appraisal of the ability of the factor to stand as a national annual average emission factor for that source activity.

Test data quality is rated A through D, and ratings are thus assigned:

A = Tests are performed by a sound methodology and are reported in enough detail for adequate validation.
B = Tests are performed by a generally sound methodology, but lacking enough detail for adequate validation.
C = Tests are based on an unproven or new methodology, or are lacking a significant amount of background information.
D = Tests are based on a generally unacceptable method, but the method may provide an order-of-magnitude value for the source.

The quality rating of AP-42 data helps identify good data, even when it is not possible to extract a factor representative of a typical source in the category from those data. For example, the data from a given test may be good enough for a data quality rating of "A", but the test may be for a unique feed material, or the production specifications may be either more or less stringent than at the typical facility.

The AP-42 emission factor rating is an overall assessment of how good a factor is, based on both the quality of the test(s) or information that is the source of the factor and on how well the factor represents the emission source. Higher ratings are for factors based on many unbiased observations, or on widely accepted test procedures. For example, ten or more source tests on different randomly selected plants would likely be assigned an "A" rating if all tests are conducted using a single valid reference measurement method. Likewise, a single observation based on questionable methods of testing would be assigned an "E", and a factor extrapolated from higher-rated factors for similar processes would be assigned a "D" or an "E".

AP-42 emission factor quality ratings are thus assigned:

A — Excellent. Factor is developed from A- and B-rated source test data taken from many randomly chosen facilities in the industry population. The source category population is sufficiently specific to minimize variability.

B — Above average. Factor is developed from A- or B-rated test data from a "reasonable number" of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with an A rating, the source category population is sufficiently specific to minimize variability.

C — Average. Factor is developed from A-, B-, and/or C-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category population is sufficiently specific to minimize variability.
D — Below average. Factor is developed from A-, B- and/or C-rated test data from a small number of facilities, and there may be reason to suspect that these facilities do not represent a random sample of the industry. There also may be evidence of variability within the source population.

E — Poor. Factor is developed from C- and D-rated test data, and there may be reason to suspect that the facilities tested do not represent a random sample of the industry. There also may be evidence of variability within the source category population.

Public Review Of Emission Factors

Since AP-42 emission factors may have effects on most aspects of air pollution control and air quality management including operating permit fees, compliance assessments, and SIP attainment emission inventories, these factors are always made available for public review and comment before publication. The Emission Factor And Inventory Group panel of public and peer reviewers includes representatives of affected industries, state and local air pollution agencies, and environmental groups. More information on AP-42 review procedures is available in the document, Public Participation Procedures For EPA’s Emission Estimation Guidance Materials, EPA-454/R-94-022, July 1994. This publication is available on EFIG’s CHIEF (Clearinghouse For Inventories And Emission Factors) electronic bulletin board (BB) and its Fax CHIEF, an automated facsimile machine. It is also available in conventional paper copy from the National Technical Information Service (NTIS). The Agency encourages all interested parties to take every opportunity to review factors and to provide information for factor quality improvement. Toward this objective, EFIG invites comments and questions about AP-42, and users are invited to submit any data or other information in accordance with this procedures document.

Other Ways To Obtain AP-42 Information And Updates

All or part of AP-42 can be downloaded either from the CHIEF BB or Fax CHIEF, and it is available on the Air CHIEF CD-ROM (Compact Disc - Read Only Memory). AP-42 is available in conventional paper copy from the Government Printing Office and NTIS, as well as through the Fax CHIEF.

The emission factors contained in AP-42 are available in the Factor Information Retrieval System (FIRE). Also, software has been developed for emission models such as TANKS, WATER7, the Surface Impoundment Modeling System (SIMS), and fugitive dust models. This software and the FIRE data base are available through the CHIEF BB. FIRE is also on the Air CHIEF compact disc. The Fax CHIEF and the CHIEF BB will always contain the latest factor information, as they are updated frequently, whereas Air CHIEF, the FIRE program, and printed AP-42 portions are routinely updated only once per year.
Greenhouse gas emissions in Minnesota: 1990-2016

Biennial report to the Legislature tracking the state’s contribution to emissions contributing to climate change.

January 2019

Pollution Control Agency
Department of Commerce
Legislative charge

Minn. Stat. § 216H.02 Greenhouse gas emissions control.
Subd. 1. Greenhouse gas emissions-reduction goal. It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions to a level at least 15 percent below 2005 levels by 2015, to a level at least 30 percent below 2005 levels by 2025, and to a level at least 80 percent below 2005 levels by 2050. The levels shall be reviewed based on the climate change action plan study.

Minn. Stat. § 216H.07 Emissions-reduction attainment; policy development process.
Subd. 3. Biennial report. (a) By January 15 of each odd-numbered year, the commissioners of commerce and the Pollution Control Agency shall jointly report to the chairs and ranking minority members of the legislative committees with primary policy jurisdiction over energy and environmental issues the most recent and best available evidence identifying the level of reductions already achieved and the level necessary to achieve the reductions timetable in section 216H.02. (b) The report must be in easily understood nontechnical terms.

Authors
Anne Claflin
Fawkes Steinwand

Contributors/acknowledgements
Peter Ciborowski
Christopher Davis (Department of Commerce)
Michelle Gransee (Department of Commerce)
Marcus Grubbs (Department of Administration)
Laura Millberg
Katie Pratt (Environmental Quality Board)
Steve Rakow (Department of Commerce)
Amanda Jarrett Smith

Editing and graphic design
Editor: Ralph Pribble
Graphic design: Paul Andre, Anne Claflin
Administrative: Barb Olafson

Estimated cost of preparing this report (as required by Minn. Stat. § 3.197)

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total staff time: 160 hrs.</td>
<td>$5,660</td>
</tr>
<tr>
<td>Production/duplication</td>
<td>$20</td>
</tr>
<tr>
<td>Total</td>
<td>$5,680</td>
</tr>
</tbody>
</table>

The MPCA is reducing printing and mailing costs by using the Internet to distribute reports and information to wider audience. Visit www.pca.state.mn.us for more information.
MPCA reports are printed on 100% post-consumer recycled content paper manufactured without chlorine or chlorine derivatives.

Minnesota Pollution Control Agency
520 Lafayette Road North | Saint Paul, MN 55155-4194 |
651-296-6300 | 800-657-3864 | Or use your preferred relay service. | Info.pca@state.mn.us
This report is available in alternative formats upon request, and online at www.pca.state.mn.us.

Document number: Iraq-2sy19
Contents

Summary: Report to the Legislature .................................................................2
Introduction .................................................................................................3
  Greenhouse gas emissions in Minnesota ......................................................3
Tracking Minnesota’s emission reduction progress .....................................4
  Missing our first milestone: 2015 emissions ..............................................5
  Changing economy, changing emissions ....................................................6
  Greenhouse gas emission intensity ..............................................................10
Moving forward: What else are we doing? ................................................11
  Reducing state government emissions ......................................................11
  Participating in national and international climate change initiatives ........11
  Greening up our energy generation ..........................................................12
  Paving the way for cleaner transportation ..............................................13
  Developing policies that encourage us to adapt to a changing climate ....14
The takeaway ..............................................................................................15
Appendix: Methodology .............................................................................16
Summary: Report to the Legislature

The primary driver behind Minnesota's rapidly changing climate is the emissions of greenhouse gases (GHGs). This report summarizes what we know about the role of GHGs in Minnesota and what the Minnesota Pollution Control Agency (MPCA), Department of Commerce, and other state agencies are doing to track and reduce GHG emissions, comply with relevant state and federal laws, and prepare for the coming impacts of a changing climate.

Key points:

- While Minnesota’s overall GHG emissions declined 12% relative to 2005 levels, we missed the Next Generation Energy Act’s goal of a 15% emissions reduction by 2015.

- Emissions from electricity used by Minnesotans are down by about 29% since 2005. This means the electricity generation sector has met the Act’s 2015 goal, and has nearly reached the 2025 emissions reduction goal. Moreover, Minnesota’s utilities have committed to additional coal plant closures that will further reduce GHG emissions from this sector in the future.

- Transportation is now the largest source of GHG emissions in Minnesota. This sector will require ongoing, focused effort to reduce emissions to the levels necessary to meet statutory goals.

- Growth in our forests contributed to the sequestration of carbon and reduced total GHG emissions. If this growth can be sustained over long periods of time, Minnesota’s forest resources can help us achieve our emission reduction goals.

- Agricultural nutrient management is the largest source of nitrous oxide (N₂O) emissions, but many best management practices that protect water quality from nutrients and sediment also can help reduce GHG emissions.
Introduction

According to the Minnesota Climatology Office, our state’s climate is changing rapidly, and these changes – driven largely by human activities that cause emissions of greenhouse gases – are affecting our health, well-being, ways of life, and natural resources. State agencies are working to protect Minnesotans facing these challenges, and are helping to lead and shape the national conversation about the impacts of climate change and ways we can adapt.

Tracking GHG emissions and understanding their sources are important ways the MPCA helps Minnesotans navigate our changing climate. Collecting and analyzing data helps identify opportunities and challenges for reducing GHG emissions. The Minnesota Department of Commerce protects the public interest by ensuring that energy resources are reliable, affordable, and increasingly clean. Understanding Minnesota’s GHG emissions and emission sources helps Minnesotans mitigate and adapt to a changing climate.

To learn more about climate change in Minnesota and what the MPCA is doing to track GHG emissions, visit our website at https://www.pca.state.mn.us/air/climate-change-minnesota.

Greenhouse gas emissions in Minnesota

GHGs are gases that warm the atmosphere and surface of the planet. Human activity has been increasing the amount of GHGs in the atmosphere, leading to changes in the earth’s climate. The primary GHGs are carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), sulfur hexafluoride (SF₆), and two classes of compounds called hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Figure 1 shows the relative proportions of GHG emissions in Minnesota in 2016.

CO₂ is the most abundant GHG and has had the largest effect on our climate. Other GHGs are emitted in smaller amounts, but can trap heat more effectively than CO₂, and some stay in our atmosphere for a very long time. "Global warming potential" is a relative measure of how much heat a GHG traps in the atmosphere. Because we need to compare these different emissions and pollutants, we use the effect of CO₂ on our climate as a common reference. In this report, emissions are reported as "CO₂-equivalent" (CO₂-e) tons, meaning emissions are stated in terms that reflect their global warming potential.
GHGs come from a variety of sources:

- Fossil fuel combustion is responsible for most CO$_2$ emissions in the U.S. The majority of fossil fuels used today are for generating electricity and fueling vehicles.
- Animal agriculture is responsible for the majority of methane (CH$_4$) emissions. Methane also is emitted from the anaerobic decomposition of organic material.
- Over 50% percent of nitrous oxide (N$_2$O) emissions are caused by agricultural nutrient management practices.
- The majority of HFC emissions are from their use in refrigerants, such as in air conditioning, in both vehicles and buildings.
- PFCs and SF$_6$ only account for a small portion of GHG emissions and are emitted as the result of technical applications, like semiconductor manufacturing and electricity transmission.

In Minnesota, CO$_2$ emissions account for about 73% of total emissions, while methane and nitrous oxide each account for about 13%.

---

**Tracking Minnesota’s emission reduction progress**

In 2007, the Legislature passed the Next Generation Energy Act (NGEA), which set interim and long-term goals for the reduction of GHG emissions in the state. Figure 2 shows the goals, establishing a 2050 reduction of 80% below the 2005 baseline.

Figure 2. Next Generation Energy Act (2007) greenhouse gas emissions reduction goals. These goals are codified in Minn. Stat. § 216H.02.

---

1 Data revisions and changes in methodology can cause the baseline to change, but continuity is provided when making relative year-to-year emissions comparisons.
Missing our first milestone: 2015 emissions

Although mitigation actions have prevented an increase in GHG emissions, Minnesota did not reach the NGEA's 2015 emissions reduction goal of 15% relative to the 2005 baseline. Across all sectors, GHG emissions fell by about 5% from 2005 to 2015; without actions taken within the state, GHG emissions would have risen over that time. This decrease was driven primarily by steep declines in GHG emissions from electricity generation.

Table 1 shows Minnesota's progress in reducing emissions from 2005 through 2016, while Figure 3 shows how emissions have changed during that time.

Table 1. Actual GHG emissions in Minnesota compared to GHG emissions reduction goals set in the Next Generation Energy Act (2007), 2005-2016.

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual emissions (million tons CO₂-e)</th>
<th>Actual percent decrease from baseline*</th>
<th>Emissions goal (million tons CO₂-e)</th>
<th>Goal percent decrease from baseline*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>174.6</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>2015</td>
<td>165.6</td>
<td>5</td>
<td>148.4</td>
<td>15</td>
</tr>
<tr>
<td>2016</td>
<td>154.2</td>
<td>12</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

*Emissions reduction goals in the act are based on actual emissions in Minnesota for the year 2005. Thus, the baseline for reduction is equal to 174.6 million tons CO₂-e.

Figure 3. Minnesota’s GHG emissions, 1990-2016, compared to the 2015 and 2025 goals of the Next Generation Energy Act. Although emissions are decreasing, we did not meet the 2015 emissions reduction goal.
Changing economy, changing emissions

Despite missing the NGEA’s 2015 interim goal, Minnesota is making progress in many areas. This section discusses GHG emissions changes across seven economic sectors in Minnesota: transportation, electricity generation, agriculture and forestry, industrial, residential, commercial, and waste.

Figure 4 compares GHG emissions in each of the seven economic sectors from 2005 to 2016.

Figure 4. Minnesota's GHG emissions from economic sectors, 2005-2016. The dark line in the column for the electricity generation sector represents the division between emissions from electricity generated in Minnesota (below the line) and emissions from imported electricity (above the line).
Transportation

Emissions in the transportation sector include on-road vehicles, airplanes and other aviation equipment, trains, leaky vehicle air conditioning units, and natural gas transmission pipelines. More than 70% of emissions from the transportation sector come from light-duty trucks, passenger vehicles, and medium to heavy-duty trucks. GHG emissions from transportation have decreased by 8% since 2005, and account for about one quarter of the GHG emissions in Minnesota. In 2016, emissions from transportation and electricity generation were about the same². Since emissions from electricity that is generated in Minnesota have been reduced over time and are expected to decrease further, transportation is now the largest source of GHG emissions generated within the borders of Minnesota.

Our personal choices have an impact on emissions. On-road vehicles are the largest category of greenhouse gas emissions within the transportation sector. Federal regulations have resulted in newer vehicle models that are generally more fuel-efficient and therefore produce fewer GHG emissions than older, similar vehicles. However, at the same time Minnesotans are choosing to drive larger, less-efficient and more-polluting vehicles instead of smaller, more-efficient cars. Minnesotans are also driving more miles in those larger vehicles. While federal fuel efficiency standards are putting downward pressure on vehicle GHG emissions, the trend towards larger vehicles and more miles traveled is preventing more significant emissions reductions in this sector. The increased emissions from driving larger vehicles more miles offset reductions otherwise achieved by newer, fuel-efficient vehicles.

The state can support greater GHG reductions from transportation while ensuring that Minnesotans have access to varied transportation options. State government is doing its part by using hybrid or fully electric vehicles and supporting community actions to use alternative transportation. Read more in the “Moving forward” section about what we are doing to help meet the NGEA goals.

Electricity generation

GHG emissions from electricity generation are mostly the result of fuel combustion used to generate electricity consumed by Minnesotans, including electricity generated outside of Minnesota. Other sources include methane from coal storage and hydroelectric reservoirs, CO₂ from flue-gas desulfurization, and SF₆ from electricity transmission and distribution.

Historically, the electricity sector has been the largest source of GHG emissions in Minnesota; in 2016, however, emissions from electricity generation and transportation were about the same². Emissions from the electricity sector have declined 29% since 2005. The decrease is largely due to reductions in the amount of coal burned to generate electricity and increased use of renewable energy.

² Comparisons between sectors depend on the categories and boundaries chosen and on the methods used to estimate emissions. See the appendix for further discussion of methods.
Our total GHG emissions from electricity generation include emissions from electricity generated outside of our state borders, but which we use here. We can also look at just the GHG emissions from electricity generated at facilities within the state. Emissions from in-state generation fell 24% from 2005 to 2016. The amount of electricity that we generate in Minnesota increased at a faster rate than the total amount of electricity Minnesotans consume, which reduces the amount we estimate as imported.

In reality, electricity freely flows across boundaries; we created an accounting framework, based on available data, which takes responsibility for emissions from in-state facilities and in-state consumption of electricity generated elsewhere. In Minnesota and surrounding states, however, coal is being replaced by renewable wind and solar energy, along with natural gas. Recent decisions in utilities’ integrated resource plans will reduce GHG emissions from this sector further.

Agriculture and forestry

Emissions sources in the agriculture and land use sector include livestock, animal feedlots, manure, fertilizer, crop cultivation practices, anaerobic decomposition of organic material, and related fuel combustion of off-road implements like tractors and combines. Carbon also is sequestered in forest regrowth, which is captured in the emissions from this sector.

Compared to the 2005 baseline, emissions from the agriculture and forestry sector have decreased about 12%, but emissions have been highly variable between 2005 and 2016. The largest source of N\textsubscript{2}O emissions is nutrient management, which includes fertilizer use, nitrogen fixation, mineralization, and runoff. N\textsubscript{2}O emissions from crop agriculture increased by about 12% from 2005 to 2016.

We can achieve reductions from this sector by improving best management practices, as many BMPs for nutrient use and sedimentation also act to decrease GHG emissions. Some of the more promising practices for reducing GHGs from agriculture include improved efficiency of nitrogen use (through optimized fertilizer application rates, timing, and placement), conservation cover, riparian buffers and related vegetative filter strips and field borders, and cover crops.

Animal agriculture is the largest source of methane emissions, specifically from manure management and cattle digestion. Methane emissions from animal agriculture increased by about 8% from 2005 to 2016. Our lakes, rivers, and reservoirs are another large source of methane emissions, from the breakdown of biological materials in sediments.

Carbon is sequestered in our forests as they grow. Although there is not a stable or predictable trend, the carbon stored in Minnesota’s forests between 2005 and 2016 increased, which then offset GHG emissions from other agricultural activities.

Industrial

Emissions sources in the industrial sector include fuel combustion, taconite processing, petroleum refining, magnesium casting, lead recycling, peat mining, industrial wastewater treatment, solvent use, and the manufacture of steel, glass, insulating foam, and semiconductors.

Since 2005, emissions from this sector have increased by about 3 million tons CO\textsubscript{2}-e; in 2016, emissions were about 17% above the baseline.
There has been an overall increase in energy used in the industrial sector since 2005, but industrial energy use has decreased from its peak in 2014. Within the total energy trends, coal use has continued to decline steadily. Natural gas use has increased since 2005, but has remained relatively stable since 2010, peaking in 2014.

CO₂-e emissions data for individual sources with MPCA air permits are available on our website, at https://www.pca.state.mn.us/air/permitted-facility-air-emissions-data.

**Residential**

Emissions sources in this sector include fuel combustion for heating and in-home appliances, like water heaters or clothes dryers, and from other sources, including fertilizer use, product use, food additives, and refrigerant leakage from air conditioners and refrigerators. Emissions from electricity use are all included in the electricity generation sector rather than divided between consumers in each sector.

Since 2005, emissions from the residential sector have increased by about 0.9 million tons CO₂-e; in 2016, emissions were about 11% above the 2005 baseline.

Carbon is also stored in wood construction materials for periods long enough that carbon is effectively removed from the atmosphere, reducing total emissions.

**Commercial**

Emissions sources in this sector include fuel combustion, solvent use, and medical N₂O emissions. Institutional emissions are counted in this sector, as well. Commercial-sector emissions have shown an increase of just 1% above the 2005 baseline in Minnesota.

**Waste**

Emissions sources in the waste sector include energy use in waste processing, incinerator fuels and waste incineration, and methane from landfill gas and wastewater treatment. Carbon is also stored, or sequestered from the atmosphere, as wood waste in demolition and construction landfills, which offsets emissions.

Compared to the 2005 baseline, GHG emissions from waste have decreased by about 6%. This is a change from 2014, when waste emissions were greater than they were in 2005.

The MPCA has been working to address methane emissions as the administrator of the state’s closed landfill program.
Greenhouse gas emission intensity

As Minnesota’s economy and population grow, our GHG emissions have declined, which shows that we can support healthy communities and ecosystems, as well as a strong economy. These trends indicate we can continue to curb GHG emissions, while still growing and thriving.

Measuring the amount of GHG emissions compared to other economic trends is one way to understand how GHG emissions relate to our economy. Trends show that Minnesota has begun to disconnect our economic growth from our GHG emissions. Minnesota’s gross state product has grown since 1997, while GHG emissions have remained relatively flat. What this means is that our state economy can grow without increasing GHG emissions. In fact, Minnesota’s experience shows that strong economic growth occurs at the same time that we are reducing GHG emissions. Figure 5a shows this relationship.

Minnesota’s experience shows that we can grow our population while reducing our per capita GHG emissions. While the population in Minnesota is increasing, and is projected to continue increasing, there is a net decrease in how much each individual on average is emitting. Figure 5b shows this relationship.

Figure 5a (left). Minnesota’s GHG emissions per dollar gross state product (GSP), 1997-2016.
Figure 5b (right). Minnesota’s GHG emissions, per capita, 1997-2016.
Moving forward: What else are we doing?

Here are some ways that the MPCA and the Minnesota Department of Commerce are working with other state agencies, Minnesota businesses, and other state and national partners to further reduce GHG emissions in Minnesota.

Reducing state government emissions

The Office of Enterprise Sustainability is providing leadership to all state agencies in efforts to curb GHG emissions. So far, these efforts, including expanding the use of EVs and installation of solar panels, have reduced state government emissions by about 17% from 2005 to 2017.

These efforts were initiated by Governor Mark Dayton’s Executive Order 17-12, which directs state agencies to reduce waste, conserve energy, and save money. One of the objectives of the executive order was to reduce GHG emissions created during day-to-day enterprise operations. State agencies came together to identify reduction strategies, including reducing fuel consumption in state vehicles, reducing energy consumption in buildings, and implementing existing renewable energy policies.

Due to these efforts, state government is over halfway to the order’s goal of 30% reduction by 2025, with half of the decrease coming from electricity savings, reduced square footage of workspaces, and on-site renewable energy generation across state agency offices. Future initiatives include transitioning many light-duty fleet vehicles to electric, exploring the use of more biofuels in medium- and heavy-duty vehicles, implementing a building retro-commissioning program to conserve energy, and installing solar panels at state office and workspace locations.

For more information about how state government has reduced GHGs, check out the Office of Enterprise Sustainability’s 2017 report, at https://mn.gov/admin/assets/2018%20annual%20report_web_tcm36-355173.pdf.

Participating in national and international climate change initiatives

Minnesota is a member of various national and international coalitions working to reduce GHG emissions and move forward with actions to mitigate climate change. In 2015, Minnesota joined the Under2 Coalition, an international group comprising over 200 state, regional, and national governments committed to keeping global temperature increases to under 2 degrees Celsius. The coalition aims to find pathways for “deep decarbonization,” innovative policy solutions, and systems to improve emissions reporting and policy development. More information can be found at https://www.under2coalition.org/.

In 2017, Minnesota also joined the U.S. Climate Alliance, a bipartisan group of state governors committed to reducing GHG emissions consistent with the goals of the United Nations Paris Agreement. As a member of the alliance, Minnesota agrees to implement policies that advance the goals of the Paris Agreement, track and report progress to the global community, and accelerate new and existing policies to reduce carbon pollution. More information can be found at https://www.usclimatealliance.org/.
Most recently, in September 2018, Minnesota joined the Powering Past Coal Alliance, an international group of state, regional, and national governments, businesses, and organizations dedicated to advancing the transition of power generation away from coal. Members of this alliance believe that moving away from coal power generation is necessary to promote clean air, healthy communities, sustainable economic growth, and a safe climate. As a part of this alliance, Minnesota is committed to work with our utility partners to move towards a future of renewable energy generation and to reduce our reliance on coal. More information can be found at https://poweringpastcoal.org/.

**Greening up our energy generation**

Minnesota has made great progress toward a clean energy future by substantially reducing GHG emissions from electricity generation. Local utilities continue to close coal plants and replace that power generation with a mix of renewables backed by natural gas. Minnesota's work on clean energy shows we can reduce GHG emissions cost-effectively while our economy continues to grow.

The electricity generation sector’s steep reductions in GHG emissions in Minnesota have resulted from policies to reduce demand for electricity and shift generation to cleaner energy sources. These policies worked in tandem with market forces that make many renewable resources more cost-effective than coal facilities. Efficiency projects are often the most cost-effective way to reduce GHG emissions from electricity generation, so they were the first area where Minnesota focused reduction efforts, requiring utilities to invest in energy efficiency for homes and businesses. Utilities have taken advantage of market developments as well: technology improvements and federal tax policies that have lowered the cost of wind and solar energy development, the continued low price of natural gas, and electricity consumers’ growing preference for “green” energy.

Over the past two decades, Minnesota adopted several requirements for electricity generation and renewable energy:

- In 2001, the Legislature allowed utilities to charge customers for the cost of air pollution-reduction projects. This law has encouraged utilities to replace coal generation with gas and wind.
- In 2007, the Legislature adopted the state Renewable Energy Standard (RES) that created renewable energy requirements for all utilities operating in Minnesota. By 2025, the RES requires that a weighted 27% of all retail electricity sales in Minnesota come from renewable energy sources. Minnesota’s utilities are on track to meet this requirement.
- Also in 2007, the state implemented electric utility requirements to reduce 1.5% of retail sales through programs that target the users of electricity, building on previous successful efficiency programs.
- In 2013, the Legislature adopted a solar energy standard for the state’s investor-owned utilities that requires that, by the end of 2020, at least 1.5% of total retail sales are generated by solar energy.
Additionally, several electricity generating facilities, especially those powered by coal, have either recently been retired or are planned to be retired soon. The planned retirements are listed in Table 2.

**Table 2. Planned in-state electricity generating unit retirements for Minnesota utilities.**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Fuel type</th>
<th>Size</th>
<th>Retirement date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minnesota Power</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boswell Energy Center 1</td>
<td>Coal</td>
<td>67 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Boswell Energy Center 2</td>
<td>Coal</td>
<td>67 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Taconite Harbor Energy Center unit 2</td>
<td>Coal</td>
<td>76 MW</td>
<td>2020</td>
</tr>
<tr>
<td>Taconite Harbor Energy Center unit 3</td>
<td>Coal</td>
<td>83 MW</td>
<td>2020</td>
</tr>
<tr>
<td>Silver Bay Power: 2 units</td>
<td>Coal</td>
<td>130 MW</td>
<td>2021</td>
</tr>
<tr>
<td><strong>Otter Tail Power Company</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoot Lake Combustion Turbine units</td>
<td>Coal</td>
<td>141 MW</td>
<td>2020</td>
</tr>
<tr>
<td><strong>Great River Energy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stanton Station (North Dakota)</td>
<td>Coal</td>
<td>187 MW</td>
<td>2018</td>
</tr>
<tr>
<td><strong>Xcel Energy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benson Power Biomass Plant</td>
<td>Biomass</td>
<td>55 MW</td>
<td>2018</td>
</tr>
<tr>
<td>Sherburne County 1</td>
<td>Coal</td>
<td>680 MW</td>
<td>2026</td>
</tr>
<tr>
<td>Sherburne County 2</td>
<td>Coal</td>
<td>682 MW</td>
<td>2023</td>
</tr>
</tbody>
</table>

**Paving the way for cleaner transportation**

Minnesota state agencies, local governments, non-profits, and electric utilities are working to accelerate electric vehicle (EV) adoption in Minnesota by educating Minnesotans about the benefits of EVs and leading and supporting initiatives to build out EV charging infrastructure across the state. The state’s ongoing transition away from coal to renewable energy is amplifying the benefits of EVs, which can take advantage of GHG emission reductions in the power sector. Special electricity rates for EV owners can encourage Minnesotans to charge their EVs at night, which provides benefits to the power grid.

Minnesota is receiving $47 million under the national Volkswagen settlement, and is targeting 15% (the maximum allowed by the settlement) of our Phase I funds to begin building a statewide network of EV charging stations. This will help expand the reach of EVs and reduce barriers to their adoption. More information about how Minnesota is using VW settlement funds can be found at [www.pca.state.mn.us/vw](http://www.pca.state.mn.us/vw).

In addition to promoting electrification, the MPCA serves as an advisor and technical resource for a wide range of other transportation planning and funding efforts across the state. Transportation planning can
have a big impact on vehicle emissions by promoting investment in infrastructure that supports alternative modes of transportation, like public transit, walking, and biking. We work with partners to encourage land-use planning that provides opportunities for people to live within walking or biking distance of the places they need to get to every day, and to promote the use of public transit.

Developing policies that encourage us to adapt to a changing climate

Many Minnesota state agency programs and policies relating to climate change focus on reducing GHG emissions. Adapting to a changing climate, on the other hand, involves developing and implementing strategies, initiatives, and measures to help us prepare for and address the impacts of climate change.

In its 2017 report, “Adapting to Climate Change in Minnesota,” the Interagency Climate Adaptation Team recommended six priority action steps where state government could be of most help:

1. Build greater resilience to extreme precipitation.
2. Identify opportunities to strengthen the health and resilience of vulnerable populations to climate effects through cooperation with local governments.
3. Increase focus on preserving natural and restored ecosystems and habitat to increase resilience of wildlife and native plants.
4. Strengthen agricultural water-management efforts to increase resilience to climate change impacts.
5. Increase focus on managing climate impacts in cities, towns, and other population centers.

The MPCA is implementing several of the above recommendations throughout our work. In 2018, we adopted a new cross-agency strategic goal focusing on climate adaptation efforts, and we are creating an information dashboard to display our climate adaptation data. We also are working with community partners to incorporate resilience into planning and infrastructure, identify and reduce risks for climate-vulnerable populations, and implement adaptation best practices. To learn more about the MPCA’s climate adaptation efforts, visit https://www.pca.state.mn.us/air/adapting-changing-climate.

The Minnesota Department of Health is working with the MCPA and other state agencies to deal with the effects of climate change on human health. The goal of the Minnesota Climate and Health Program is to help us understand the impacts of climate change, and to educate local public health resources and the public about potential health risks. More information on MDH’s Minnesota Climate and Health Program can be found at http://www.health.state.mn.us/divs/climatechange/.
The takeaway

Minnesota has made important progress in reducing GHG emissions, but there is more work to be done to achieve the goals of the Next Generation Energy Act. Significant GHG reductions from the electricity generation sector have driven overall emission trends downward since 2005, aided by smaller improvements in some sectors. These changes show that clean energy laws and programs can and do reduce GHG emissions, but we need to accelerate the pace of progress.

Emissions from Minnesota’s electricity generation sector will continue to decrease, as renewable sources account for greater amounts of the energy produced and used here. In order to achieve our GHG emissions reduction goals, however, we will need to further reduce emissions from what is now our largest source of in-state emissions, transportation. Supporting and promoting the use of EVs, supporting the use of cleaner transportation fuels (such as biofuels), encouraging the use of public and multimodal transportation, and mindful transportation planning are crucial elements in decreasing GHGs from transportation.

Minnesota has been and will remain a leader in GHG emission trends, but without continued support and additional effort, we are not likely to achieve the goals of the Next Generation Energy Act.
Appendix: Methodology

Greenhouse gas emission inventory
A technical support document published in 2012 with the emissions report for 1970-2008 provides a more detailed discussion on the calculation methodology and is available at https://www.pca.state.mn.us/air/greenhouse-gas-emissions-minnesota-0.

Only emissions that occur within the geographical borders of the state are estimated, with two exceptions – net imports of electricity into the state to meet Minnesota demand and emissions from the combustion of aviation fuel purchased in Minnesota, but not necessarily combusted within Minnesota air space.

GHG inventory protocols require that evaluation of state-level GHG emissions take into account photosynthetically-removed CO₂ stored in biomass in forests, landfills, and structures. Carbon storage and emissions from forest soils and agricultural soils are tracked separately from the emissions inventory because it is difficult to estimate specific sources within the larger estimate of carbon flux. Storage of carbon in forest regrowth is incorporated into the agriculture and forestry sector using a discounted storage term of 25 years. Long-term storage of carbon in residential structures and demolition and construction landfills is included in statewide GHG emission totals because it is more certain that the materials will remain as carbon stores for a long time.

Emissions are estimated for all years from 1970 to 2016, though presented here in an abbreviated timeline. With a few exceptions, the methods used to develop these estimates are derived from the following sources:


Updates to methodology and data sources
Except for changes within the agriculture and forestry sector, the methods used to develop the emission estimates are largely unchanged from previous reports. The methodological changes made since the last report were made to improve estimation of total emissions. To assure consistency, these changes were applied to all prior inventory years, when possible, including the baseline year of 2005. Revised data used as inputs for estimation were updated when available.

Significant changes were made to estimates of emissions from agriculture and forestry. The methods used to estimate N₂O from agricultural soils were updated to include present scientific understanding
and inventory practice based on an inventory framework from the IPCC (2006). New or revised N₂O emission sources include: dry deposition, crop residues from cultivated acres and grasslands, mineralization on cropland and grassland, and asymbiotic nitrogen fixation. The emission factor for pastured histosols was also updated.

Emissions of CO₂ from cultivation and pasturing of histosols were recalculated using state-level information provided by the EPA.

Sources of methane were added to the agriculture and forestry sector to account for the production of methane in lakes, rivers, streams, and reservoirs.

Forest regrowth was added as a source of carbon sequestration. Given the many unknowns about the future of our forests, we estimate a higher probability that carbon stored in the forest will remain there for about 25 years. We have adjusted our inventory estimates to account for that understanding.

Prior to the 2017 Biennial Greenhouse Gas Emissions report, emissions from the transportation sector had been estimated using fuel sales, with the emissions allocated to different modes of transportation using vehicle population, vehicle miles traveled, fuel efficiency, and other fleet statistics. The EPA has developed and improved their motor vehicle emissions simulator (MOVES) to estimate greenhouse gas emissions as well as criteria air pollutants. This model was used to estimate Minnesota’s transportation GHG emissions beginning in the last report and covers 2005-2016. The MOVES model uses the same types of fleet statistics, but estimates energy and fuel consumption as model outputs.

Uncertainty of estimates
The MPCA developed its GHG Emission Inventory system with the following in mind: the long record of emissions covering periods of years to decades; a consistent time series of estimates; best international and US practices; high level of data disaggregation; and timeliness. Reflecting these principles, this GHG inventory is:

Complete: This inventory accounts for and reports on Minnesota GHG emission sources and activities within the chosen inventory boundary, as described in the MPCA’s GHG Inventory Technical Support Document. Not all emissions and sinks are included in the statewide total. In some cases, methods have not been developed or data do not exist to support an estimate.

Consistent: The MPCA uses consistent methodologies to allow for meaningful comparisons of emissions over time. Changes to the methods are documented and reported.

Transparent: The MPCA administers the production of the GHG inventory to address all relevant issues in a factual and coherent manner, and to maintain a clear audit trail. Relevant assumptions are disclosed with appropriate references to the accounting and calculation methodologies and data sources used.

Accurate: The MPCA administers the GHG inventory to ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, and as far as the MPCA can judge, uncertainties are reduced as far as practicable.

With this report, the MPCA is providing a qualitative discussion of the uncertainty of emission estimates. Uncertainties around the precision and accuracy of estimates arise and the acknowledgement of uncertainty is not intended to invalidate the estimates. The uncertainties in the reported greenhouse gas estimates are reduced as far as is practical. In future inventories, the MPCA may provide quantitative uncertainty analysis.
This report summarizes GHG emissions by economic sectors, meaning that emissions estimates are the sum of emissions from activities within the sector. Many methodologies and data sources are used to estimate emissions from each activity within a sector. Some of the methods for generating the estimates are very detailed and are the result of site-specific measurements for both activity and emissions, while some are based entirely on the use of a model with only general data to characterize the source of emissions.

As a result, it is not accurate to assign a single quality rating to the entire economic sector estimate at this time. Within each sector, the confidence in data quality can vary. Generally, the more regulated activities have high-quality activity and emission data.

On the whole, fossil fuel use and emissions are very well understood, especially when aggregated to state totals. For example, the quantity of natural gas used in the state leaves little uncertainty, but there is some uncertainty in distributing its use among sectors. Fossil fuel combustion from stationary sources, such as power plants, creates about 50% of our GHG emissions. These emissions are estimated using highly reliable methods, like continuous emissions monitors in place for other regulatory reporting requirements, by mass balance calculations, or by factor calculation from fuel consumption.

All transportation emissions account for about 25% of our GHG emissions. Emissions from on-road transportation are estimated using the MOVES model, which depends on vehicle population data and vehicle miles traveled, rather than fuel data. There is some uncertainty from data inputs and from the underlying equations and assumptions of the model.

The MPCA has undertaken improvement projects which reduce uncertainties to the extent that is practical and where data allows. Comparisons can be made across time because of the consistent revision of the inventory. Conclusions about reaching Minnesota’s GHG reduction goals can be drawn from the inventory when its limits are understood.
Improved calculation of warming-equivalent emissions for short-lived climate pollutants

Michelle Cain1,2, John Lynch3, Myles R. Allen1,3, Jan S. Fuglestvedt4, David J. Frame5 and Adrian H Macey6,7

Anthropogenic global warming at a given time is largely determined by the cumulative total emissions (or stock) of long-lived climate pollutants (LLCPs), predominantly carbon dioxide (CO₂), and the emission rates (or flow) of short-lived climate pollutants (SLCPs) immediately prior to that time. Under the United Nations Framework Convention on Climate Change (UNFCCC), reporting of greenhouse gas emissions has been standardised in terms of CO₂-equivalent (CO₂-e) quantities. However, the recent introduction of Global Warming Potential (GWP) over 100-years, but the conventional usage of GWP does not adequately capture the different behaviours of LLCPs and SLCPs, or their impact on global mean surface temperature. An alternative usage of GWP, denoted GWP*, overcomes this problem by equating an increase in the emission rate of an SLCP with a one-off “pulse” emission of CO₂. We show that this approach, while an improvement on the conventional usage, slightly underestimates the impact of recent increases in SLCP emissions on current rates of warming because the climate does not respond instantaneously to radiative forcing. We resolve this with a modification of the GWP* definition, which incorporates a term for each of the short-timescale and long-timescale climate responses to changes in radiative forcing. The amended version allows “CO₂-warming-equivalent” (CO₂-we) emissions to be calculated directly from reported emissions. Thus SLCPs can be incorporated directly into carbon budgets consistent with long-term temperature goals, because every unit of CO₂-e emitted generates approximately the same amount of warming, whether it is emitted as an SLCP or a LLCP. This is not the case for conventionally derived CO₂-e.

npj Climate and Atmospheric Science (2019) 2:29; https://doi.org/10.1038/s41612-019-0086-4

INTRODUCTION

Comprehensive climate policies must appraise a range of greenhouse gases and aerosols, which can differ significantly in their radiative efficiencies and atmospheric lifespans, and hence the nature of their climate impacts.1 To reflect this, different climate pollutants are often expressed using a common emission metric. Emissions reporting under the United Nations Framework Convention on Climate Change (UNFCCC) now requires the use of 100-year Global Warming Potential (GWP₁₀₀) to account for all gases as carbon dioxide equivalent (CO₂-e) quantities. Despite its prevalence in the UNFCCC and national climate policies, GWP has received criticism, not least that it cannot be used to appraise temperature-related goals, and other equivalence metrics have been proposed.6–9 Indeed, Shine notes that strong caveats were in place when GWP was introduced in the Intergovernmental Panel on Climate Change’s First Assessment Report: “It must be stressed that there is no universally accepted methodology for combining all the relevant factors into a single [metric]... A simple approach [i.e., the GWP] has been adopted here to illustrate the difficulties inherent in the concept.” Working Group 1 of the Fifth Assessment Report, AR5, did not recommend any metric and emphasised that the choice of metric depends on the specific goal of the climate policy. In AR4, however, the GWPs were the recommended metric to compare the effects of long-lived greenhouse gases, and AR5 values of GWP₁₀₀ have now been adopted for emissions reporting (see the textual proposal from 12 December 2018 on the transparency framework for action and support referred to in Article 13 of the Paris Agreement: https://unfccc.int/process/bodies/subsidiary-bodies/ad-hoc-working-group-on-the-paris-agreement-apa/information-on-apa-agenda-item-5).

The temperature response to emissions is ambiguous under GWP,10,11 and this ambiguity is particularly relevant in the context of the Paris Agreement, given its stated aim of “holding the increase in the global average temperature well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C.” Beyond the reference to a balance of emissions by sources and removals by sinks well before the end of the century, neither the means by which this is to be achieved nor the metrics used to assess progress are explicitly stated.12 Tanaka and O’Neill demonstrate that net-zero aggregate CO₂-e emissions based on GWP₁₀₀ (which is often assumed to be the definition of the balance of sources and sinks described in the Paris Agreement) are not essential to limit warming to 1.5 °C. Wigley posits that the balance of sources and sinks in Article 4.1 of the Paris Agreement is scientifically inconsistent with the temperature goals in Article 2.1. These papers show how moving from the temperature goals articulated in the Paris Agreement to emissions targets and profiles is not something that is currently well-handled by conventional carbon accounting; they also show that the area...
is receiving renewed scrutiny as countries, firms and sectoral bodies try to work out mitigation strategies of their own.

This paper demonstrates a method that unambiguously links aggregated greenhouse gas emissions with their warming outcomes on decade to century timescales, allowing short-lived climate pollutants (SLCPs) to be brought into a carbon budget framework. It is designed to be useful for informing policies that specifically aim to limit global warming, as is required under the Paris Agreement. This method builds on the revised usage of GWP, denoted GWP*, proposed in Allen et al., building on Shine, et al. Specifically, we address a shortcoming in the originally proposed definition of GWP*, in that it did not account for the delayed temperature response to past increases in SLCP emissions, bringing aggregate emissions into closer agreement with both CO2-forcing-equivalent emissions and the temperature response.

RESULTS
A revised definition of GWP*
A new usage of GWPs, denoted GWP*, allows emissions of short-lived and long-lived climate pollutants (SLCP & LLCPS) to be more consistently expressed within a single metric by equating a change in the emission rate of an SLCP as equivalent to a single emissions pulse of a long-lived pollutant. As originally defined in Allen, et al., a step-change in emission rate of an SLCP (ΔESLCP tonnes per year) is equivalent to a one-off pulse emission of ΔESLCP × GWP* H tonnes of CO2, where GWP* is the conventional Global Warming Potential relative to CO2, integrated over a time-horizon H years. Emissions of LLCPS, defined here as those having an atmospheric lifetime longer than H, will still behave as a cumulative pollutant within time-horizon H, and therefore equivalent emissions for LLCPS are derived simply by multiplying those emissions by GWP*. This rate-based equivalence for SLCPs overcomes the problems inherent in GWP (or any pulse-based metric) in not adequately distinguishing their largely non-cumulative behaviour. However, although a sustained SLCP emissions rate will result in a stable atmospheric concentration and hence maintain the same level of forcing, some additional long-term warming will occur while the climate system is still equilibrating to past increases in SLCP emissions. Note this is not a cumulative impact of emissions mirroring that of CO2; it is, rather, the delayed response associated with equilibration to a past increase in forcing. After a sufficiently long period of constant emissions (on the order of centuries), SLCP-induced warming will stabilise, whereas CO2-induced warming continues to increase as long as CO2 emissions remain above zero. After CO2 emissions reach zero, ongoing thermal adjustment in surface temperature is largely balanced by ocean uptake of CO2, at least in the absence of strong Earth System feedbacks.

The multi-century component of the thermal response of the climate system, together with carbon cycle feedbacks, act to prolong the warming impact of SLCP emissions. As noted in Allen, et al., this can be incorporated by including a small contribution that scales with time-integrated (SLCP) emissions.

This component was not pursued in Allen, et al., for simplicity and because the contribution of this multi-century adjustment to past increases in SLCP emissions is small compared to the impact of current changes in SLCP emissions under the scenarios considered in that paper (see their Fig. 2 and supplementary Fig. 1 to this paper). Nevertheless, it may be significant for individual countries whose SLCP emissions have increased within the past half-century or so and are now approximately stable.

Thus, we propose a re-definition of GWP* to incorporate both timescales, as well as providing a theoretical justification below, we here adjust this empirically to produce the best fit between cumulative CO2-warming-equivalent (CO2-we) emissions and resultant warming (see below and Methods for full details). Calculated using this re-defined GWP*, CO2-we emissions of an SLCP in a given year are defined:

\[ E_{\text{CO2-we}} = \text{GWP}_* \times \left( r \times \frac{\Delta E_{\text{SLCP}}}{\Delta t} \times H + s \times E_{\text{SLCP}} \right) \]  

where GWP* is the conventional global warming potential for a given SLCP over time-horizon H, \( \Delta E_{\text{SLCP}} \) the change in SLCP emission rate over the preceding Δt years, \( E_{\text{SLCP}} \) the SLCP emissions for that year, and r and s the weights assigned to the rate and stock contributions, respectively. The only difference between this formulation and that of Allen et al. is that they used \( r = 1 \) and \( s = 0 \). Including the time period Δt spreads the CO2-we pulse corresponding to a change in SLCP emission rate over Δt. Allen et al. suggest at least 20 years, which has the effect of reducing the volatility in CO2-we emissions and improving the correspondence with temperature response. The first ("rate") term on the right-hand side, \( r \times \frac{\Delta E_{\text{SLCP}}}{\Delta t} \times H \times \text{GWP}_* \), represents the response to the changing SLCP emission rates. The second ("stock") term, \( s \times E_{\text{SLCP}} \times \text{GWP}_* \), is added to represent the long-term equilibration to past increases in forcing, which can be approximated by a small term scaling with cumulative SLCP emissions. In other words, the rate term approximates the short-timescale climate response to a change in radiative forcing; the stock term approximates the long-timescale equilibration which occurs even when there is constant radiative forcing.

The exact values of r and s will depend on the precise timescales of the climate response to radiative forcing, on how long ago the increase in SLCP emissions occurred, and on carbon cycle feedbacks, all of which are uncertain and scenario-dependent. Constraining \( r + s = 1 \) ensures that total CO2-we emissions over 100 years corresponding to a steady SLCP emission starting in year 1 are the same as total CO2-we emissions would be, consistent with the original derivation of GWP* presented in Allen, et al. The ratio \( s/r(H) \) corresponds to the fractional rate of decline of SLCP emissions for these to be considered equivalent to a zero rate of CO2-we emissions and hence not cause further warming. This depends on the SLCP and details of the scenario in question. Our objective is a simple and reliable indicator of the relationship between emissions and recent and near-term future warming associated with the largest non-CO2 climate drivers, so we estimate r and s using a multiple linear regression onto the response to methane emissions in commonly used scenarios (representative concentration pathways, RCPs), focusing on the time period 1900–2100.

The method is applicable to other SLCPs, but the optimal values of r and s could be different for each SLCP dependent on past emissions. As many short-lived industrial gases have only started being released in recent decades, the warming responses to these gases is likely distinct to those for methane, with a greater emphasis on the immediate effects of changing emission rates, and thus not necessarily reflecting the same r and s values as derived for methane here. That said, GWP*, like any metric, depends on strong assumptions of linearity, so the additional precision may not be worth the additional complexity. The application of GWP* to specific other gases is beyond the scope of this paper but warrants further investigation, given their impacts are substantial and potentially growing. For example, the radiative forcing from total halocarbons (long and short-lived) is less than half that from methane but may grow with increasing demand for air conditioning.

Empirical estimation of flow and stock contributions
The global mean surface temperature (GMST) responses (ΔT) to methane radiative forcing from the RCP2.6, 4.5 and 6 scenarios taken from the AR5 database were derived using the default configuration of the FaR simple climate model. Methane was
The cumulative CO²-e emissions calculated using dashed line, right axis) for RCP 2.6 (upper), RCP 4.5 (middle) and RCP 6 (lower) are shown aggregated using GWP₁₀₀ (cyan), GWP* using only the flow properties (orange), GWP* for both flow and stock properties using $r = 0.75$ and $s = 0.25$ (purple), against modelled warming response to the methane radiative forcing from the scenario database. TCRE values of 1.5 (shallowest gradient), 2.0, and 2.5 K per trillion tonnes Carbon equivalent (or 0.41, 0.55 and 0.68 K per trillion tonnes of CO₂-we) are shown by grey lines.

Fig. 2 Cumulative methane emissions (1900–2100) from the historical period plus RCP 2.6 (solid), RCP 4.5 (dashed) and RCP 6 (dotted) converted to CO²-e emissions using GWP₁₀₀ (cyan), GWP* using only the flow properties (orange), GWP* for both flow and stock properties using $r = 0.75$ and $s = 0.25$ (purple), against modelled warming response to the methane radiative forcing from the scenario database. TCRE values of 1.5 (shallowest gradient), 2.0, and 2.5 K per trillion tonnes Carbon equivalent (or 0.41, 0.55 and 0.68 K per trillion tonnes of CO₂-we) are shown by grey lines.

The linear relationship between cumulative CO₂ emissions and warming is the basis for the carbon budget concept, which describes how much CO₂ can be emitted before any given threshold of global mean warming is reached. Previous studies have computed CO₂ budgets conditioned on specific scenarios for non-CO₂ forcing. GWP* allows non-CO₂ forcings to be included in the carbon budget itself, as it describes a linear relationship between cumulative CO₂-we emissions of SLCPs and warming, as shown in purple in Fig. 2.

Under GWP₁₀₀ (cyan) this relationship breaks down completely when SLCP emissions start to decline. Unphysically, GWP as traditionally used implies declining methane emission rates still contribute to increasing cumulative CO₂-e, when they are in fact causing cooling. Hence, the negative gradient towards the end of the cyan scenarios in Fig. 2. If only the flow properties of methane are considered (orange), reducing methane emission rates are now equivalent to a negative CO₂ emission, so the line ‘turns back’ on itself as cumulative emissions decline alongside reducing temperatures. Although much closer to a linear relationship than GWP₁₀₀, in this exclusively rate-based version there is now more CO₂-we removal than would be expected to explain a given amount of cooling, if we consider that the truly equivalent relationship should mimic that of CO₂ emissions and temperature response, which is approximately linear.

To demonstrate the improved warming-equivalence of GWP*, cumulative emissions (left axes) are shown alongside the corresponding warming in Fig. 1. The change in GMST calculated from the methane radiative forcing is shown as a time series (black dashed line, right axis) for RCP 2.6 (upper), RCP 4.5 (middle) and RCP 6 (lower). The cumulative CO₂-e emissions calculated using GWP₁₀₀ (cyan) show that there is no agreement between CO₂-e emissions and warming when methane emissions are stable or in decline. CO₂-we emissions calculated with GWP*, especially when both stock and flow properties are included (purple), show a clear improvement with the cumulative emissions matching the temperature response.

Under GWP₁₀₀ (cyan) this relationship breaks down completely when SLCP emissions start to decline. Unphysically, GWP as traditionally used implies declining methane emission rates still contribute to increasing cumulative CO₂-e, when they are in fact causing cooling. Hence, the negative gradient towards the end of the cyan scenarios in Fig. 2. If only the flow properties of methane are considered (orange), reducing methane emission rates are now equivalent to a negative CO₂ emission, so the line ‘turns back’ on itself as cumulative emissions decline alongside reducing temperatures. Although much closer to a linear relationship than GWP₁₀₀, in this exclusively rate-based version there is now more CO₂-we removal than would be expected to explain a given amount of cooling, if we consider that the truly equivalent relationship should mimic that of CO₂ emissions and temperature response, which is approximately linear.
Physical interpretation and justification

We can illustrate the physical interpretation of $r$ and $s$ values by considering some more idealised scenarios. Setting the left-hand side of equation 1 (CO$_2$-we emissions) to zero, we are able to calculate the methane trend required to be equivalent to no further CO$_2$ emissions: $\Delta EAG/$\Delta$ = -s/(rH)EAG$, which is required to generate a radiative forcing pathway that will approximately stabilise temperatures over the time period $\Delta$ t. Hence with $r = 0.75$, $s = 0.25$ and $H = 100$ years, $s/(rH) = 0.3%$ is the rate at which methane emissions need to decline to give stable methane-induced warming. This makes zero CO$_2$-we emissions under GWP* consistent with stable temperatures, matching the temperature response to zero CO$_2$ emissions.

The definition of CO$_2$-we using GWP* is independent of SLCP lifetime (assumed to be much shorter than $H$), but it does depend on the SLCP forcing history: if temperatures are close to equilibrium following a very gradual forcing increase over many centuries, a near-zero decline rate (near constant SLCP emissions) would be consistent with no further warming. Faster rates of decline would be required to maintain no further warming following a rapid increase in SLCP forcing, because the climate system would be further from equilibrium. Here we have based the coefficients and therefore the rate of decline on a combination of historical (1900 onwards) and future scenario emissions to encompass climate response in the near future to emissions over the last century.

We have used an empirical method to find a definition of GWP* that preserves the link between an emission and the warming it generates in the medium term up to 2100. The physical interpretation of equation 1 is that the flow term (with coefficient $r$) represents the fast climate response to a change in radiative forcing, generated by the atmospheric and ocean mixed-layer response.$^{29}$ The timescale of this response is about 4 years here.$^{31}$

The stock term (with coefficient $s$) represents the slower timescale climate response to a change in radiative forcing, due to the deep ocean response. This effect means that the climate responds slowly to past changes in radiative forcing, and is why the climate is currently far from equilibrium. We have approximated this response by treating a quarter of the climate response to a SLCP as "cumulative". The timescale for this response is uncertain.$^{32}$ and is of the order a few centuries, as discussed below.

The exponential decline of 0.3% per year corresponds to a time constant of about 300 years, consistent with the equilibrium timescale of the climate system. This timescale is largely governed by deep ocean adjustment to relatively recent forcing increases identified by Geoffroy, et al.$^{33}$ (multi-model mean of 290 years, with a standard deviation of 107 years). If the equilibrium timescale of the climate system were shorter, then $r$ would be lower. If the deep ocean response timescale were the same as the atmosphere and mixed ocean timescale (about 4 years), then $r$ would be 1, $s$ would be 0, and the definition of GWP* from Allen, et al.$^{12}$ would not change.

The rate at which global methane emissions need to decline to reduce the rate of methane-induced warming to zero has not been explored systematically with complex models and would depend on the details of its atmospheric chemistry. An indication of the rate of decline of emissions of a generic SLCP required to stabilise SLCP-induced warming following a linear increase in SLCP emissions over a multi-decade period can be provided by considering the generic response to the following widely studied scenario: a linear increase in forcing to the equivalent of a CO$_2$ doubling over 70 years, followed by constant forcing. If the thermal response of the climate system is characterised by a short (sub-decadal, atmosphere and mixed layer ocean) adjustment time, $d_s$ and a long (multi-century, deep ocean) adjustment time, $d_s \gg 70$ years, temperatures after year 70 adjust exponentially from their value at year 70 (the Transient Climate Response, or TCR) to their long-term equilibrium value (the Equilibrium Climate Sensitivity, or ECS) with an adjustment timescale $d_s$. Hence, warming would rise at a fractional rate of (ECS–TCR)/($d_s \times$ TCR) per year in the decades immediately after forcing is held constant (see supplementary Fig. 2). On multi-decade timescales longer than the SLCP lifetime, SLCP emissions would need to fall at the same fractional rate to yield no further warming, since the rate of SLCP emissions scales with SLCP-induced forcing and the temperature response is linear in forcing.

For representative values, (ECS = 2.75 °C, TCR = 1.6 °C, $d_s = 239$ years, after Millar, et al.$^{31}$) this indicates a decline rate, (ECS–TCR)/(($d_s \times$ TCR)), of 0.3% per year, corresponding to a time-scale of 333 years (the inverse of 0.3%/year). This is consistent with our estimates of $r = 0.75$ and $s = 0.25$ for $H = 100$ years, which give a time-scale ($r/s) \times H$ of 300 years. This indicates the approximate rate of decline of methane emissions required for no further warming. However, this timescale depends on the multi-century response of the climate system and carbon cycle feedbacks, all of which are poorly constrained by available observations and modelling: targeted experiments varying methane emissions growth and decline rates would give a more precise indication.

The relationship between stable or declining methane emissions is shown in Fig. 3 for a range of model parameters in the simple climate model, FaIR (assuming a constant methane lifetime). Different colours show simulations with a 1-sigma range of $d_s$ values from Geoffroy, et al.$^{33}$ and for a range of realised warming fractions (the ratio of TCR/ECS) based on that in the CMIP5 ensemble.$^{33}$ The dashed lines show the scenario in which methane emissions are kept stable for 130 years after a 70-year ramp up to approximately present day emission rates. For all parameter combinations, constant methane emissions cause a continued warming. The solid lines show scenarios which reduce the emissions by a fractional rate of (ECS–TCR)/(($d_s \times$ TCR)) per year to compensate for the slow climate response. As predicted, these give stable temperatures over the decades following the emissions peak. Decline rates range from between 0.06% (TCR:1.6 °C, ECS:2.0 °C, $d_s=397.0$ years) and 0.55% (TCR:1.6 °C, ECS:3.2 °C, $d_s=183.0$ years). Note that these values have been calculated based on a simple climate model that emulates the response from complex climate models. There remains considerable uncertainty in how the real climate would evolve, for example...
through feedbacks that are not yet included in climate models, which may not be fully reflected in this range of estimates.

While methane emissions may thus appear to have a cumulative impact on global temperature, this is better interpreted as the delayed response to relatively recent methane emissions increases. Constant anthropogenic methane emissions, if maintained indefinitely, clearly have no further warming impact (being indistinguishable from constant natural emissions). This apparent cumulative impact is important, and captures the potential benefits of early methane mitigation not apparent through a solely rate-based equivalence, but is only about 25% (s) of the impact indicated by GWP_{100} and closer to that indicated by the 100-year Global Temperature-change Potential (GTP) including carbon cycle feedbacks. This should not, however, be interpreted as simple support for a lower metric value than GWP_{100}; most scenarios and policy interventions involve changes in methane emission rates outside the range zero to −0.3%/year, in which case the first term on the RHS of equation 1 (neglected by conventional metrics) dominates.

DISCUSSION

We have demonstrated how it is possible to represent both the short-lived nature of methane and the long-timescale adjustment of the climate system in a single metric, GWP*. This metric allows SLCP emissions to be converted to CO₂-equivalent emissions and preserve an unambiguous link to global warming, which we have therefore termed CO₂-warming-equivalent. Just as many different methods have been proposed for the calculation of CO₂-equivalent emissions, so there are multiple ways of calculating CO₂-warming-equivalent emissions. Some, like GWP*, rely heavily on linearization; others, like CO₂-forcing-equivalent emissions or explicit modelling of the temperature response, have a stronger physical justification and are likely to be more accurate for specific applications, at the cost of simplicity and generality. While complete disambiguation requires all details to be specified, the aim of CO₂-we emissions is clear: to calculate the CO₂ emission pathway that would yield the same global temperature change on all relevant timescales as that caused by the time-history of some non-CO₂ climate forcer. Given this objective, appropriate methodological decisions should always yield broadly similar CO₂-we pathways for the same climate forcer, in stark contrast to CO₂-e emissions, for which legitimate methodological decisions such as the choice of time-horizon can change results by over an order of magnitude. Conventional pulse-based metrics treat SLCPs like methane as a stock pollutant only, thereby neglecting the rapid climate response to changes in SLCP emission rates, which dominate the temperature response while emission rates are changing.

Single-number metrics like GWP typically overestimate the cumulative effects of SLCPs; but there is some apparent cumulative impact of SLCP emissions, which arises not because they accumulate in the atmosphere, but because a component of the climate system’s response to past forcing increases is characterised by a slow equilibration timescale. Based on historical emissions and RCPs 2.6, 4.5 and 6, GWP* is found to best represent the temperature impacts of methane emissions by modifying the definition in Allen, et al. to weight the flow response (impact of changing methane emission rates) by 0.75 and the stock response (equilibration of the climate system to past methane emission increases) by 0.25.

The benefits of GWP* are most apparent when SLCP emission rates are declining, as this is when CO₂-we emissions derived from conventional GWP_{100} would indicate a temperature response of the wrong sign (further warming instead of cooling). Under the Paris Agreement, nations have agreed to limit global warming to well below 2 °C, and to pursue efforts to limit it to 1.5 °C. Using GWP* to calculate CO₂-we emissions can therefore be useful in linking emissions scenarios with temperature goals. It uses GWP_{100} in a novel way, and is thus consistent with current requirements that countries use this metric in emissions accounting. GWP* allows the contributions of all climate forcing agents to be aggregated to reach a global total cumulative CO₂-we, which can then be multiplied by the TCRE to give an estimate of resultant warming over any given time period: \( \Delta T = \text{TCRE} \times (\Sigma \text{CO}_2-we + \Sigma \text{CO}_2-e) \), where TCRE is the Transient Climate Response to cumulative carbon Emissions, \( \Sigma \text{CO}_2-we \) is the cumulative short-lived GHG emissions aggregated using GWP* and \( \Sigma \text{CO}_2-e \) is the cumulative long-lived GHG emissions aggregated using GWP_{100}. This method provides a simple and transparent mechanism by which to estimate whether countries are on track to meet the Paris Agreement goals in the global stocktake. It also allows SLCPs and cumulative gases to continue
to be included together in reporting mitigation ambitions, maintaining fungibility while improving environmental integrity.

**METHODS**

Method to derive r and s

Data from the RCP database has been used to investigate how methane emissions relate to warming, and how different emission metrics represent that warming.

The RCP database contains emissions rates and radiative forcings for different greenhouse gases from 1765 to 2100 for the four RCP scenarios (RCP2.6, RCP4.5, RCP6 and RCP8.5). Here, the representation of methane based on GWP<sub>100</sub> and GWP* is considered.

The methane emissions time series for each of the RCP scenarios are converted to CO<sub>2</sub>-e emissions timeseries using a GWP<sub>100</sub> of 28.1. The temperature response to the methane radiative forcing (from the RCP database) is calculated using the FaIR model, with a factor of 1.65 applied to account for the secondary effects of ozone and stratospheric water vapour as recommended in Myhre, et al. Our analysis is consistent with findings, for example updated radiative forcings from Etminan, et al. In all scenarios, the warming trend does not correspond closely to the cumulative CO<sub>2</sub>-e emissions calculated using GWP<sub>100</sub>.

Table 1 shows the values for r and s that are generated using the above method, for historical data from 1900 and RCP 2.6, 4.5 and 6 data to 2100. The mean and standard deviation of these values are used in this work for r and s. The time period 1900 to 2100 is chosen as it represents the recent historical increase in methane emissions, as well as capturing three possible futures.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>r</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP 2.6</td>
<td>0.68</td>
<td>0.32</td>
</tr>
<tr>
<td>RCP 4.5</td>
<td>0.80</td>
<td>0.20</td>
</tr>
<tr>
<td>RCP 6</td>
<td>0.77</td>
<td>0.23</td>
</tr>
<tr>
<td>Mean</td>
<td>0.75</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**DATA AVAILABILITY**

The RCP datasets analysed during the current study are available at https://www.iiasa.ac.at/web-apps/tnt/RcpDb.

**CODE AVAILABILITY**

The code used to calculate r and s, CO<sub>2</sub>-e emissions and produce Figs 1 and 2 is available at https://gitlab.ouce.ox.ac.uk/OPMP_climate_pollutants/co2-warming-equivalence.

**ACKNOWLEDGEMENTS**

The authors would like to thank A. Resinger for helpful discussion that contributed to the development of this paper. M.C. acknowledges support from the Oxford Martin Programme on Climate Pollutants. J.L. acknowledges support from The Wellcome Trust, Our Planet Our Health (Livestock, Environment and People—LEAP), award number 205212/Z/16/Z. M.R.A. and J.L. acknowledge support from Natural Environment Research Council award number NE/T004053/1-A practical tool and robust framework for evaluating greenhouse gas emissions from land-based activities.

**AUTHOR CONTRIBUTIONS**

M.C. and M.R.A. initiated the work. J.L. and M.C. developed the work and produced the original draft paper. M.C. undertook the modelling with contributions from M.R.A. and J.L. M.C. produced Figs 1, 2 and 3. M.R.A. produced supplementary Figs 1 and 2. All authors contributed to developing the scientific questions, analysis of the results, subsequent drafts of the paper and in editing the final version.

**ADDITIONAL INFORMATION**

Supplementary information accompanies the paper on the npj Climate and Atmospheric Science website (https://doi.org/10.1038/s41612-019-0086-4).

**COMPETING INTERESTS:** The authors declare no competing interests.

**Publisher’s note:** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**REFERENCES**


Livestock’s Contributions to Climate Change: Facts and Fiction
*A white paper, defining the role animal agriculture and other sectors of society play in their respective contribution of greenhouse gases, as the societal concerns grow to seek a sustainable global future.*

Frank Mitloehner, Professor & Air Quality Specialist
Department of Animal Science, University of California, Davis

As the November 2015 Global Climate Change Conference COP21 concluded in Paris, 196 countries reached agreement on the reduction of fossil fuel use and emissions in the production and consumption of energy, even to the extent of potentially phasing out fossil fuels out entirely. Both globally and in the U.S., energy production and use, as well as the transportation sectors, are the largest anthropogenic contributors of greenhouse gasses (GHG), which are believed to drive climate change. While there is scientific consensus regarding the relative importance of fossil fuel use, anti-animal agriculture advocates, portray the idea that livestock is to blame for a lion share of the contributions to total GHG emissions.

One argument often made is U.S. livestock GHG emissions from cows, pigs, sheep and chickens are comparable to all transportation sectors from sources such as cars, trucks, planes, trains, etc. The argument suggests the solution of limiting meat consumption, starting with “Meatless Mondays,” which will show a significant impact on total emissions.

When divorcing political fiction from scientific facts around the quantification of GHG from all sectors of society, one finds a different picture. Leading scientists throughout the U.S., as well as the U.S. Environmental Protection Agency (EPA1) have quantified the impacts of livestock production in the U.S., which accounts for 4.2%2 of all GHG emissions, very far from the 18% to 51% range that advocates often cite. Comparing the 4.2% GHG contribution from livestock to the 27% from the transportation sector, or 31% from the energy sector in the U.S. brings all contributions to GHG into perspective. Rightfully so, the attention at COP21 was focused on the combined sectors consuming fossil fuels, as they contribute more than half of all GHG in the U.S.
Breaking down the 4.2% EPA figure for livestock by animal species, shows the following contributors: beef cattle 2.2%, dairy cattle 1.37%, swine 0.47%, poultry 0.08%, sheep 0.03%, goats 0.01% and other (horses, etc.) 0.04%. It is sometimes difficult to put these percentages in perspective, however; if all U.S. Americans practiced Meatless Mondays, we would reduce the U.S. national GHG emissions by 0.6%. A beefless Monday per week would cut total emissions by 0.3% annually. One certainly cannot neglect emissions from the livestock sector but to compare them to the main emission sources would put us on a wrong path to solutions, namely to significantly reduce our anthropogenic carbon footprint to reduce climate change.

In spite of the relatively low contributions to total GHG emissions, the U.S. livestock sector has shown considerable progress during the last six plus decades, and commitment into the future, to continually reduce its environmental footprint, while providing food security at home and abroad. These environmental advances have been the result of continued research and advances in animal genetics, precision nutrition, as well as animal care and health.

**U.S. Dairy & Beef Production Continuous Improvement**

<table>
<thead>
<tr>
<th></th>
<th>1950</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Dairy Cows:</strong></td>
<td>22 million dairy cows</td>
<td>9 million dairy cows (-59%)</td>
</tr>
<tr>
<td><strong>Milk Production:</strong></td>
<td>117 million tons</td>
<td>209 million tons (+79%)</td>
</tr>
<tr>
<td><strong>Carbon Footprint:</strong></td>
<td></td>
<td>1/3 that of 1950</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1970</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Beef Cattle:</strong></td>
<td>140 million head</td>
<td>90 million head (-36%)</td>
</tr>
<tr>
<td><strong>Beef Production:</strong></td>
<td>24 million tons</td>
<td>24 million tons</td>
</tr>
</tbody>
</table>

Globally, the U.S. livestock sector is the country with the relatively lowest carbon footprint per unit of livestock product produced (i.e. meat, milk, or egg). The reason for this achievement largely lies in the production efficiencies of these commodities, whereby fewer animals are needed to produce a given quantity of animal protein food, as the following milk production example demonstrates: the average dairy cow in the U.S. produces 22,248 lbs. milk/cow/year. In comparison, the average dairy cow in Mexico produces 10,500 lbs. milk/cow/year, thus it requires 2-plus cows in...

U.S. Population Replace Incandescent with Energy Star bulbs – 1.2%

U.S. Population “Meatless Monday” = GHG Emission – 0.6%
Mexico to produce the same amount of milk as one cow in the U.S. India’s average milk production per cow is 2,500 lbs. milk/cow/year, increasing the methane and manure production by a factor of 9 times compared to the U.S. cow. As a result, the GHG production for that same amount of milk is much lower for the U.S. versus the Mexican or Indian cow. Production efficiency is a critical factor in sustainable animal protein production and it varies drastically by region.

Improvements in livestock production efficiencies are directly related to reductions of the environmental impact. Production efficiencies and GHG emissions are inversely related—when the one rises, the other falls.

The 2050 challenge to feeding the globe is real: throughout our lifetime, the global human population will have tripled from three to more than nine billion people without concurrent increases of natural resources to produce more food. Our natural resources of land, water and minerals (fertilizer) necessary for agricultural production, have not grown but in fact decreased. As a result, agriculture will have to become much more efficient worldwide and engage in an efficient path similar to the one it has traveled down in U.S. livestock production in recent decades.

**How can emissions accurately and fairly be assessed to lay ground for a path for solutions?**

In its quest to identify a sustainable, scientific path toward fulfilling the future global food demand, the Food and Agriculture Organization of the United Nations (FAO) has formed an international partnership project to develop and adopt a “gold standard” life cycle assessment (LCA) methodology for each livestock specie and the feed sector. The ‘Livestock Environmental Assessment and Performance Partnership’ (LEAP), engaged with more than 300 scientists from the world’s most prestigious academic institutions in developing this unprecedented effort in developing a global benchmarking methodology. The first three-year phase project was finalized in December 2015 with six publically available LCA guidelines. This globally harmonized quantification methodology will not only allow the accurate measurement by livestock species and production regions across the globe today, but will also identify opportunities for improvement and the ability to measure that progress in each region going forward.

---

Summary

Addressing the 2050 challenge of supplying food to a drastically growing human population can sustainably be achieved through intensification of livestock production. Indeed, intensification provides large opportunities for climate change mitigation and can reduce associated land use changes such as deforestation. Production efficiencies reduce environmental pollution per unit of product.

The U.S. livestock, poultry and feed industries are one of the most efficient and lowest environmental impact systems in the world. The research, technologies and best practices that have been developed and implemented over time in the U.S. can also be shared with other production regions around the world. It is important to understand that all regions have unique demands and abilities, and thus require regional solutions. However, the advances in the U.S. agriculture and food system can be adapted within these regional solutions. These significant environmental advances and benefits are in addition to the well-documented human health and developmental value of incorporating animal protein in the diets of the growing population.

The livestock sector is committed to continuous improvement of their environmental impact in North America, and to doing its part in transferring knowledge, technologies and best practices to enhance global environmental livestock impact by region. Now is the time to end the rhetoric and separate facts from fiction around the numerous sectors that contribute emissions and to identify solutions for the global food supply that allow us to reduce our impact on the planet and its resources.
Dear Ms. Grosenheider,

Thank you for submitting these comments to Commissioner Bishop.

Best,

Jenny Scholtes

On Fri, Mar 6, 2020 at 2:24 PM Jenny Scholtes <jennywoodsscholtes@gmail.com> wrote:

Dear Commissioner Bishop,

As a member of MN350, I’m working to tackle the climate crisis. As a Minnesotan, I’m engaged in protecting the state’s natural resources. And as an aunt, I’m working to preserve our planet for my nieces and nephew. One of my nieces is a student at Winona State University, and I’m concerned the proposed expansion by Daley Farms would affect her health, as well as the health of everyone in the surrounding community. The expansion also would be detrimental to Minnesota’s environment and contribute to climate change. Please deny the permit. The health and environmental risks are too great not to do so.

One of my biggest concerns is the effect of our changing weather patterns on Daley Farms’ manure lagoons. As the MPCA has reported, climate models for Minnesota indicate the state’s rainfall will likely happen less frequently but with more intensity. The U.S. Army Corps of Engineers has told cities along the river from Winona to Guttenberg, Iowa, to monitor and brace for potential flooding in the weeks and months ahead. Last March, eight Northwest Iowa animal feeding operators reported flooding-related manure discharges, according to Iowa DNR records. If the manure lagoons breach, it would have devastating effects on surrounding communities and waterways. Daley Farms is located in the state’s karst region, an environmentally sensitive area prone to groundwater contamination. Communities in the region already are living with contaminated water. As climate change worsens, our state will experience more extreme weather events, including storms and floods that increase the risk of breached or overflowed manure lagoons. MPCA did not account for this in its Environmental Assessment Worksheet.

In November, the American Public Health Association issued a policy statement calling for a
moratorium on the expansion of existing concentrated animal feeding operations until regulation and enforcement conditions are in place to adequately protect the public’s health. The Centers for Disease Control and Prevention also has determined that they pose risks to public health and the environment.

Beyond the health risks of the Daley Farms expansion, my other main concern is the increase in greenhouse gas emissions it will have. The MPCA’s Environmental Assessment Worksheet undercounted greenhouse gas emissions by not considering emissions from building construction and associated energy use; transportation of manure, equipment, and milk; and increases associated with animal feed production. The Minnesota Environmental Quality Board noted in its 2019 Minnesota Environment and Energy Report Card that the state is not on track to meet its climate goals of reducing annual greenhouse gas emissions by 80% between 2005 and 2050, with the interim goal of 30% by 2025. Agriculture and forestry account for a quarter of Minnesota’s greenhouse gas emissions, and the state will not meet its climate goals outlined in the Next Generation Energy Act without changes in the agriculture sector.

In its 2019 report, “Methane Emissions in the United States: Sources, Solutions and Opportunities for Reduction,” the EPA noted that the agricultural sector is the leading source of U.S. methane emissions. NASA reports that one ton of methane has a global warming potential that is 84 to 87 times greater than carbon dioxide over a 20-year period.

This past October, the MPCA identified opportunities for changing land use, cropping practices, and nutrient reduction in its "Greenhouse gas reduction potential of agricultural best management practices" report. Yet the Daley Farms EAW identifies just one CO2 mitigation measure — planting alfalfa — which would reduce the project’s greenhouse gas pollution by just 1,000 tons per year, or about 3 percent of the more than 32,000 tons of CO2 equivalent emissions expected from this project. The MPCA should specifically identify mitigation measures to offset emissions, encouraging alternative farming systems such as well-managed grazing systems, more diverse crop rotations, and planting perennial grasses to build soil health, protect water quality, and increase Daley Farms’ resilience to climate impacts.

By denying this permit, the MPCA has an opportunity to drive meaningful environmental change for Minnesota and set an example for other top agricultural states. Our shared future depends on these kinds of decisions.

Sincerely,

Jenny Scholtes
This message may be from an external email source. Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

________________________________

You’re so awesome!

Sent from my iPhone

> On Mar 5, 2020, at 8:39 AM, Michael Haldeman <michaelvihaldeman@gmail.com> wrote:
>
> Dear Ms. Grosenbeider,
>
> I am a life-long Minnesotan; my sister and her two boys live in Winona, MN. I have concerns that they may be harmfuly impacted by increased greenhouse gas emissions, and sickened by dangerous chemicals in their drinking water which scientific advisories have detected in the deepest aquifers in this the Karst region.
>
> I am writing to ask you to listen to the appeals of concerned citizens regarding the proposed expansion of Daley Farms’ largest site to 3,000 dairy cows; and to consider non-industry expert sources’ determinations of adverse environmental and human health impacts if the operator’s proposed expansion is approved.
>
> I have deeply considered the matter, especially weighing the interests of the owners and those who depend on them for their livelihoods, against the health and quality of life of people in the region like my sister Margaret and her boys, Sal and Victor, and their descendants.
>
> My concerns are for:
>
> * The water that my young nephews drink, and which sustains Meg’s gardens and herbal tonics which partly support the family.
>
> * The air they breathe.
>
> * Their ability to lead healthy lives and contribute to their community.
>
> * The jobs and livelihoods created by dairy farming on a smaller, sustainable scale vs additional jobs resulting from an expanded mega-dairy and the privilege of Ben Daley and associates to realize greater profit.
>
> I have researched the issues involved and my conclusion is that at the very least an Environmental Impact Statement is warranted, if not a denial of Daley Farms’ application for expansion by the MPCA.
>
> While cover crops and different corn feed, as well as state-of-the-art manure containment; soil injections with safeguards; and so on are all positive and responsible, I believe these and other improvements, controls, and remediations do not and cannot justify Daley Farms’ desired expansion and concurrent dangerous increases in GHG emissions as well as further contamination of the aquifer.
>
> Further, I have observed that parties who concern themselves first with economic gain, have unfailingly minimized and even attempt to rationalize the buildup of dangerous chemicals in the soil and water. It is past time to draw the line.
>
>
Minnesota’s citizens demand and deserve safe water to drink and with which to grow food and medicine. Safe air to breathe. Sustainable agricultural practices. A liveable earth. And a life/business balance which prioritizes the health and well-being of all citizens as we, your neighbors, are the most cherished resource.

Thank you very much for your consideration.

Sincerely,

Michael (and Vi) Haldeman and family.

Duluth, MN.
Dear Ms. Grosenheider:

Thank you for your service to the State of Minnesota - the quality of life in Minnesota is exceptional partially due to the dedicated State employees who value public service more than personal profit. As a trained scientist it is easy for you to understand the destructive impact of nitrates and industrial dairy farms on Minnesota residents.

Please insist on conducting science-based oversight of the destructive chemicals released due to industrial dairy farms. Smaller dairy farmers are capable of supplying and meeting the demand for dairy products without hurting the environment and while providing better quality products and employing people who care about these products, and the cows.

Destroying the soil, the air and Daley's neighbors is not good science, and it is not the Minnesota that outshines and out-performs its neighboring states. This oversight makes the human residents of Minnesota top priority, restricts unnecessary mega scale production and makes Minnesota a leader and a role model as our habitat begins to change.

Please be a leader and pave the way for proud, stable stewardship of our land.

Thank you,
Mary Voight
St. Paul
Dear Ms Bishop and Grosenheider,

I am co-chair of Mankato Zero Waste and Fair Trade Mankato. These two nonprofits advocate for: Clean water, land and air; reduced waste and plastic use; and complete transition to sustainable farming to protect the earth from climate change and pollution.

I am requesting that you require an EIS on the Daley Farm's mega-dairy expansion application as required by the MPCA new supplemental EAW on greenhouse gas emissions for the following reasons:

1. We have a serious issue already with nitrate and phosphate pollution of our aquifers and groundwater. We need to stop the pollution of these vital water supplies.
2. We have a serious emergency issue with climate change that needs all our effort to stop now before it is too late. We need to change how farming is done to that end and have only small scale dairy farms (under 1000) that do rotational grazing and an end to confined factory farms if we are to stop climate change. Agriculture also has to become family farms and small farms interspersed throughout the communities to help our economy and these communities flourish. We need sustainable farming to feed people. It's the only kind of farming that will be able to feed the world. By small sustainable farms I mean farms that practice cover crops, diversified crops, no till planting and livestock on the land in rotational grazing. All of the agricultural scientists, all the farming studies and the U.N. report on sustainable farming called "Wake Up Before it is too Late" have confirmed this. The Nobel Conference speakers on farming practices in the 2018 Dirt conference at Gustavus Adolphus gave convincing documentation of an urgent need to transition to small farm sustainable practices to address climate change, stop soil erosion and pollution.
3. Consumers are starting to understand the humanitarian urgency of treating animals more humanely. More and more consumers are learning of the cruel conditions of factory farm animals and are shocked into action to oppose these practices.

We need a moratorium on large scale monocrop agriculture, dairy farms and other unsustainable practices for the good of the planet. Do the EIS on the Daley farm dairy expansion and you will realize that the water pollution as a result plus the powerful methane greenhouse gas released into the air makes this operation unacceptable.

Thank you for doing the responsible right thing.

Jane Dow 507-469-5537
Dear Kim,

We have not met, but my family hails mostly from Swedish: German: Lutheran: Catholic, Farmer: Public Servant types. I have an Environmental Science degree from the University of Minnesota and also serve on the Planning Commission for Winona County. Until recently I have been very proud of our state’s careful consideration of the sustainable development of our natural resources, mainly our soil, water and air quality.

Many state agencies have reported that Southeast Minnesota has abundant levels of nitrate in the soil and water. There are many ill effects from exposure, one being the acute medical disorder, methemoglobinemia, a serious sickness. One of its conditions is depleted oxygen in the bloodstream. Lack of Oxygen in the bloodstream affects ALL the body’s systems. Think about it for a minute!

How is forgoing a request for an Environmental Impact Statement, of a proposed mega dairy operation, working to help mitigate the effects of nitrogen polluted soil and water?

I attended the State’s public forum at the Saint Jame’s Hotel in Red Wing a couple of seasons back and listened to all the presentations. I carefully studied the posted maps of nitrate levels in soils. There were several easels and extensive map data. I also studied the maps that depicted existing sinkholes and overlaid it perfectly with locations on the map depicting toxic levels of nitrate. Joining that with a map depicting current farms, well, you can probably guess the match. Yea for science! Boo for falling on stupid humans.

Can you please advise how increasing a Big farm’s cattle herd, by more than double on virtually the same acreage does Not warrant an EIS. And that the resulting actions of this proposal will not offset any attempt to mitigate existing toxic levels of nitrate?

Who has any data supporting the outcome and risk of a manure lagoon withstanding a severe rain event? Or withstanding several flash floods in a few days, as happens with more regularity?

If a manure pool is compromised by puncture or another anomaly, such as poor quality of material, have we accurately estimated / tested the speed of which the karst bedrock will be saturated? How fast does the current remediation plan take actual effect? Do you realize how quickly ground water travels to the non-filtering ‘Swiss cheese’ that is Karst? What is the perceived percent of recovered liquid manure before infiltration in the event of a spill? I would hazard a guess it is zero.

Can you please tell me that the state is not abandoning Winona County; the state has a better plan than this for a future that includes healthy soil and clean water?

Is the state really considering approving a factory farm, without the scrutiny of an EIS, for a product that is losing demand on a national consumer level?

Are you prepared with adequate information to take that responsibility. It appears inaction is in fact denying any state interest in access to clean water and healthy soil.

If it is not possible to answer these questions with confidence, and I do expect a reasonable reply, please do at least respond and tell me what you know or not.
There are answers to some questions that will cause permanent changes to the health and well being of Minnesotans. And the College of Natural Resources in Saint Paul teaches students to believe that is why Environmental Impact Statements are implemented.

Sincerely, Lynn Carlson
112 Main Street
Rollingstone MN 55969
Kim Grosenheider
Resource Management and Assistance Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155

Please find below my comments on the subject project’s EAW supplement.

First, let me commend the Agency for attempting to assess the greenhouse gas effects of the proposed dairy expansion. Since the agriculture and forestry sectors account for approximately one quarter of Minnesota’s greenhouse gas emissions, it is unfortunate that the EAW failed to address how dairy consolidation and concentrations fits with the state’s Next Generation Energy Act goals. A more specific comment related to the subject project is that there are a long list of operational practices that are identified as mitigating GHG generation. The EAW fails to identify whether those practices will be enumerated in a permit such as the pending NPDES permit and if there will be active monitoring and enforcement to ensure compliance. Alternatively, the EAW fails to identify a “worst case scenario” if such practices are not rigorously followed.

The EAW process is not well structured to address social and economic effects of projects. And yet, from a broader environmental perspective, and in light of the Walz administration’s commitment to One Minnesota <https://mn.gov/governor/news/?id=1055-401958>, the social and economic implications of permitting large concentrated animal feeding operations (CAFOs) to continue unhindered represent a significant environmental impact since agricultural consolidation is a leading contributor to the hollowing out or rural Minnesota. An Environmental Impact Statement (EIS), or better yet, a Generic EIS could and should provide a framework within which such social and economic impacts, and related GHG emissions, can be evaluated. In particular, an EIS could and should include the evaluation of alternatives to the proposed expansion and GHG mitigation options associated with regenerative agriculture systems.

Although I live in a rural area, I am not a farmer. On the other hand, I am vested in maintaining and improving the quality of life in Minnesota’s rural areas. I would not want to live near, or be faced with the prospect of dealing with the effects of a large CAFO moving into the neighborhood. Furthermore, I have, numerous times, fished for trout in Southeastern Minnesota. I am at least generally familiar with the karst area groundwater issues. Concentrated manure management sets the area up for massive problems when the manure management facilities fail. Can MPCA guarantee there will be no failure?

Please conclude that your Agency must conduct an EIS that addresses this point raised a number of years ago by the agrarian writer Wendell Berry:
“But waste—so far, at least—has always been intrinsic to industrial production. There have always been unusable “by-products.” Because industrial cycles are never complete—because there is no return—there are two characteristic results of industrial enterprise: exhaustion and contamination….And farming, which is inherently cyclic, capable of regenerating and reproducing itself indefinitely, becomes similarly destructive and self-exhausting when transformed into an industry. Agricultural pollution is a serious and growing problem. And industrial agriculture is forced by its very character to treat the soil as a “raw material,” which it proceeds to “use up.”

Please recommend the preparation of an EIS that addresses the question of the effects on the karst geology that “uses up” the overlying soil as a raw material, due to the increase of industrial agriculture in the form of more and larger CAFAs.

Thank you.

Sincerely,

John Harrington
Lent Township
Chisago County, MN

johnharrington [at] gmail [dot] com
Dear Ms. Grosenbeider,

I am a life-long Minnesotan; my sister and her two boys live in Winona, MN. I have concerns that they may be harmfully impacted by increased greenhouse gas emissions, and sickened by dangerous chemicals in their drinking water which scientific advisories have detected in the deepest aquifers in this the Karst region.

I am writing to ask you to listen to the appeals of concerned citizens regarding the proposed expansion of Daley Farms’ largest site to 3,000 dairy cows; and to consider non-industry expert sources’ determinations of adverse environmental and human health impacts if the operator’s proposed expansion is approved.

I have deeply considered the matter, especially weighing the interests of the owners and those who depend on them for their livelihoods, against the health and quality of life of people in the region like my sister Margaret and her boys, Sal and Victor, and their descendants. My concerns are for:

* The water that my young nephews drink, and which sustains Meg’s gardens and herbal tonics which partly support the family.

* The air they breathe.

* Their ability to lead healthy lives and contribute to their community.

* The jobs and livelihoods created by dairy farming on a smaller, sustainable scale vs additional jobs resulting from an expanded mega-dairy and the privilege of Ben Daley and associates to realize greater profit.

I have researched the issues involved and my conclusion is that at the very least an Environmental Impact Statement is warranted, if not a denial of Daley Farms’ application for expansion by the MPCA.

While cover crops and different corn feed, as well as state-of-the-art manure containment; soil injections with safeguards; and so on are all positive and responsible, I believe these and other improvements, controls, and remediations do not and cannot justify Daley Farms’ desired expansion and concurrent dangerous increases in GHG emissions as well as further contamination of the aquifer.

Further, I have observed that parties who concern themselves first with economic gain, have unfailingly minimized and even attempt to rationalize the buildup of dangerous chemicals in
the soil and water. It is past time to draw the line.

Minnesota’s citizens demand and deserve safe water to drink and with which to grow food and medicine. Safe air to breathe. Sustainable agricultural practices. A liveable earth. And a life/business balance which prioritizes the health and well-being of all citizens as we, your neighbors, are the most cherished resource.

Thank you very much for your consideration.
Sincerely,

Michael (and Vi) Haldeman and family.
Duluth, MN.
Dear Kim Grosenhelder,

I have concerns about the current EAW for Daley Farms and ask for the MPCA to do a more thorough Environmental Impact Statement that would ensure a deeper consideration of the important issues. The Daley expansion -- adding 3,000 cows to its existing 1,500 -- would make this mega-dairy nine to 23 times bigger than the typical Minnesota dairy. Minnesota lost 315 dairies in 2019. The construction of large-scale mega dairies will increase overproduction, further driving the dairy crisis and threatening remaining small to mid-sized dairy farmers in our state.

The MPCA did not account the environmental risks and the damage that breached or overflowing manure lagoons could cause. As climate change worsens, Minnesota will experience more extreme weather events, including storms and floods. When storms or floods hit, manure lagoons can breach and release their waste into the environment. This poses a massive risk to surrounding communities, their drinking water supply and waterways.

The MPCA measured the methane emitted by dairy cows and their manure on a 100-year timeframe rather than a more-accurate 20-year timeframe that reflects the urgency of the climate crisis. The MPCA assessed Daley Farms’ greenhouse gas emissions in terms of its contribution to global climate change. No single project in Minnesota could measurably impact climate change on a global scale, and the MPCA must consider Daley Farms’ emissions in terms of Minnesota’s climate goals.

Also, the MPCA significantly undercounted GHG emissions by ignoring GHGs from new building construction and associated energy use; transportation of manure, equipment, and milk; and increases associated with animal feed production. The Daley Farm's EAW identifies just one CO2 mitigation measure -- planting alfalfa -- which would reduce the project's greenhouse gas pollution by just 1,000 tons per year, or about 3 percent of the more than 32,000 tons of CO2 equivalent emissions expected from this project. The MPCA is ignoring the climate benefits of regenerative and sustainable farming.
systems. Well-managed grazing systems, more diverse crop rotations, and planting perennial grasses build soil health, protect water quality, and increase a farm’s resilience to climate impacts. The MPCA should encourage these farming methods to new or expanding CAFOs - specifically identifying mitigation measures to offset GHG emissions.

**We are facing a climate crisis.** The MPCA downplayed the urgency of the climate crisis and must consider Daley Farm's emissions in terms of Minnesota’s climate goals.

Thank you for your consideration,
Jean Ross
Concerned long time resident of Minnesota
To: Laura Bishop

From: Dr Chad M Oness, Winona County Rural Resident

I will make this brief as I am sure you know the issues regarding the expansion of Daley Farms here in Winona County. I have spent 20 years working and improving properties in order to finally establish my residence in this beautiful rural county in Minnesota. The environment all over the world is under attack, and when I travel I always refer to Winona County as “the last safe place on earth.” Yet, though the science is clear that our Karst geology is extremely vulnerable, there are still those willing to threaten our health and safety for their own gain. We need the protections Minnesota Environmental Policy act and the requirement of a full unbiased Environmental Impact Statement before a project like the expansion of the Daley farm is allowed to proceed. Our local governments have already denied the expansion. They are protecting the health of our environment and our water. Please do the same and deny the permit; or, at the very least, use your power to protect the citizens of this county, and our forever home, by requiring a full EIS on the project.
Hello good Folks,
I am living in the house I was born in on my farm here in south-eastern Minnesota. (That was almost 90 years ago.) I have seen the environment deteriorate in my lifetime and I would hope that is about to come to an end.
I don't remember when the EPA came into existence but it seems that at its beginning there was a lot more 'Protection' than is the case today. Everyone should know by this time what karst geology is. It is very porous rock formation that transports water through it at a very rapid rate. Many tests have shown that.
With that in mind, we come once again to the Daley Farms. They have tried to show how their expansion would be different. It would not cause more air or water pollution. This just is not true. Actually any kind of large confinement leads to the desegregation of the air and water resources. These are the facts and we here in SE Minn. do not want that for our children or grandchildren. One wise Native-American once said, 'any action we take, we should think 7 generations down the line.'
It is my understanding that the Daley Farms has been out of compliance with state regulations for run-off and other aspects of operations with violations filed by by the MPCA's feedlot division that have gone unenforced for over 23 years. How has that been possible? We are a nation of laws and when a law is broken action is taken. At lest that is what I was taught in school many years ago. What has changed?
I do not want it written on my tombstone that 'he did nothing to improve the conditions for the generations to follow in Fillmore County.' My mother told me. "Harvey, leave things the way they are or better." That I have tried to do. With deep concern and sadness, Harvey (from Harmony) Benson
Hello, I am writing in regard to the Supplemental Environmental Assessment Worksheet (EAW) related to potential greenhouse gas emissions related Daley Farms of Lewiston dairy expansion and modernization project.

I support the Daley Family’s efforts to pass on their family dairy farm that has been a part of the Winona County and Lewiston communities for six generations. Sadly, it seems there are a lot of people not actively engaged in dairy farming who have a lot of opinions regarding how a family dairy farm should be allowed to grow and prosper. Neither the MPCA nor any prior court decision had previously required an analysis of potential greenhouse gas emissions from a livestock facility in Minnesota. Environmental review of greenhouse gas emissions isn’t appropriate for a single feedlot project and the amount of cows Daley Farm is adding is less than the number of cows that Winona County has lost in the last few years.

There is no easy measure for determining the environmental impact from a feedlot permit because of the substantial difficulty and uncertainty in estimating emissions from animal feedlots. Even the federal EPA has been unable to create accurate models for livestock facilities’ impact on air quality because there are too many variables in the process. The MPCA performed a detail analysis of the Daley Family’s project and found it will not have any negative environmental impacts —essentially, it will provide environmental benefits.

Since 1991, supporting documents demonstrated that due to the family’s stewardship and utilization of best practices, nitrate percentages in area wells had improved by 2-3 percent. The MPCA publicly stated the project would not have any adverse effects on water quality. The project was carefully engineered and reviewed by the MPCA, ensuring that the manure generated met requirements of all applicable laws and regulations. Not only do the manure basins not only meet, but far exceed, required engineering standards. Additionally, according to a study of air emissions from the Daley Farm expanded facility, it would meet air quality standards and odor guidelines. The environmental advantages of the project are numerous.

The project will use approximately 1,000 additional acres of land to raise alfalfa and will convert or retain numerous additional acres of land for use as pasture. Alfalfa and pasture of been scientifically demonstrated to seize carbon in the soil and will thus reduce the amount of carbon in the atmosphere. Without the project, this land may be converted to other uses, in which case the benefits of these carbon reductions would not be realized. The land application of manure will replace nutrients that farmers would otherwise provide to their fields via application of chemical fertilizers, thereby avoiding GHG emissions associated with chemical fertilizer production which are
greater than the potential emissions from the land application of manure. The Daley Family has also agreed to implement a number of manure application practices including without limitation the use of cover crops that will further mitigate GHG emissions and sequester greater carbon in the soil. These practices will substantially mitigate much (if not all) of the potential additional GHG emissions from the Project.

Daley Farm of Lewiston is trying to preserve its family farm and to continue to perform as good stewards of the land and support our rural economy. I strongly support the efforts of the Daley Family to pass their dairy farm to the next generation and believe their project has been held up for far too long.

Thanks,

Hailey Schultz
Lewiston Store Manager
p:(507) 523-2188  m:(507) 259-0066
a: P.O. Box 249 Lewiston, MN 55952
s: agpartners.net
Dear Commissioner Bishop,

I would like to take a moment and call on you to require an ETS for the Driftless region of Wisconsin. The issues of water quality and quantity are well documented and recorded so I would like to discuss the 32,500 tons of greenhouse gases this facility will annually produce. As the effects of climate change such as increased precipitation in the Driftless region become more evident it is more imperative that we have a complete picture of the full impact greenhouse gases produced by this project. The only way this can be accomplished is through complete ETS.

When the issues of water quality, greenhouse gases are thoroughly studied and the overall environmental sensitivities of the Driftless region are considered an ETS is clearly called for.

Thayla

Delehudle
1223 West Lincoln Blvd
Winne, WI 53957
March 4, 2020

Commissioner Laura Bishop
Assistant Commissioner Katrina Kessler
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Your support of an EIS for the Daley Farm's (Winona County) proposed expansion represents respect for the Common Good and Minnesota Laws.
—because...
1. It just might prevent further degradation of our drinking water
2. Respects Minnesota Laws
3. Respects local control rights
4. Might just lead to implementation of non-toxic sustainable farm practices

Who am I?: Owner of chemical free farm land in the Karst region; former licensed professional engineer in Minnesota and other states—now retired; experienced in systems thinking; attended educational programs on Karst geology, groundwater travels, dye tracing, and “recognized by the State of Minnesota as an Agricultural Water Quality Certified Producer.” I also participated in the DOA’s Township nitrate/pesticide monitoring program.

re #1: An EIS just might prevent further degradation of the Karst region drinking waters.
The problem is clear:
Water quality degradation is entering deeper and deeper aquifers. I drilled a new well in 1996 and found clean water in the Tunnel City-Wonewoc aquifer at 520 feet depth. The enclosed record shows how my well water quality is degrading rapidly. Not shown is the fact that pesticide residues are also showing up. We have 40 acres surrounded by coulees on 3 sides. A chemically sprayed apple orchard is to the north across a coulee. A small subdivision and open industrially operated farmland to the south. Shallower aquifers were “too polluted for me to use” and hence I have endured expensive pumping to obtain water for cattle and domestic use. In comparison, the Daley farm at Lewiston already sits on top of aquifers so polluted that the city has to treat the city water—an externalization of the costs to the citizens.

re #2: Saying YES to an EIS respects Minnesota State Laws.
Refer to Minnesota Administrative Rules 4410.1700 subp. 2a: EIS is required when insufficient information for sound decision making exists.
Having attended the MPCA public meeting February 4, 2020 in Lewiston where MPCA staff said: “...they do not have enough information to complete the greenhouse gas EAW.”
AND
Refer to Minnesota Administrative Rule 4410.1700 subp. 7 A, B, and D: EIS is required when irreversible environmental effects are already present.
My own example in point No. 1 above demonstrates an irreversible situation: Groundwater conditions are getting worse and we have no information saying to expect improvements under current operational practices.

re #3: Saying YES to an EIS may restore respect for local control rights.
Winona County has—after several years of deliberations and research—limited feedlots to 1,500 Animal Units in order to protect the Common Good = clean water and air.
March 4, 2020

An EIS conducted with the current knowledge of Climate Change, Water transit behaviors in the South East Minnesota Karst region, wide spread worsening of water quality in the Southeast Minnesota Karst region, AND emergence of viable farming alternatives.

Even doing an EAW and EIS violates Winona County’s right to control their own public resources by limiting farm sizes—but since the “cat is out of the bag,” an EIS might just rectify this situation.

re#4: Saying YES to an EIS might just lead to opening the door for implementation of non-toxic, family friendly, sustainable farm practices.
I say this, because an EIS hopefully would address alternatives as baselines for comparisons.
Organic regenerative agriculture is now a proven practice that increases farm profitability, enhances water quality, reduces flooding, and enhances soil health.
MPCA’s Daley Farm EAW permit makes references to farm practices that the farmer “may” undertake. “May” does not mean “shall,” so as such they have no meaning. And just growing alfalfa does not represent sustainable regenerative practices.

Sincerely Yours,

Dag I Knudsen
Manawa Prairie Farm
P. O. Box 180
Lake City, MN 55041-0180

The American Public Health Association adopted several policy statements last year, addressing public health and welfare, including…
resolution No. 20194 Moratorium on concentrated animal feeding operations
and resolution No. 20195 Drinking water and public health.

23 to 26 years of water testing shows degrading quality of well water/aquifer.

Well # 570-735
Depth = 520'
Aquifer = Wonowoc
(way down here)

Sulfate sources: dissolved from bedrock, decaying organic matter, chemical fertilizers, and sewage. Excessive intake can cause health impact of 250 mg/l.

Chloride: water softener brine, sewage, highway deicing salt, fertilizer, and flood runoff. Excessive intake can cause health impact of 250 mg/l.

Nitrate-Nitrogen: manure, sewage, fertilizer. Health impact is 10 mg/l.