Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Notice of Availability of an Environmental Assessment Worksheet (EAW)

Curt Schilling Swine Facility

Doc Type: Public Notice

Public Comment Information

EAW Public comment period begins: August 17, 2015

EAW Public comment period ends: September 16, 2015

Notice published in the EQB Monitor: August 17, 2015

Facility Specific Information

Facility name and location:
Curt Schilling Swine Facility
SE ¼ NE ¼ Section 34
Township 101N Range 43W
Grand Prairie Township, Nobles County

Facility contact:
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MPCA Contact Information

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General Information

The Minnesota Pollution Control Agency (MPCA) is distributing this Environmental Assessment Worksheet (EAW) for a 30-day review and comment period pursuant to the Environmental Quality Board (EQB) rules. The MPCA uses the EAW and any comments received to evaluate the potential for significant environmental effects from the project and decide on the need for an Environmental Impact Statement (EIS).

An electronic version of the EAW is available on the MPCA Environmental Review webpage at http://www.pca.state.mn.us/oxpg691. If you would like a copy of the EAW or NPDES/SDS Permit or have any questions on the EAW or NPDES/SDS Permit, contact the appropriate person(s) listed above.

Description of Proposed Project

Curt Schilling (Proposer) proposes to expand his existing 2,400 head, swine finishing facility in Section 34 of Grand Prairie Township in Nobles County (Facility). The Proposer will construct one new power-vented building to store up to 2,400 finishing hogs (Project). The Facility plus the Project will have a combined total maximum capacity of 4,800 finishing hogs (1,440 animal units (AU)). The Proposer will store manure in reinforced concrete pits beneath each of the two buildings.

Written comments on the EAW must be received by the MPCA EAW contact person within the comment period listed above. For information on how to comment on the (NPDES/SDS Permit, contact the MPCA Permit contact person listed above.

NOTE: All comment letters are public documents and will be part of the official public record for this project.

Need for an EIS

(1) The MPCA Commissioner will make a final decision on the need for an EIS after the end of the comment period.

Alternative EAW Form for Animal Feedlots

ENVIRONMENTAL ASSESSMENT WORKSHEET

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/EnvRevGuidanceDocuments.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 651-757-2100. 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: Curt Schilling Swine Facility

B. Feedlot Proposer: Curt Schilling

C. RGU: Minnesota Pollution Control Agency

	Technical Contact Person	Contact Person
	Andrew A. Nesseth	Kevin Kain
and Title	Project Consultant - Extended Ag Services, Inc.	and Title: Principal Planner
Address	507 Milwaukee Street Lakefield, MN 56150	520 Lafayette Road North St. Paul, Minnesota 55155-4194
Phone	507 – 662-5005	651-757-2482
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D. Reason for EAW Preparation: (check one)

EIS Scoping		Mandatory EAW	X	Citizen Petition		RGU Discretion		Proposer Volunteered	

If EAW or EIS is mandatory, give EQB rule category subpart number and name: Minn. R. 4410.4300, subp. 29(A)

TDD (for hearing and speech impaired only): 651-282-5332
Printed on recycled paper containing 30% fibers from paper recycled by consumers

E. Project Location: County: Nobles City/Twp: Grand Prairie

SE 1/4 NE 1/4 Section: 34 Township: T101N Range: R43W

Watershed (name and 4-digit code): Rock River

F. Attach each of the following to the EAW:

Attachment A	County map showing the general location of the project
Attachment B	U.S. Geological Survey (USGS) 7.5 minute, 1:24,000 scale map indicating project boundaries
Attachment C	Map of project site with significant natural features
Attachment D	Summary map of manure application sites
Attachment E	One-mile radius map
Attachment F	Correspondence with Minnesota Department of Natural Resources
Attachment G	County Well Index / Drinking Water Supply Management Areas Map
Attachment H	Correspondence with Minnesota Historical Society
Attachment I	Air Quality Model
Attachment J	Results of Minnesota Phosphorus Index Modeling
Attachment K	Cumulative Impacts Map
Attachment L	Odor OFFSET Results
Attachment M	Groundwater Sensitivity Map

The National Pollutant Discharge Elimination System/State Disposal System Feedlot Permit (NPDES/SDS Permit) application and associated documents, including the Air Emissions and Odor Management Plan, the Animal Mortality Plan, the Emergency Response Plan, and the Manure Management Plan (MMP), are available for review at the following locations:

- The MPCA's St. Paul Office, 520 Lafayette Road North, St. Paul, Minnesota
- The MPCA's Mankato Office, 12 civic Center Plaza, Suite 2165, Mankato, Minnesota

G. Project summary of 50 words or less to be published in the *EQB Monitor*.

Curt Schilling (Proposer) proposes to expand his existing 2,400 head, swine finishing facility in Section 34 of Grand Prairie Township in Nobles County (Facility). The Proposer will construct one new power-vented building to store up to 2,400 finishing hogs (Project). The Facility plus the Project will have a combined total maximum capacity of 4,800 finishing hogs (1,440 animal units (AU)). The Proposer will store manure in reinforced concrete pits beneath each of the two buildings.

H. Please check all boxes that apply and fill in requested data:

Animal Type	Number Proposed	Type of Confinement
☒ Finishing hogs	2,400 proposed 2,400 existing	Total Confinement
☐ Sows		
☐ Nursery pigs		
☐ Dairy cows		
☐ Beef cattle		
☐ Turkeys		

☐	Layer hens		
☐	Chickens		
☐	Pullets		
☐	Other (Please identify species)		

[1] An "animal unit" or "AU" is a unit of measure developed to compare the differences in the amount of manure produced by livestock species. The "AU" is standardized to the amount of manure produced on a regular basis by a slaughter steer or heifer, which also correlates to 1,000 pounds of body weight. The "AU" is used for administrative purposes by various governmental entities for permitting and record-keeping.

I. Project magnitude data.

Total acreage of new farm expansion: 1,041 acres

Number of animal units proposed in this project: 720 AU

Total animal unit capacity at this location after project construction: 1,440 AU

Acreage required for manure application: 372 acres per year

J. Describe construction methods and timing.

The Proposer will construct the project, in the SE¼ of the NE¼ of Section 34 of Grand Prairie Township in Nobles County, a 101.5-foot by 192-foot total confinement, power-ventilated building (see Attachment C). The building has a concrete slatted floor above the eight-foot deep, reinforced concrete pit. The Proposer will collect and store manure in the concrete pit constructed beneath the building. The Proposer will install exhaust fans over the manure pump outs along the edge of the building. The new building is identical to the existing building at the Facility.

The Proposer will install a perimeter drain tile around the base of the manure storage pit. The perimeter tile is used to relieve any seasonal saturation and limit any hydrostatic pressure on the concrete pit walls.

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.

Currently, the Facility consists of a single total confinement, power-ventilated building housing 2,400 head of finishing swine (720 AU). The Proposer stores manure in a reinforced concrete pit located beneath the building. No past environmental review was conducted on the existing Facility.

The proposal is to add one additional identical total confinement, power-ventilated building housing 2,400 head of finishing swine (720 AU), including manure storage in a reinforced concrete pit located beneath the building. The Proposer does not plan any further expansion of the Facility.

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.

The Facility and the manure application sites are located in Nobles County, zoned and utilized for agricultural.

Facility Site: A total of eight residences are located within one mile of the Facility with three of those residences within one-half mile. Attachment E shows the location of the neighbors within one mile of the Facility. No schools, daycare facilities, senior citizens housing, or public places of worship are within a one-mile radius of the Facility.

Manure Application Sites: The manure application sites are within six miles of the Project located in Grand Prairie Township (Attachment D) in Nobles County or Kanaranzi Township in Rock County. The city of Ellsworth's community well is located approximately 1,550 feet to the northwest of the manure application site in Grand Prairie Township 33.

Nobles County

Grand Prairie Township

Section 27: The manure application site in Section 27 is bordered by 320th Street, a gravel road, to the north and Chaney Avenue to the east. Two residences, one with a feedlot, are adjacent to the manure application site. The manure application site is managed for crop production.

Section 26: There are two manure application sites in Section 26. One is bordered by 320th Street, a gravel road, to the north and Chaney Avenue, a gravel road, to the west. One residence with a feedlot is surrounded by this manure application site. The other manure application site is bordered by 330th Street to the south and Cory Avenue to the east. One residence with a feedlot is surrounded by this manure application site. Both manure application sites are managed for crop production.

Section 33: There are two manure application sites in Section 33. Both are bordered by 330th Street/County Road 30, an all-weather paved road to the north. The Proposer's residence is surrounded by these manure application sites. The manure application sites on both parcels are managed for crop production.

Section 34: There is one manure application site in Section 34, bordered by 330th Street/County Road 30, an all-weather paved road to the north. One residence is surrounded by the manure application site. The Facility is within the Section and one residence is surrounded by the manure application site. The manure application site is managed for crop production.

Rock County

Kanaranzi Township

Section 14: There is one manure application site in Section 14, bordered by County 41st Street/County Road 1, an all-weather paved road, to the south and 190th Avenue/ County Road 3, an all-weather paved road, to the west. One residence is surrounded by the application

Site and two residences are adjacent to the site, across the road. The manure application site is managed for crop production.

Section 24: One manure application site is in Section 24. The site is bordered by an unnamed gravel road to the east. No residences are adjacent to this manure application site. Kanaranzi Creek lies approximately 350 – 1500 feet to the west of the site. The manure application site is managed for crop production.

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**[1]
- ☒ **land use plan or ordinance**[2 3]
- ☒ **shoreland zoning ordinance**[1]
- ☒ **flood plain ordinance**[5]
- ☐ **wild or scenic river land use district ordinance**
- ☐ **local wellhead protection plan**

If yes, describe the inconsistency and how it will be resolved.

Nobles County is located in southwestern Minnesota, and is predominately rural in character with the vast majority of land in the unincorporated areas of the County used for agricultural production. As a corollary to this, agricultural residences are scattered throughout the rural areas. In addition to these related uses, the rural areas contain a certain percentage of land unsuitable for cultivation because of conditions such as topography and drainage. In Nobles County there is comparatively little unsuitable land. However, there are some wetlands and wooded areas. These areas provide wildlife habitat, preserve natural scenery, and protect soil and water resources. Nobles County is located on a geologic structure known as the Buffalo Ridge, a large expanse of rolling hills. Buffalo Ridge is a drainage divide that separates the Mississippi and Missouri River watersheds. The Project is consistent with the Local Comprehensive Plan.

The Project is consistent with the land use plan or ordinance and specifically, the Special Protection, Floodplain, and Feedlot Ordinances. Shoreland areas within 300 feet of lakes, rivers and streams and are unique in natural wildlife resource value and experience considerable public use for recreation purposes, and are part of a Special Protection District. The Project is not located inside of Shoreland areas. The Floodplain District includes those areas that lie within the 100 year and 500 year flood boundaries on the Flood Insurance Rate Map Index dated July 21, 1999. Feedlots are not a permitted use in the Floodplain District. The Shoreland Management Ordinance regulates the development of shorelands of public waters, preserves the quality of surface waters, conserves the economic and natural environmental values of shorelands, and provides for the wise use of waters and related land resources. Feedlots are a conditionally permitted use in the Shoreland Management District (Page 98 of Ordinance: http://www.co.nobles.mn.us/LinkClick.aspx?fileticket=qxb0UT5gHS8%3d&tabid=849&mid=1968).

The Project site is located outside of the Special Protection, Floodplain, and Shoreland Management Districts and the Project is a conditionally permitted use in the Agricultural Preservation District.

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[1] Nobles County Comprehensive Plan. http://www.co.nobles.mn.us/Departments/PublicWorks/EnvironmentalServices/NoblesCountyComprehensivePlan/tabid/851/Default.aspx (Retrieved February 6, 2015)

[2] Rock County Feedlot Ordinance. http://www.rockswcd.org/uploads/2/6/2/4/26246555/zoning_ordinance.pdf (Retrieved February 6, 2015).

[3] Nobles County Land Ordinance. http://www.co.nobles.mn.us/LinkClick.aspx?fileticket=qxb0UT5gHS8%3d&tabid=851&mid=1968 (Retrieved February 6, 2015)

Nobles County Zoning Ordinance 725.8 specifies that expanding existing animal feedlots maintain a minimum setback based on the permitted Animal Units of one-half of a mile from rural residences and one mile from population centers. According to the 725.10 of the Nobles County Ordinance, if an applicant cannot comply with rules and specifications established in this ordinance, a conditional use permit may be applied for.

Web Link to references of Nobles County Ordinance:
http://www.co.nobles.mn.us/Departments/PublicWorks/EnvironmentalServices/FeedlotOrdinance/tabid/852/Default.aspx#feedlot-fees

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.

Resources:

Public Water Supply Wells:

Based on the information provided to the Proposer by the Minnesota Department of Health, there is one public water supply within the vicinity of the Facility. The city of Ellsworth's public water supply well is located approximately 2 miles northwest of the Facility site and approximately 1,500 feet from one of the manure application sites. The city of Ellsworth's Drinking Water Supply Management Areas is within 2.6 miles of the Facility site and about 1.7 miles from the nearest designated manure application sites. (Attachment G).

Lakes and WMAs:

Lambert Heikes Wildlife Management Area (WMA)

Lambert Heikes WMA is located about 2.7 miles to the north of the Facility. The manure application sites in the N1/2 of the NE1/4 of Section 27 and the NW1/4 of Section 26 in Grand Prairie Township (Attachment D) are located approximately 1.25 miles to the south of the Facility. The Lambert Heikes WMA is grassland with woody cover. Norwegian Creek runs through the WMA.

Sensitive Ecological Resources:

Rare Species/Natural Features

The Minnesota Department of Natural Resources (MDNR) completed a search of the Minnesota Natural Heritage Information System (NHIS) database for rare plant or animal species or other significant natural features known to occur within an approximate one-mile radius of the Project, or cropland designated to receive manure produced at the Project.

Based on the NHIS review, there are 29 known occurrences of rare species or native plant communities within an approximate one-mile radius of the Project, or manure application sites used by the Proposer. The following species listed are only those that the MDNR determined *may* be impacted:

Topeka Shiner and Pugnose Shiner:

Notropis Topeka (Topeka Shiner), a federally-listed endangered, and state-listed special concern fish species, and *Notropis anogenus* a state-listed threatened fish species, are adversely impacted by actions that alter stream hydrology or decrease water quality, including sedimentation and eutrophication. In some instances, livestock management can impact stream habitat and water quality if there are continuous or acute impacts of sediments, feces, nutrients, or other organic material directly into streams. Any efforts that can be made to reduce these factors will lessen the potential for impacts and aid in the recovery of this endangered species. Several of the manure application sites are located near segments of Kanaranzi Creek that has been designated as critical habitat for the Topeka Shiner (Attachment F)

Minnesota Biological Survey Sites of Biodiversity Significance

Native Prairie Remnants and Plant Communities: The NHIS search conducted by the MDNR identified a site classified by the Minnesota Biological Survey as "moderate" significance of biodiversity in the vicinity of the manure application site in Kanaranzi 24. Precautions are recommended to be taken to ensure that manure is not applied within the prairie remnant and that runoff is diverted away from prairie remnants.

Additional Mitigation Measures:

The Proposer will follow the manure management plan (MMP) and all applicable setbacks from sensitive features as required by the Feedlot Permit. The MMP determines the nutrients needed for the intended crop from *all sources*. Application of manure replaces nutrients supplied from commercial fertilizer sources. Manure applied at agronomic rates reduces the potential for nitrate leaching. To reduce the potential for surface runoff and minimizing odors associated with manure applications, the Proposer will inject the manure into the soil via knife injection. The Source Water Assessment for the Ellsworth well indicates that the well is in a sensitive aquifer due to the geologic setting; however the well is not sensitive due to the integrity of the construction and ongoing

maintenance[4].

All land application sites for the Facility have been in crop production for decades. As a result of the Project, no wetlands will be dredged, deepened, or filled.

The Project will meet air quality standards at the property line (Attachment I). Therefore, nearby resources are not expected have air quality impacts.

The MPCA has determined the Project will not impact ecologically significant areas.

3. Geologic and soil conditions.

A.

Approximate depth (in feet) to:	Feedlot	Manure Storage Area	Manure Application Sites
Ground Water (minimum)	>3	>3	>3
(average)	>6	>6	>6
Bedrock (minimum)	>200	>200	>150
(average)	>250	>250	>200

B.

NRCS Soil Classifications (if known)	Feedlot	Manure Storage Area	Manure Application Sites
	P28A	P28A	P12B, P15B, P16A, P1B, P21A, P27A, P28A, P2A, P30B, P31A, P3A, P42A P45E, P48A, P48B, P49A P50B, P51C2, P56B, P5A, P9A

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.

	Feedlot	Manure Storage Area	Manure Application Sites
Karst features (sinkhole, cave, resurgent spring, disappearing spring, karst window, blind valley, or dry valley)	No	No	No
Exposed bedrock	No	No	No
Soils developed in bedrock (as shown on soils maps)	No	No	No

4. Water Use, Tiling and Drainage, and Physical Alterations.

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.

[4] Minnesota Department of Health. Source Water Assessment: Ellsworth, ID# 1530005 http://www.health.state.mn.us/divs/eh/water/swp/swa/swainfo/pdwgetswa.cfm?pwsid=1530005&office=0 (Retrieved January 20, 2015).

B. Will the project involve installation of drain tiling, tile inlets or outlets? ☒ Yes ☐ No

If yes, describe.

The Proposer will install a four-inch perimeter drain tile of high density polyethylene around the base of the manure storage pit. The perimeter drain tile is used to relieve any seasonal saturation and limit any hydrostatic pressure on the concrete pit walls. The Project drain tile will connect to existing Facility drain tile.

The Proposer will monitor weekly discharge from the perimeter drain tile for change in appearance and odor. The Proposer will keep a record of monitored results as part of the operation and maintenance of the proposed concrete liquid manure storage area.

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 1,230,312 gallon

By swine 1,230,312 gallons

By species 2: NA

Frequency and duration of manure removal: number of days per cycle 5 days per year

Total days per year 6 days

Give a brief description of how manures will be collected, handled (including methods of removal), and stored at this feedlot:

The Proposer collects and stores manure generated at the Facility in underfloor reinforced concrete pits. Manure drops directly into the pits through slatted floors in the buildings and stored in liquid form.

The Proposer agitates liquid manure via chopper pumps and then land applied via soil injection. The Proposer will remove all of the manure in the fall to be land applied to nearby fields as a fertilizer replacement, typically over the course of 3-7 days per cycle.

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.

The Proposer or manure recipient will land apply liquid manure from the existing Facility and the Project site using either soil injection, a drag line system or liquid tankers. Manure rates are calibrated utilizing a flow meter; the MMP lists actual rates and the methodology for determining said rates. The Proposer or manure recipient will apply manure at agronomic rates based on the crop rotation, soil test and manure test. Fields will receive manure either annually or semi-annually, depending on the crop rotation.

The Proposer's controlled manure application sites are located in Grand Prairie and Kanaranzi townships of Nobles County.

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

The Proposer submitted a MMP for Proposer Manure Ownership with the NPDES/SDS Permit application for an Animal Feedlot or Manure Storage Area. (This is for manure the Proposer is retaining ownership of and applying to cropland under his control/management.)

After MPCA review and approval, the MMP becomes an integral and enforceable part of the MPCA Feedlot Permit.

The Proposer will apply manure at agronomic rates, per an MPCA approved MMP. Only the amount of manure used by the growing crop as nutrients is applied to ensure no excess nutrient buildup in the soil based on the type of crop grown, the soil type and the soil chemistry. The rates cannot exceed the nitrogen of the intended crop, and may not exceed P205 if certain conditions are present (soil test levels/sensitive features). The agronomic rates are included in the NPDES/SDS permit as well as the submitted and MPCA-approved MMP. Failure to follow these rules is subject to penalty by the permit holder.

Field priority is based on a phosphorus (P_2O_5) soil test and potassium (K_2O) with the lower levels of these receiving the manure first. Other factors that will determine nutrient needs are crop grown, yield goal, organic matter content, previous manure credits and other legume credits. Nutrient

rates are determined by utilizing University of Minnesota Extension Service bulletin, "Fertilizer Recommendations for Agronomic Crops in Minnesota."

Previous Crop	Crop to Utilize Manure	Expected Yield	Nitrogen Needed	Phosphorus Needed
Corn	Corn	185 bu/ac	180 lbs N/ac	59 lbs P_2O_5/ac*
Soybeans	Corn	185 bu/ac	140 lbs N/ac	109 lbs P_2O_5/ac**

Note: *P_2O_5 removed in grain, per crop year; ** P_2O_5 removed for two-year rotation.

ac = acres
bu = bushel
lbs = pounds
N = nitrogen
P_2O_5 = phosphorus

Continual land grant college research[5] developed this procedure as the one that best predicts the amount of that nutrient in the soil that is used by plants. Using this method, a 'Maximum Return to Nitrogen' value is used in determining the appropriate manure application rates. The Proposer takes soil samples of manure application sites every four years to monitor crop needs and target acres that will positively respond to manure applications.

3. Discuss the capacity of the sites to handle the volume and composition of manure. Identify any improvements necessary.

The Proposer estimates 4,800 finishing swine at the existing Facility and Project will generate approximately 1,230,312 gallons of manure per year. The MMP stipulates that manure be applied at agronomic rates. Accordingly, approximately 351 corn acres each year is needed to utilize all of the manure generated. There are currently 1,041 acres available for manure application per year which is more than sufficient to apply the collected manure at agronomic rates as specified in the MMP.

Corn/Soybean Rotation:
The Proposer applies swine manure at a nitrogen-based rate to provide approximately 140 pounds of nitrogen per acre the first year in order to achieve an average yield of 185 bushels of corn per acre in the corn/soybean rotation.

[5] Continual land grant research is conducted by land grant colleges in the United States. The University of Minnesota, South Dakota State University, Iowa State University, University of Wisconsin, North Dakota State University, University of Nebraska, University of Illinois and the Purdue University are those that specifically participate in Midwest Corn Belt Nitrogen needs. Each State has a very similar but unique set of guidelines for other nutrients.

An application rate of approximately 3,509 gallons of manure per acre from the proposed Project is needed based on published estimates of the nutrient content of manure from a facility of this type[6,7,8]. The Proposer estimates 351 acres are needed to utilize all of the manure each year. None of the land to be used for manure application is labeled as highly erodible by the Natural Resources Conservation Service.

The Proposer evaluated each field scheduled to receive manure using the Minnesota Phosphorus Index (Attachment J). The evaluation takes into consideration slope, proximity to water, tillage, crop rotations, and nutrient applications (timing, rate, placement). The Minnesota Phosphorus Index is a management tool to estimate the relative risk that phosphorus is being lost from an agricultural field and delivered to a nearby ditch, stream, or lake. All fields reviewed by the Proposer received very low ratings, indicating that no management changes are recommended and the potential for off-site movement of soluble and sediment bound Phosphorus is low.

4. Describe any required setbacks for land application systems.

The MPCA feedlot staff has reviewed and approved the MMP for the Facility and Project. The Proposer has an adequate land-base to properly apply animal waste as fertilizer. Nobles County follows the Minnesota rules pertaining to setback distances. The Proposer and manure recipients will abide by the MPCA feedlot rules regarding land application practices and environmentally sensitive features
(Minn. R. 7020.2005):

MPCA Animal Waste Land Application Setback Chart:

Feature	Winter	Non-Winter With Immediate Incorporation (<24 hours)		Non-Winter Not incorporated within 24 hours	
		With P Mgmt.	No P Mgmt.	With Vegetated Buffer	Inadequate Vegetated Buffer
Lake, Stream	300′	25′	300′	100′	300′
Intermittent Stream* MDNR protected wetlands** Drainage ditch w/o quarry*	300′	25′	300′	50′	300′
Open Tile Intake	300′	0′	0′	300′	300′
Well, mine or quarry	50′	50′	50′	50′	50′
Sinkhole with no diversion	Downslope 50′ Upslope 300′	50′	50′	Downslope 50′ Upslope 300′	Downslope 50′ Upslope 300′

* Intermittent streams and ditches are those identified on USGS quadrangle maps, excluding drainage ditches with berms that protect from runoff into the ditch and segments of intermittent streams, which are grassed waterways. USGS quadrangle maps can be found at County Soil and Water Conservation District Offices or can be viewed on the internet at http://www.terraserver.microsoft.com (August 17, 2004).

** Wetland setbacks pertain to all protected wetlands identified on DNR protected waters and wetlands maps (these maps are often located in County Soil and Water Conservation District offices and typically include all

[6] Manure Management in Minnesota. FO – 3553 – C U, University of Minnesota Extension. 1999.
[7] Manure Characteristics. MWPS-18, Section 1, Midwest Plan Service. 2000.
[8] Livestock Waste Facilities Handbook, MWPS-18, Midwest Plan Service. 1985.

wetlands over ten acres).
***The setback for open tile intakes is a least 25 feet unless they are able to achieve 75 percent settling of solids prior to entering the intake. This is most often accomplished using a riser pipe, such as a Hickenbottom riser.

E. Other methods of manure utilization. If the project will utilize manure other than by land application, please describe the methods.

None

6. Air/odor emissions.

A. Identify the major sources of air or odor emissions from this feedlot.

Manure and those surfaces or items that come into contact with the manure, including floors, walls, equipment, and animals are sources of air and/or odor emissions. The manure collection and storage facilities, the dead animal disposal and storage areas, and the manure application fields are also significant sources of odor. Dust generated by truck traffic around the site can also contribute as a carrier of odor. Results of estimated odor impacts are characterized in Attachment I.

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.

All of the manure is land applied and incorporated as soon as field conditions permit. The Proposer will observe all required setbacks from nearby residences for all manure applications. The Proposer will evaluate weather conditions, primarily wind speed/direction and humidity before manure is land applied to insure minimal impacts on neighbors and the public. The Proposer will consult with the MPCA/County Feedlot Officer to identify changes that can be made to reduce odors in the event that complaints are received.

The Proposer will only agitate stored manure immediately prior to the manure being removed for land application. Further, the pit ventilation is cleaned and serviced on a regular basis to reduce dust accumulation and discharge. The Proposer will inject all manure immediately or incorporate manure within 24 hours to minimize the release of odors. If the Proposer hires a third party to apply manure, the third party must obtain a Commercial Animal Waste Technician (CAWT) licensed by the Minnesota Department of Agriculture. (If the Proposer is applying manure at his/her own site, this activity does not require a CAWT license). The licensed technician will limit the number of application days as much as possible depending on weather, safety, availability size of equipment, and availability of personnel to operate equipment. The licensed technician will use good manure sanitation practices such as properly operating manure equipment to reduce/eliminate spillage.

The Proposer will maintain clean, dry floors, eliminate the buildup of manure, and clean up any spilled feed. Standard good housekeeping practices will include washing and disinfection of the interior of the finishing building at the end of each cycle, while paying special attention to the ventilation fans.

The Proposer will implement Board of Animal Health and MPCA- recommended best management practices ("BMPs") at the animal mortality compost building such as: utilizing sufficient carbon source (12 inch minimum cover over carcass); maintaining adequate temperature; and keeping compost material inside proper bunkers.

The Proposer is committed to being a good neighbor, and will evaluate weather conditions prior to land application to minimize impacts on neighbors and the public. The Proposer will consult with the MPCA/County Feedlot Officer to identify changes that can be made to reduce odors in the event that complaints are received.

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.**

The Proposer completed air dispersion modeling (using the AERMOD model and approved MPCA protocol) for the Project. Air quality modeling estimated the atmospheric concentrations of hydrogen sulfide, ammonia, and selected odorous gases at the property lines for the existing Facility and Project, and at 21 of the proposed feedlot's nearest neighbors. A complete report of the air quality modeling findings is found in Attachment I.

Hydrogen Sulfide

The AERMOD modeling results suggest the Project (and existing Facility operations) will comply with the 30 parts per billion (ppb) hydrogen sulfide Minnesota ambient air quality standard (MAAQS). Under the MAAQ standard, the third exceedance of the MAAQS within any 5-day period is a violation. Modeled compliance is demonstrated when the high-third-high (H3H) concentration (with background) for any 5-day period at each property-line receptor is less than 30 ppb. AERMOD calculated a maximum H3H property-line hydrogen sulfide concentration of 1.47 ppb. When a background concentration of 17 ppb is added to the AERMOD-calculated concentration, the H3H hydrogen sulfide concentration is 18.47ppb, which is below the ambient standard of 30 ppb. Thus, no violation of the 30-ppb ambient hydrogen sulfide standard was modeled for the Proposer's total confinement buildings at the existing Facility and Project.

The AERMOD results indicate that the Facility and Project, and the 11 neighboring feedlots will not create exceedances of the subchronic (13-week) hydrogen sulfide inhalation Health Risk Value (iHRV) at the neighboring residences. The estimated maximum monthly hydrogen sulfide concentration for a non-feedlot neighboring residence is 0.30 $\mu g/m^3$ and 0.50 $\mu g/m^3$ for a feedlot residence. When a background concentration of 1.00 $\mu g/m^3$ is added to the AERMOD estimate, the maximum monthly hydrogen sulfide concentration for a non-feedlot neighbor is 1.30 $\mu g/m^3$, and 1.50 $\mu g/m^3$ which is below the subchronic hydrogen sulfide iHRV of 10 $\mu g/m^3$.

Ammonia

The modeling results also suggest that the Facility and Project will not create exceedances of the acute ammonia iHRV. AERMOD calculated a maximum hourly property-line ammonia concentration of 162 $\mu g/m^3$. When a background concentration of 148 $\mu g/m^3$ is added to the AERMOD-generated concentration, the maximum property-line ammonia concentration is 310 $\mu g/m^3$, which is below the acute ammonia iHRV of 3,200 $\mu g/m^3$. The modeling showed no exceedances of the acute ammonia iHRV at the property lines for the Facility, including the Project.

The AERMOD results indicate the air emissions from the Facility and Project, and the 11 neighboring feedlots will not create exceedances of the chronic ammonia iHRV at the neighboring residences. The calculated maximum one-year time-averaged ammonia concentration for the neighbors is 4.78 $\mu g/m^3$. When a background ammonia concentration of 5.72 $\mu g/m^3$ is added to the AERMOD concentration,

the maximum annual ammonia concentration for a neighboring residence is 10.5 µg/m^3, which is below the chronic ammonia iHRV of 80 µg/m^3.

Odor

The AERMOD modeling results indicate that detectable concentrations of odorous gases can exist beyond the Facility with Project property lines. The modeling shows maximum hourly odor intensity at the Facility with Project is 21 odor units (OU), which is below the "faint" odor threshold of 83 OU. By definition, a faint odor can be detected by an average person if attention is called to the odor.

Proposed Site Property Boundary	Hydrogen Sulfide Results (ppb)[1] (Includes a 17 ppb background concentration)	Acute Ammonia Results (µg/m^3)[2] (Includes a 148 µg/m^3 background concentration)	Odor Results (odor units)[3]
North	18.47	209.44	14
South	17.72	175.46	10
East	18.20	310.16	52
West	17.81	184.09	11

[1] State ambient hydrogen sulfide air quality standard: 30 ppb half-hour average.
[2] Acute inhalation health risk value for ammonia: one-hour average of 3,200 µg/m^3.
[3] Odor impact assessment based on odor units. A value of 72 OU is considered to be a faint odor (for swine) detectable by most people.

ppb = parts per billion
µg/m^3 = micrograms per cubic meter

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.

There are eight neighbors located within one mile of the Facility. The Proposer does not plan to notify neighbors prior to operational events such as manure storage, agitation, pump out, or application, but indicated a willingness to work around planned social events. The Proposer will notify the Nobles County Feedlot Officer prior to operational events such as manure agitation and land application. The Proposer will implement the air emission plan in the NPDES/SDS Permit in the event that an odor event occurs. The air emission plan is an enforceable provision of the NPDES/SDS Permit.

E. Noise and dust. Describe sources, characteristics, duration, quantities or intensity and any proposed measures to mitigate adverse impacts.

During construction, the Proposer will generate normal noise and dust associated with earth moving equipment and construction at the Facility. Adverse impacts resulting from these activities are not anticipated. Following construction, the MPCA anticipates the loudest noise generated at the Facility will be from, truck traffic entering and leaving the Facility. Additional noise will be generated along nearby residential roads from vehicle and truck traffic servicing the existing Facility and Project. The nearest neighbors are within one-half mile and the separation distance is the primary mitigating factor in reducing the potential for adverse impacts from this Project.

7. **Dead Animal Disposal.**

Describe the quantities of dead animals anticipated, the method for storing and disposing of carcasses, and frequency of disposal.

The Proposer will follow the Animal Mortality Plan in accordance with the NPDES/SDS Permit and the Minnesota Board of Animal Health. The Facility utilizes a rendering service for disposing of animal mortalities. Mortalities are removed as discovered from the buildings and stored in a scavenger-proof mortality disposal area prior to rendering pickup. The predicted annual mortality rate is approximately 3% or 144 head of swine every year from the entire Facility.

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.

Facility Site

Surface water runoff at the Facility will increase as a result of the Project due to an increase in impervious surfaces, in particular the construction of the roofed building. However, because the Project is a total confinement facility, it is unlikely that runoff will come in contact with livestock or manure. The contractor hired by the Proposer and the Proposer's engineer will manage surface water runoff during construction. The Proposer will obtain a MPCA NPDES construction stormwater permit, which will require temporary and permanent stormwater and erosion control measures. Any surface water leaving the Facility will be directed to the surrounding cropland. The Proposer expects all surface water to infiltrate into the surrounding soil. In the event of excessive precipitation events, surface water runoff from the Facility and Project is directed to the north towards the adjacent cropland.

Land application sites

The MPCA does not expect any significant potential impact to surface water resources from the Facility's land application activities because, as discussed in Item 5 of the EAW, manure is applied on the soil at agronomic rates. This means that the Proposer will only apply the amount of manure that that can be used by the growing crop. Applying at agronomic rates assures there is no excess nutrient build up in the soil. In addition, land application will occur in the fall of the year after crops are removed from the field, rather than in the spring when runoff potential is greater due to increased precipitation and soil moisture. The information presented in Item 5 will be incorporated into the MMP for the proposed project. The MMP will be an enforceable provision of the NPDES/SDS Permit for the project.

9. **Traffic and Public Infrastructure Impacts.**

   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.**

   - A feed truck will visit the Facility twice per week for regular refilling duties.
   - One semi-tractor with a trailer will come to the Facility two times per year to refill the buildings with nursery pigs. Each re-stocking period for the building will take approximately one day to complete.
   - Approximately 14 semi-tractors and trailers and 1 pickup truck and trailer will visit the Facility, two times per year, to load the finished hogs from the site to take to market. This period of heavy traffic at the Facility will occur over an approximate time period of one month,

averaging 4 to 6 semi-trucks per week for each load out.

- Manure application will require the use of tractors and manure tankers to empty the buildings and haul manure to area fields in the fall. It is anticipated that approximately 150 loads will be required to empty the buildings over the course of one week each year.

The primary service corridor for the Facility is County Road 30, a paved, all-weather access road with a 10-ton load restriction, to Highway 91, a paved all weather access road with a 10-ton load restriction.[9] The axle weight restriction will not impact the amount of traffic from the proposed Project. The MPCA does not anticipate that the additional traffic from the Project will impact the normal road use.[10] Therefore, no road improvements are necessary or planned for the proposed Project.

B. Will new or expanded utilities, roads, other infrastructure, or public services be required to serve the project? ☐ Yes ☒ No

If yes, please describe.

None

10. Permits and approvals required. Mark required permits and give status of application:

Unit of government	Type of Application	Status
☒ MPCA	NPDES/SDS Feedlot/Stormwater Permit*	Pending - issued upon completion of environmental review.
☒ County	Nobles County Feedlot Permit	Pending - issued upon completion of environmental review.
☒ County/twp/city	Conditional use or other land use permit	Pending- issued upon completion of environmental review.

* The Stormwater Permit, or portions of it, is included as an appendix to the NPDES/SDS Feedlot Permits

[9] Nobles County Public Works. 2014 Spring Road Restrictions Map (retrieved February 8, 2015). http://www.co.nobles.mn.us/LinkClick.aspx?fileticket=5fKnnb9XGG0%3d&tabid=859&mid=1994.

[10] February 20, 2015, e-mail from Steven Schnieder, Nobles County Public Works Department, to project consultant Andrew Nesseth, noting no additional comments to road use beyond legal trucking requirements.

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.)*

The environmental review rules require the MPCA to evaluate whether a proposed Project, which may not individually have the potential to cause significant environmental effects, could have a significant effect when considered along with other projects. This type of impact is known as a cumulative potential effect. In order to assess the Project's "cumulative potential effects of related or anticipated future projects," the MPCA conducted an analysis that addressed other related or anticipated future projects that could contribute to the potential direct or indirect impacts of the Project. The MPCA analysis considered projects that: (1) are already in existence or planned for the future; (2) are located in the surrounding area; and (3) might reasonably be expected to affect the same natural resources. The following is a review of the analysis conducted to determine if the proposed Project would contribute to an adverse cumulative potential effect.

The MPCA reviewed the existing public data to identify the number of feedlots and other projects within the same sub-watersheds of the Facility. The public data reviewed included the MPCA feedlot registration database. A total of 88 livestock operations, representing 20,118 AUs are located in the same minor watersheds as the Facility and or land application sites associated with the Project (see Attachment K).

Lastly, the MPCA reviewed the Facility with Project to determine whether collectively they might reasonably be expected to affect the same natural resources. The natural resources of concern included groundwater, surface waters, air quality, and land use. The following is a brief discussion of each.

Water Resources

Water resources include the waters found on the surface and below the ground. This Proposer will utilize the Rural Water System to supply potable water for the Facility with Project. Land application of manure has the potential to impact both surface and groundwater resources if conducted improperly or without regard to agronomic rate.

Groundwater Quality

Groundwater resources can be also be adversely impacted by manure land application activities where ground-water resources are at or near the surface or are accessible through conduits and fractures commonly associated with karst topography. The 1989 Minnesota Groundwater Protection Act authorized the MDNR to map geographic areas defined by natural features where there is risk to groundwater from activities conducted at or near the land surface.[11] The Proposer reviewed information compiled by the MDNR to determine whether the proposed Project has the potential to contribute pollutants to the underlying aquifer creating an adverse cumulative effect.

The soil type and depth to bedrock were considered as factors in the review to determine groundwater sensitivity and pollutant impacts. The Proposer reviewed the report, Ground Water Contamination

[11] See generally Minn. Stat. § 103H.

Susceptibility in Minnesota,[12] to estimate the potential for groundwater pollution from the proposed Project. The report uses a matrix for determining a Sensitivity Rating of the Water Table ranging from Very High to Very Low based on aquifer material, recharge potential, soil materials and vadose zone materials. The Proposer's review indicated the majority of the areas of manure application sites have a Moderate sensitivity with the remainder being considered High sensitivity. A Moderate rating indicates vertical travel times of years to decades and a High sensitivity indicates vertical travel times of weeks to years (see Attachment K). No known karst topography exists within the vicinity of Existing Facility's total confinement bar, the proposed New Facility, or the manure application sites. The Proposer's land application practices reduce risk to ground-water quality (see Item 5 of the EAW).

To further protect groundwater, the Proposer will follow the requirements in Minn. R. ch. 7020 for the construction of the manure storage structures for the swine manure and the land application of the manure. These rules are intended to protect groundwater from both cumulative and individual feedlot impacts. The MPCA must approve all proposed plans and specifications for the manure storage pits, the design and operation of the open lots, and the MMP for the land application of the manure, all of which will be integral and enforceable conditions of the Proposer's NPDES/SDS Permit. In light of the potential risk of contamination to groundwater resources and the manner in which land application will be managed for the Facility, the MPCA does not anticipate the Project will contribute to an adverse cumulative potential effect to groundwater resources in the area.

Surface water Impacts

Land application of manure can be a concern with respect to water quality. The MPCA reviewed the MPCA's impaired waters database to determine if the Facility with Project would contribute to any existing impaired surface waters. Kanaranzi Creek and Norwegian Creek are the closest water courses in the same watershed listed on the 2012 Impaired Waters requiring a Total Maximum Daily Load (TMDL). Norwegian Creek is listed as impaired for Fecal Coliform and is within approximately 2.0 miles of the manure application sites in Grand Prairie Township (see Attachment K). Additionally, Kanaranzi Creek is listed as impaired for Fecal Coliform and Turbidity and is approximately 1.0 mile from the manure application site in Section 24 of Kanaranzi Township. These waters are located within the Rock River Watershed and were listed as impaired on the Federal Clean Water Act 303(d) list for recreational/human contact use based on water quality standards for fecal coliform bacteria. The Rock River Fecal Coliform TMDL Report[13] lists incorporated manure as a Low – Moderate contributor to fecal coliform bacteria in the watershed, depending on climatic conditions. The Proposer will implement best management practices, as outlined in the implementation plan for manure management include buffer strips, nutrient and manure management, and residue management.

To ensure water resources will not be impacted, the MMP requires the Proposer to take several measures. The Proposer will conduct soil and manure testing to determine the amount of manure to apply on application sites, known as agronomic rates. Agronomic rates are designed to provide only the amount of manure that is needed for crop growth. This practice minimizes the possibility that excess manure will impact water resources. Additionally, the Proposer will follow required setbacks from all surface waters. The Proposer will inject all swine manure generated. Injecting or incorporating manure assimilates it into the soil profile and ties up a large portion of the nutrients in the organic portion of the soil, thereby decreasing mobilization of the nutrients by wind and/or water, which could otherwise add to the impairments. Injection or incorporation of the manure also increases the organic matter in the

[12] Porcher, Eric. 1989. Ground Water Contamination Susceptibility in Minnesota. Available at: http://files.dnr.state.mn.us/waters/groundwater_section/mapping/sensitivity/docs/porcher1989.pdf

[13] Minnesota Pollution Control Agency. Fecal Coliform and Turbidity TMDL Assessment for the Rock River Watershed. February 2008. http://www.pca.state.mn.us/index.php/view-document.html?gid=8157 (Retrieved on February 8, 2015).

soil, making it less likely to erode and add sediment to the impaired waters. The Proposer conducted a phosphorus loss assessment which takes into account tillage, timing and rate of nutrient applications, topography, soil types, and proximity to water. The results indicate the potential for phosphorus transport from both insoluble and soluble forms is low (Attachment J). In addition, Minn. R. ch. 7020 specifies that the only nutrients that are allowed to be applied to the manure spreading acreage are those that are included in the MMP. The only nutrient applications to the fields included in the MMP are those manure applications and fertilizer applications needed to meet the nutrient needs of the crops. No other biosolids, manure from other feedlots, or other nutrient sources will be added to the fields where manure will be spread from the Proposer's feedlot. MPCA feedlot staff has reviewed the MMP for the Project and consider the MMP approvable. The MMP will be an integral and enforceable part of the Proposer's NPDES/SDS Feedlot Permit.

The land application areas are located within three minor watersheds of the Rock River Watershed. The Rock River Watershed drains an area of land approximately 365,625 acres in size, with land use being primarily agricultural dominated by animal and crop production. The activities related to the surface water impairments in the Rock River Watershed originate from a combination of anthropogenic point source (e.g., inadequately functioning septic systems) and nonpoint source (e.g., agricultural activities) discharges. The MPCA anticipates the Project will not contribute to the existing water quality issues discussed above. The Project will minimize its potential impact to surface water quality through the land application activities discussed in Item 5 of the EAW, including storage in an engineered concrete structure, fall land application, injection of manure, and observation of setback distances, as well as the use of an agronomic rate for land application. These practices will be included in the Proposer's NPDES/SDS Permit, which requires a "no discharge" standard.

The Proposer will house all livestock in total confinement buildings, and manure will be stored beneath the buildings in concrete pits designed by a licensed Professional Engineer. The NPDES/SDS Permit requires a zero discharge standard. As a result, the MPCA concludes the Project will not contribute to an adverse cumulative potential impact of surface water quality.

Land Use

The land identified for the purpose of this Project includes the Facility along with the land application acreage available. Two issues have been identified with respect to land resources – wildlife habitat and row crop agriculture.

1. Habitat
   There is a competing issue in rural landscapes to maintain a balance between agricultural demands and preserving natural resources. In this case, the land to be used for the proposed expansion is currently open agricultural land that offers limited protection, food, or cover for wildlife. The MPCA does not anticipate any additional impact to wildlife habitat as a result of this Project.

2. Row Crop Agriculture
   The Project is designed to utilize existing row crop feedstock, rather than to cultivate fallow or marginal land to meet crop use needs. The MPCA does not expect the Project's use of existing row crop agriculture to create an additional adverse impact to environmental quality.

Air Quality Impacts

The MPCA evaluated the Project for regulated pollutants (e.g., hydrogen sulfide, odor and ammonia) and accounted for other off-site sources through the use of air dispersion modeling software. Modeling results indicate expected concentrations of hydrogen sulfide, ammonia, and selected odorous gases from the Project will not contribute to exceedances of hydrogen sulfide, ammonia and odor levels.

Traffic

The cumulative potential effects analysis for traffic included an evaluation of the direct contribution of new traffic through the development and operation of the Project in context to the existing traffic load. The direct impact analysis is provided in Item 9.A of the EAW. The MPCA does not consider the additional traffic identified in Item 9.A to be a significant contribution to the existing traffic load and determines that this traffic does not present an adverse cumulative potential impact.

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.

The MPCA has not identified any additional issues.

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: Bill Sierks for Dan Card

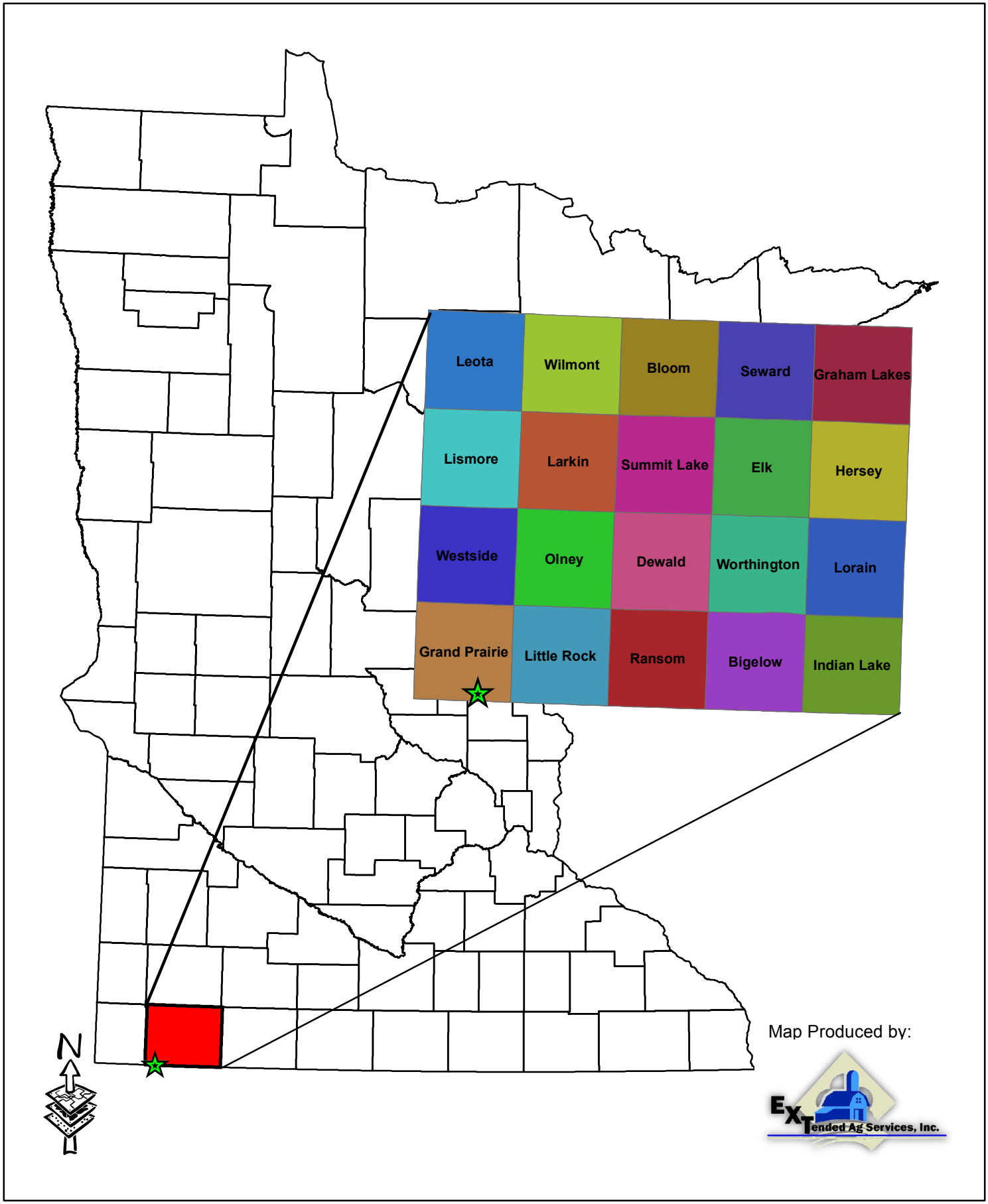
Dan R. Card, P.E., Supervisor, Environmental Review Unit
St. Paul Office
Resource Management and Assistance Division

Date: August 10, 2015

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/EnvRevGuidanceDocuments.htm.

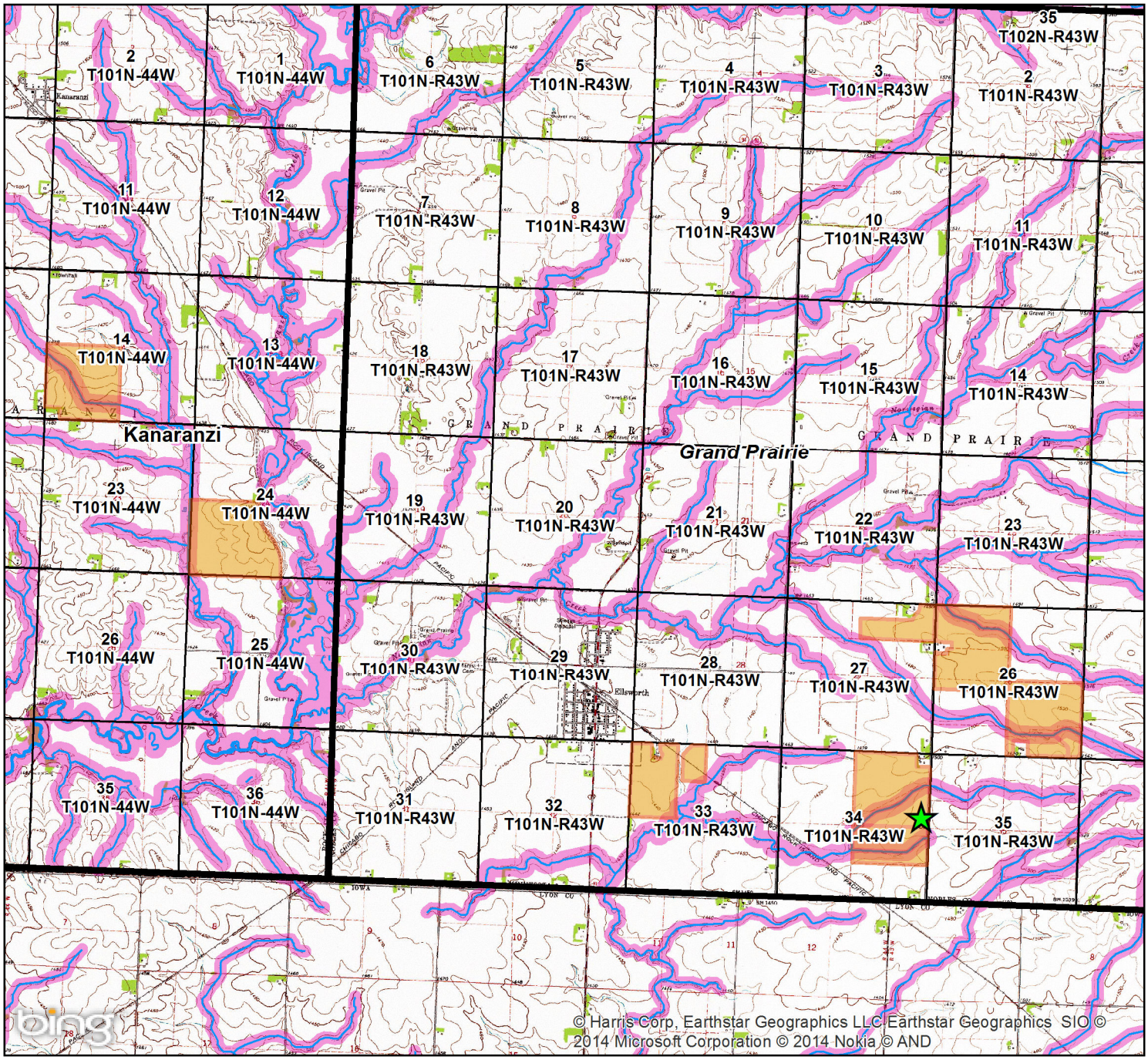
Curt Schilling Swine Facility
General Location Map

ATTACHMENT A



Curt Schilling Swine Facility
Topographic Map

ATTACHMENT B



NOTES:

Legend

- Manure Acres
- Waterway
- Special Protection Area

Imagery Courtesy of BING.

N

Feet

0 1,350 2,700 5,400 8,100 10,800

EXTended Ag Services, Inc.

NOTES:

Legend

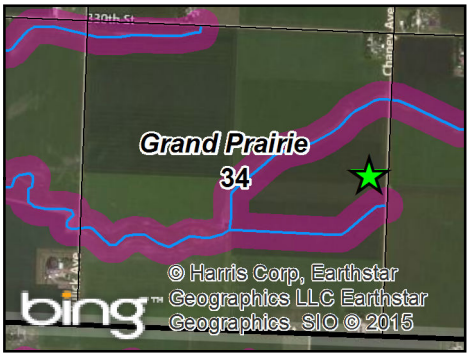
- Site Location
- Site Map
- Distances
- Waterway
- Special Protection Area

Imagery Courtesy of BING.

Extended Ag Services, Inc.

Feet

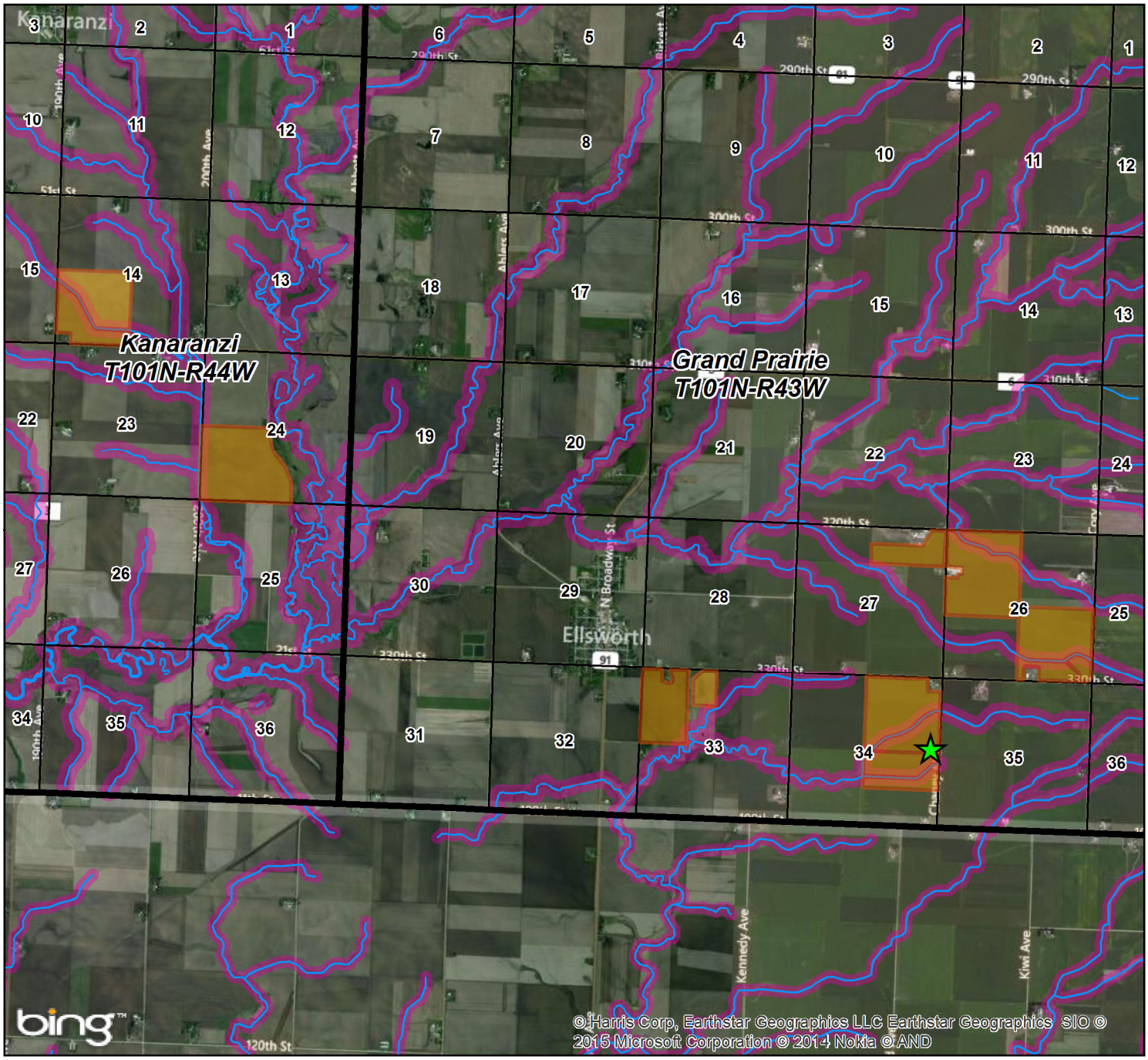
0 25 50 100 150 200



Curt Schilling Swine Facility

Manure Acreage Summary Map

ATTACHMENT D



NOTES: 1040.9 Total Acres

Legend

- Manure Acres
- Waterway
- Special Protection Area

Imagery Courtesy of BING.

N

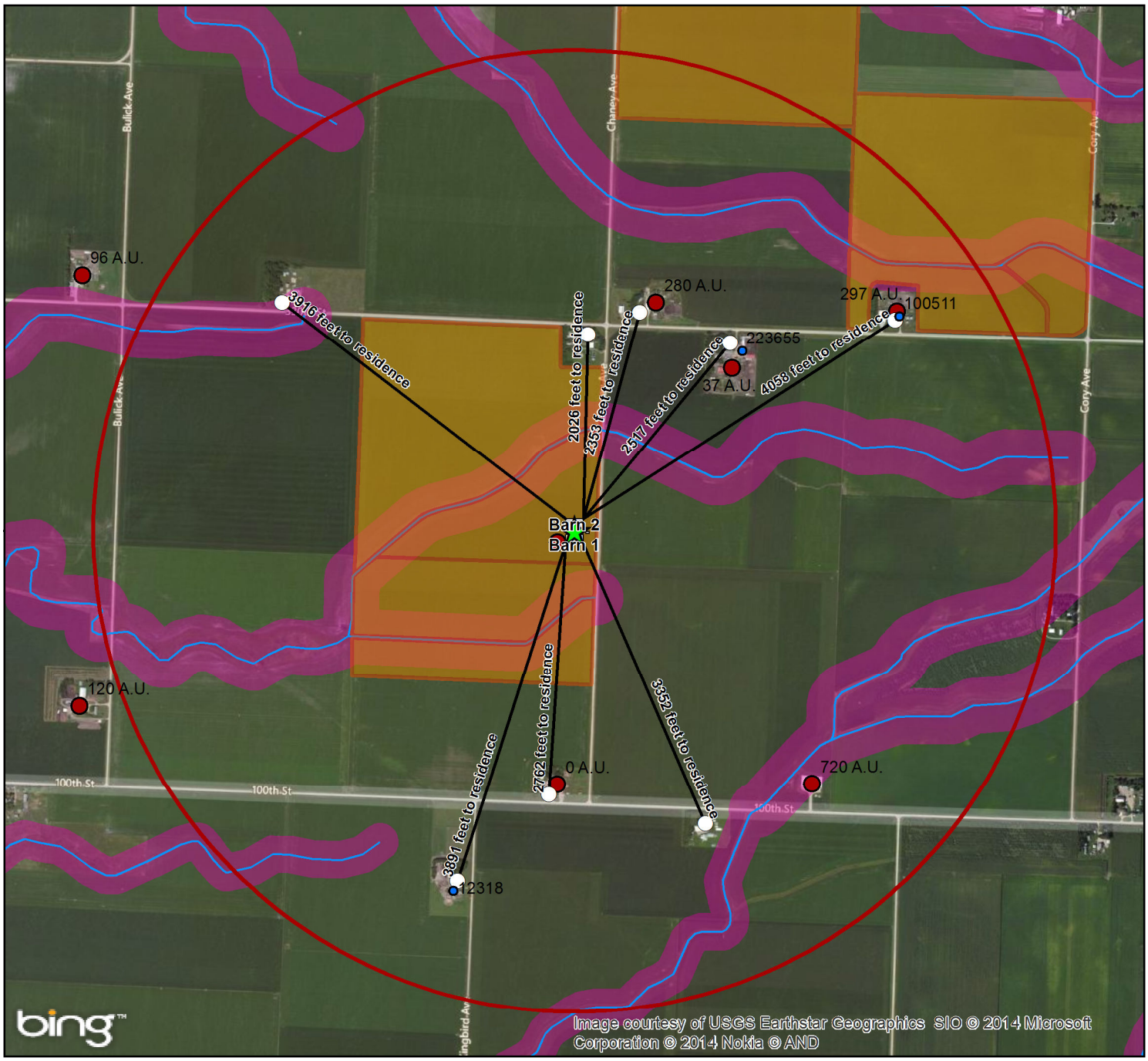
Feet

0 1,650 3,300 6,600 9,900 13,200

EXTended Ag Services, Inc.

Curt Schilling Swine Facility
One Mile Radius Map

ATTACHMENT E



NOTES:
Well Locations courtesy of MN County Well Index and Iowa DNR GeoSam Database. Feedlot locations courtesy of MPCA.

Legend

- Known Well
- Residence
- Site Location
- Distance to Residence
- Feedlots
- One Mile Radius
- Site Map
- Manure Acres
- Waterway
- Special Protection Area

Imagery Courtesy of BING.

EXTended Ag Services, Inc.

N

Feet

0 625 1,250 2,500 3,750 5,000

ATTACHMENT F

Minnesota Department of Natural Resources

Division of Ecological and Water Resources, Box 25

500 Lafayette Road

St. Paul, Minnesota 55155-4025

Phone: (651) 259-5091 E-mail: samantha.bump@state.mn.us

February 26, 2015 **Correspondence # ERDB 20150197**

Mr. Andrew Nesseth
Extended Ag Services, Inc.
507 Milwaukee St.
Lakefield, MN 56150

RE: Natural Heritage Review of the proposed Curt Schilling Swine Facility,

County	Township (N)	Range (W)	Section(s)
Rock	101	44	2, 14, 24
Nobles	101	43	26, 27, 33,34

Dear Mr. Nesseth,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, see the enclosed database reports; please visit the Rare Species Guide at http://www.dnr.state.mn.us/rsg/index.html for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following **rare features *may* be adversely affected** by the proposed project:

- Kanaranzi Creek has been federally designated as critical habitat for the Topeka shiner (*Notropis topeka*), a federally-listed endangered and state-listed special concern fish species. Topeka shiners are adversely impacted by actions that alter stream hydrology or decrease water quality, including sedimentation, eutrophication, and pollution/contamination. Measures should be taken to ensure that nutrient-rich runoff does not enter the above waterways or their tributaries. Given the federal status of this species, I also recommend that you coordinate with the U.S. Fish & Wildlife Service's Twin Cities Field Office (612-725-3548) regarding this project.

- The Minnesota Biological Survey (MBS) has identified a few Sites of Biodiversity Significance within the area of interest (see attached map). Sites ranked as Below do not meet the minimum biodiversity threshold for statewide significance. These sites, however, may have conservation value at the local level as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, or as areas with high potential for restoration of native habitat. As such, manure applications in these areas should be minimized as much as possible and confined to the existing fields where feasible.

- The Environmental Assessment Worksheet should address whether the proposed project has the potential to adversely affect the above rare features and, if so, it should identify specific measures that will be taken to avoid or minimize disturbance.

- Please include a copy of this letter in any DNR license or permit application.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. **If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.**

The enclosed results include an Index Report and a Detailed Report of records in the Rare Features Database, the main database of the NHIS. To control the release of specific location information, which might result in the destruction of a rare feature, both reports are copyrighted.

The Index Report provides rare feature locations only to the nearest section, and may be reprinted, unaltered, in an environmental review document (e.g., EAW or EIS), municipal natural resource plan, or report compiled by your company for the project listed above. If you wish to reproduce the index report for any other purpose, please contact me to request written permission. **The Detailed Report is for your personal use only as it may include specific location information that is considered nonpublic data under *Minnesota Statutes*, section 84.0872, subd. 2. If you wish to reprint or publish the Detailed Report for any purpose, please contact me to request written permission.**

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. To determine whether there are other natural resource concerns associated with the proposed project, please contact your DNR Regional Environmental Assessment Ecologist (contact information available at http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html). Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,

Samantha Bump

Samantha Bump
Natural Heritage Review Specialist

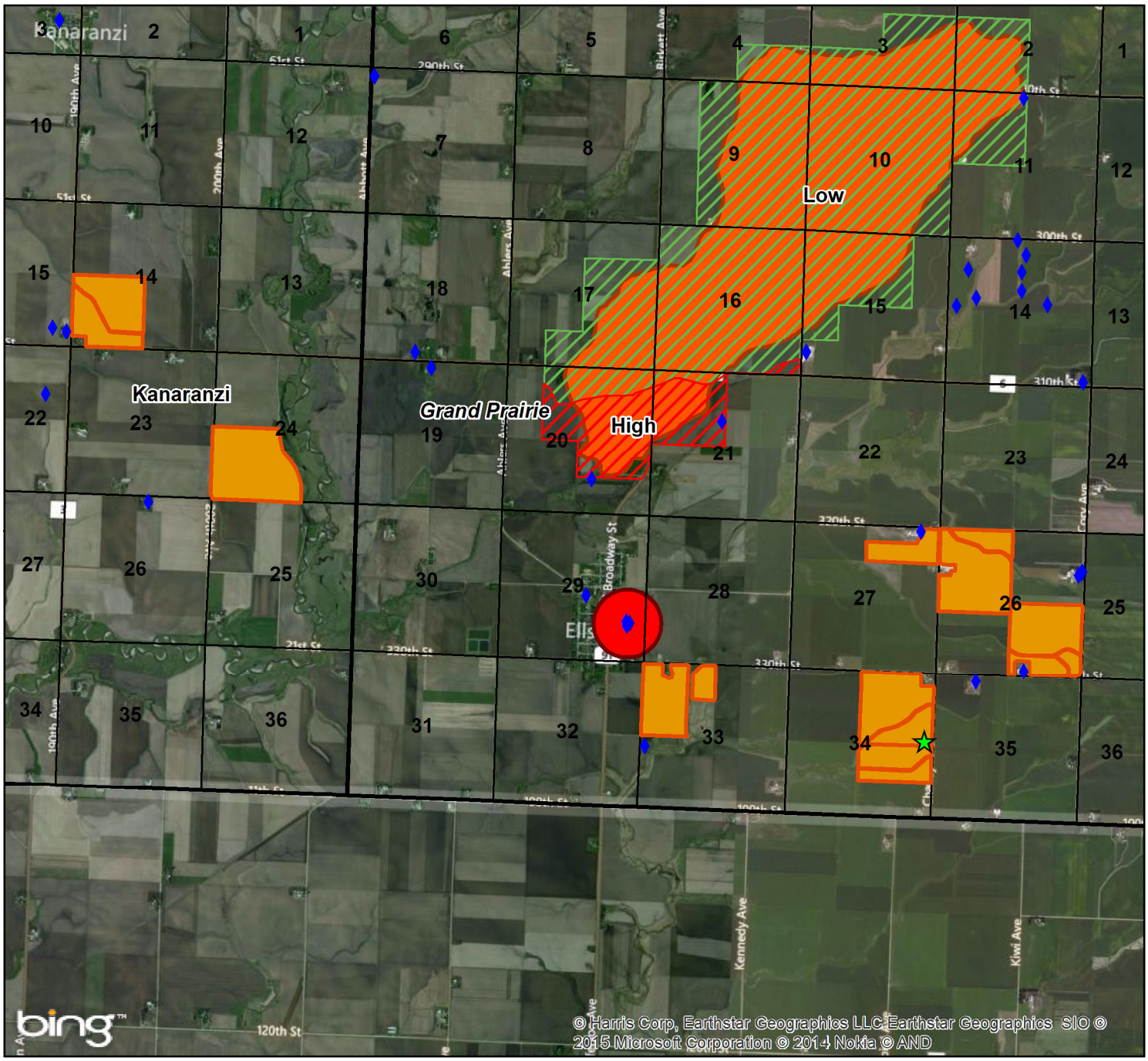
enc. Rare Features Database: Index Report
Rare Features Database: Detailed Report
Rare Features Database Reports: An Explanation of Fields
Topeka Shiner Fact Sheet
Map

Links: MBS Sites of Biodiversity Significance
http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html

cc: Kevin Mixon
Brian Nyborg

Curt Schilling Swine Facility
Drinking Water / Well Inventory Map

ATTACHMENT G



NOTES: Data courtesty of the Minnesota Department of Health. (2014)

Legend

- County Well Index
- SiteLocation
- Field Boundary
- Wellhead Protection Area
- Source Water Assessment

DWSMA

Vulnerablity

- High
- Low

Imagery Courtesy of BING.

N

Feet

0 1,750 3,500 7,000 10,500 14,000

EXTended Ag Services, Inc.

ATTACHMENT H

Andrew Nesseth

From: Thomas Cinadr <thomas.cinadr@mnhs.org>
Sent: Thursday, January 29, 2015 10:09 AM
To: Jessica Mulder
Subject: Re: SHPO Request - Curt Schilling
Attachments: Archaeology.rtf

THIS EMAIL IS NOT A PROJECT CLEARANCE.

This message simply reports the results of the cultural resources database search you requested. The database search produced results for only previously known archaeological sites and historic properties. Please read the note below carefully.

No historic structures were identified in a search of the Minnesota Archaeological Inventory and Historic Structures Inventory for the search area requested. **A report containing the archaeological sites identified is attached.**

The result of this database search provides a listing of recorded archaeological sites and historic architectural properties that are included in the current SHPO databases. Because the majority of archaeological sites in the state and many historic architectural properties have not been recorded, important sites or structures may exist within the search area and may be affected by development projects within that area. Additional research, including field survey, may be necessary to adequately assess the area's potential to contain historic properties.

Properties that are listed in the National Register of Historic Places (NRHP) or have been determined eligible for listing in the NRHP are indicated on the reports you have received. The following codes on the reports you received are:

NR – National Register listed. The properties may be individually listed or may be within the boundaries of a National Register District.

CEF – Certified Eligible to the National Register findings are usually made during the federal review process, these properties have been evaluated as being eligible for listing in the National Register.

SEF – Staff eligible findings to the National Register are properties that have been determined eligible by SHPO staff.
DOE – Determination of Eligibility is made by the National Park Service and typically refers to properties deemed eligible but the owner objects to the listing.

CNEF – Certified Not Eligible to the National Register. SHPO has begun to record properties that have been evaluated as **not eligible** for listing in the National Register. If the box on the form has a check the property has been determined to be **not eligible.**

Properties without **NR, CEF, SEF, DOE, or CNEF** designations in the reports you received may not have been evaluated and therefore no assumption to their eligibility can be made.

If you require a comprehensive assessment of a project's potential to impact archaeological sites or historic architectural properties, you may need to hire a qualified archaeologist and/or historian. If you need assistance with a project review, please contact Kelly Gragg-Johnson in Review and Compliance @ 651-259-3455 or by email at kelly.graggjohnson@mnhs.org.

The Minnesota SHPO Survey Manuals and Database Metadata can be found at http://www.mnhs.org/shpo/survey/inventories.htm
SHPO research hours are 8:30 AM – 4:00 PM Tuesday-Friday.

The Office is closed on Mondays.

Tom Cinadr
Survey and Information Management Coordinator
Minnesota State Historic Preservation Office
Minnesota Historical Society
345 Kellogg Blvd. West
St. Paul, MN 55102

651-259-3453

On Thu, Jan 29, 2015 at 9:13 AM, Jessica Mulder <jessica@extendedag.com> wrote:

> I have a SHPO Request for following field locations:
>
> T101N, R43W, Section 26, NW1/4 (Lismore Twp. Nobles County)
>
> T101N, R43W, Section 26, SE1/4 (Lismore Twp. Nobles County)
>
> T101N, R43W, Section 27, N1/2 of NE1/4 (Lismore Twp. Nobles County)
>
> T101N, R43W, Section 33, NW1/4 (Lismore Twp. Nobles County)
>
> T101N, R43W, Section 34, N1/2 of SE1/4 (Lismore Twp. Nobles County)
>
> T101N, R43W, Section 34, NE1/4 (Lismore Twp. Nobles County)
>
> T101N, R44W, Section 2, NE1/4 (Kanaranzi Twp. Rock County)
>
> T101N, R44W, Section 14, SW1/4 (Kanaranzi Twp. Rock County)
>
> T101N, R44W, Section 24, SW1/4 (Kanaranzi Twp. Rock County)
>
> *Jessica Mulder*
>
> Extended Ag Services, Inc.

Archaeological Site Locations

Site Number	Site Name	Twp.	Range	Sec.	Quarter Sections	Acres	Phase	Site Description	Tradition	Context	Reports	NR	CEF	DOE
County: Rock														
21RK0018	Hard-Up	101	44	24	NW-SE-SE-NW,E-NE-NE-SW	3	1	LS						

ATTACHMENT I

RECEIVED
MAY 26 2015
BY:

Air Quality Modeling Report
Schilling Hog Feedlot
Proposed Feedlot Expansion

Nobles County
Grand Prairie Township
E ½ Section 34

Prepared by
Barr Engineering Company
4700 West 77th Street
Minneapolis, MN 55435-4803

May 2015

BARR

Table of Contents

Introduction

Curt Schilling (Schilling) proposes to construct a second 2,400-head hog-finishing barn at his feedlot located in the E ½ of Section 34, Grand Prairie Township, Nobles County.

Based on a protocol approved by the Minnesota Pollution Control Agency (MPCA) on May 1, 2015, air quality modeling calculated the hydrogen sulfide concentrations, ammonia concentrations, and odor intensities at the property lines for the expanded Schilling hog feedlot and at the locations for 21 of the feedlot's nearest neighbors. The modeled emission sources for the expanded Schilling feedlot consisted of two 192-ft by 102-ft mechanically-ventilated hog-finishing barns with concrete manure storage pits located beneath the barns' slatted floors. In addition to the emissions from the expanded Schilling hog feedlot, the air quality modeling also considered the gaseous emissions from 11 neighboring feedlots. The locations of the 12 feedlots are provided in Figure 1.

The following atmospheric concentrations were calculated:

1. the maximum hourly hydrogen sulfide concentration at the property lines for the expanded Schilling hog feedlot to assess the potential to comply with Minnesota's ambient air quality standard for hydrogen sulfide of 30 ppb;
2. the maximum monthly hydrogen sulfide concentration at 21 of the expanded feedlot's nearest neighbors to assess the potential to exceed Minnesota's subchronic (13-week) inhalation Health Risk Value (iHRV) for hydrogen sulfide of 10 $\mu g/m^3$;
3. the maximum hourly ammonia concentration at the property lines for the expanded Schilling hog feedlot to assess the potential to exceed Minnesota's acute iHRV for ammonia of 3,200 $\mu g/m^3$;
4. the maximum annual ammonia concentration at 21 of the expanded Schilling feedlot's nearest neighbors to assess the potential to exceed Minnesota's chronic iHRV for ammonia of 80 $\mu g/m^3$; and
5. the maximum hourly odor intensities at the property lines for the expanded Schilling hog feedlot and at 21 of the expanded feedlot's nearest neighbors to access the potential for off-site odor episodes.

The above concentrations were calculated using the AERMOD air quality model, based on 5 years of historical weather data.

The modeling results suggest that the expanded Schilling hog feedlot will comply with the Minnesota ambient air quality standard for hydrogen sulfide. The standard regards the third exceedance of 30 ppb within any 5-day period as a violation. Modeled compliance is demonstrated when the high-third-high (H3H) concentration (with background) for any 5-day period at each property-line receptor is less than 30 ppb. AERMOD calculated a maximum H3H property-line hydrogen sulfide concentration of 1.47 ppb. When a background concentration of 17 ppb is added to the AERMOD-calculated concentration, the H3H hydrogen sulfide concentration is 18.47 ppb, which is below the ambient standard of 30 ppb. Thus, no violation of the 30-ppb ambient hydrogen sulfide standard was modeled for the expanded Schilling feedlot.

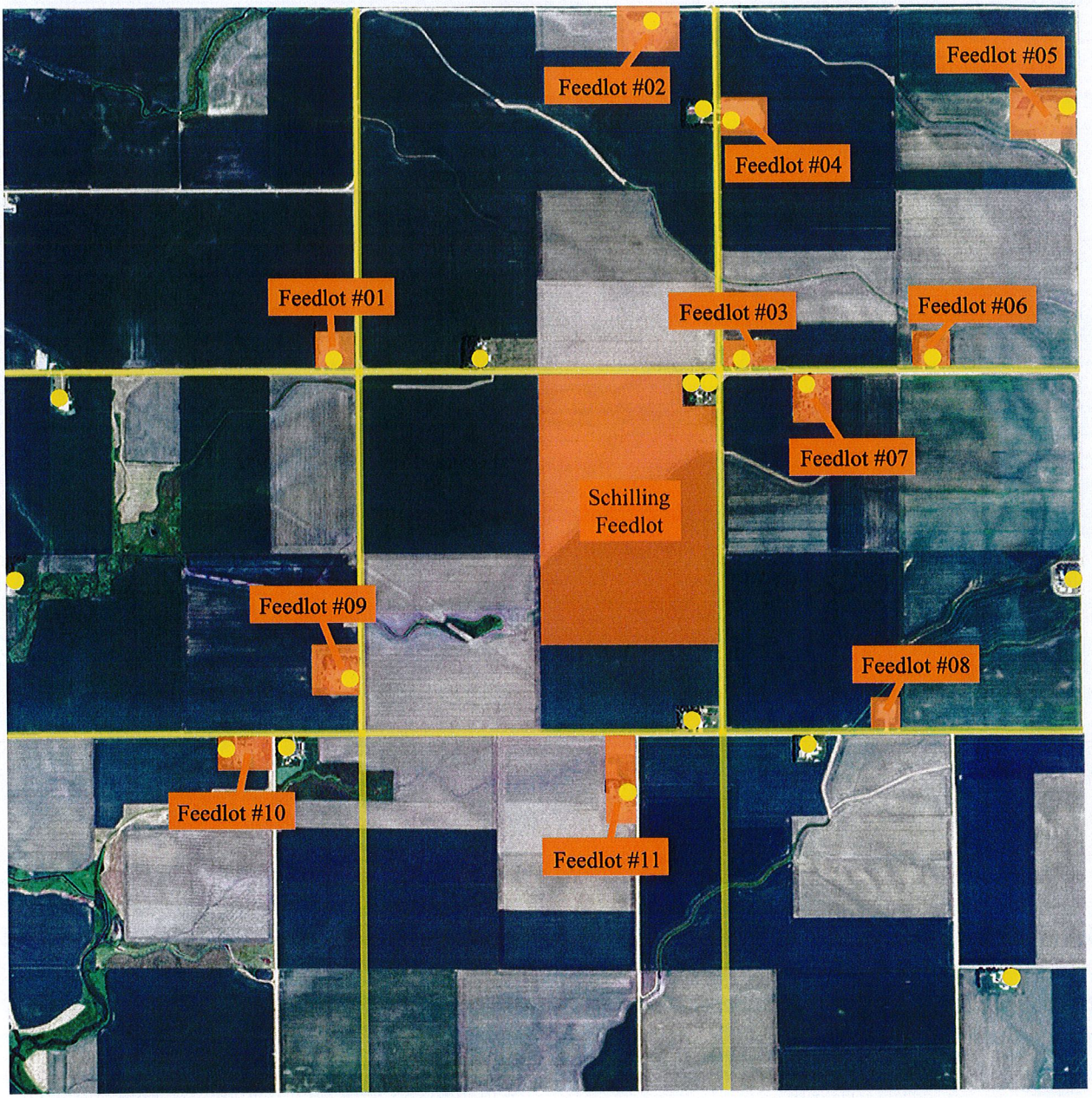


Figure 1. Modeled locations of the expanded Curt Schilling hog feedlot (E ½ of Section 34, Grand Prairie Township), the 11 neighboring feedlots, and 21 neighboring residences (not labeled).

The AERMOD results indicate that the expanded Schilling hog feedlot and the 11 neighboring feedlots will not create exceedances of the subchronic (13-week) hydrogen sulfide iHRV at the neighboring residences. The calculated maximum monthly hydrogen sulfide concentration for the neighboring residences is 0.50 $\mu g/m^3$. When a background concentration of 1.00 $\mu g/m^3$ is added to the AERMOD-calculated concentration, the maximum monthly neighbor hydrogen sulfide concentration is 1.50 $\mu g/m^3$, which is below the subchronic hydrogen sulfide iHRV of 10 $\mu g/m^3$.

The modeling results also suggest that the expanded feedlot will not create exceedances of the acute ammonia iHRV. AERMOD calculated a maximum hourly property-line ammonia concentration of 162 $\mu g/m^3$. When a background concentration of 148 $\mu g/m^3$ is added to the AERMOD-calculated concentration, the maximum property-line ammonia concentration is 310 $\mu g/m^3$, which is below the acute ammonia iHRV of 3,200 $\mu g/m^3$. Thus, no exceedance of the acute ammonia iHRV was modeled at the property lines for the expanded Schilling feedlot.

The AERMOD results indicate that the expanded Schilling hog feedlot and the 11 neighboring feedlots will not create exceedances of the chronic ammonia iHRV at the neighboring residences. The calculated maximum one-year time-averaged ammonia concentration for the neighbors is 14.39 $\mu g/m^3$. When a background ammonia concentration of 5.72 $\mu g/m^3$ is added to the AERMOD concentration, the maximum annual ammonia concentration for a neighboring residence is 20.11 $\mu g/m^3$, which is below the chronic ammonia iHRV of 80 $\mu g/m^3$.

Thus, the modeling results for the expanded Schilling hog feedlot suggest compliance with the hydrogen sulfide air quality standard, no exceedances of the subchronic hydrogen sulfide iHRV, no exceedances of the acute ammonia iHRV, and no exceedances of chronic ammonia iHRV.

General Modeling Approach

The modeling approach assumed that the gaseous emissions from the expanded Schilling feedlot and the 11 neighboring feedlots are the only significant and quantifiable emission sources within a 3-mile by 3-mile grid. The air quality impacts associated with the 12 feedlots were explicitly modeled. The air quality impacts associated with any other sources in the modeled 3-mile by 3-mile grid were considered implicitly as contributors to the background concentrations that are added to the modeling results. Hence, the background concentrations of hydrogen sulfide and ammonia include the impacts associated with sources such as small feedlots, septic tank vents, fertilizer and manure application to cropland, and wetlands.

The AERMOD (version 14134) air quality model[1, 2, 3] was used to estimate the property-line and nearest-neighbor odorous gas concentrations. The estimated concentrations were based on historical wind speeds, wind directions, atmospheric stabilities, and rural mixing heights. The historical weather data consisted of five years (2006-2010) of surface meteorological data for the National Weather Service (NWS) station in

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[1] U.S. EPA. 2004. *User's Guide for the AMS/EPA Regulatory Model—AERMOD.* U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/B-03-001.

[2] U.S. EPA. 2014. *Addendum. User's Guide for the AMS/EPA Regulatory Model—AERMOD.* U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/B-03-001.

[3] U.S. EPA. 2005. *Revision to the Guideline for Air Quality Models.* 40 *CFR* Ch. 1, Part 51, Appendix W (November 9, 2005 Edition).

Jackson, MN and of upper air weather data for the NWS station in Chanhassen, MN. The Jackson surface weather data represents a location surrounded by flat terrain and row crops. Similar conditions surround the expanded Schilling hog feedlot site. The surface and upper air weather data files were combined into an AERMET (version 12345) meteorological file[4, 5] by the Minnesota Pollution Control Agency.

Maximum one-hour, monthly, and annual average concentrations were calculated. The modeling assumed no decay of any modeled gas due to chemical reactions. The modeled receptor height was 0 meters, *i.e.*, ground level. A flat terrain was assumed. All modeled property-line and nearest-neighbor receptors were defined as discrete receptors. Property-line receptors were less than or equal to 25 meters apart. An arbitrary Cartesian coordinate system (x, y) was used with the southwest corner of Section 34, Grand Prairie Township, Nobles County as the origin (0, 0). Positive values of x represent distance east of the origin. Positive values of y represent distance north of the origin.

Impact Thresholds and Background Values

To assess the potential for environmental impacts, the odor intensities and the concentrations of hydrogen sulfide and ammonia generated by the air quality modeling were compared to air quality standards, inhalation Health Risk Values (iHRVs), and an odor classification system based on detection-threshold odor intensities. The direct comparison of model-generated concentrations to these environmental threshold concentrations does not consider the impact of different averaging times. EPA guidelines do not allow concentrations to be time averaged for time periods less than an hour.[6] This is important because the Minnesota ambient air quality standards for hydrogen sulfide are based on average concentrations over a 30-minute time period and because the published odor intensity correlations are often based on instantaneous measurements. For example, an hourly model-generated hydrogen sulfide concentration of 29 ppb may contain a half-hour average concentration that exceeds the 30 ppb standard. Also, an odor intensity that an odor panelist may find to be merely detectable in a short-term field measurement could be annoying if present for an hour or longer.

The background concentrations of hydrogen sulfide and ammonia provided in Table 1 were added to the AERMOD-calculated concentrations as described in EPA guidelines.[7] The listed background concentrations are for rural Minnesota. The listed 17-ppb background hydrogen sulfide concentration is appropriate when assessing a feedlot's potential to comply with the 30-ppb standard. A background concentration of 18 ppb should be used when assessing the potential to comply with the 50-ppb hydrogen sulfide standard.

The background concentrations listed in Table 1 are not the time-averaged concentrations obtained from monitoring. Instead, the listed concentrations reflect the monitored data

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[4] U.S. EPA. 2004. *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. EPA-454-B-03-002.

[5] U.S. EPA. 2012. *Addendum. User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. EPA-454-B-03-002.

[6] U.S. EPA. 2005. *Revision to the Guideline for Air Quality Models.* 40 *CFR* Ch. 1, Part 51, Appendix W (November 9, 2005 Edition).

[7] U.S. EPA. 2005. *Revision to the Guideline for Air Quality Models.* 40 *CFR* Ch. 1, Part 51, Appendix W (November 9, 2005 Edition).

Table 1. Background concentrations for rural Minnesota.

Pollutant	Hourly Background Concentration	13-Week Background Concentration	Annual Background Concentration
Hydrogen Sulfide	17 ppb (v/v) (24.3 $\mu g/m^3$)	0.70 ppb (v/v) (1.00 $\mu g/m^3$)	Not Required
Ammonia	208 ppb (v/v) (148 $\mu g/m^3$)	Not Required	8.07 ppb (v/v) (5.72 $\mu g/m^3$)

expressed in the terms of the "exceedance or violation condition" for the corresponding iHRV guideline or ambient standard. For example, the background 208-ppb ammonia concentration for the acute ammonia iHRV represents the maximum hourly concentration that occurred within the entire length of monitoring. This is the appropriate interpretation of background for the acute ammonia iHRV, because the guidance is concerned with any potential exceedance of the iHRV. Also, the 17-ppb hydrogen sulfide background represents the third highest 30-minute concentration that occurred within any 5-day period (*i.e.*, the high-third-high or H3H). This is appropriate, because the ambient hydrogen sulfide standard defines a violation as the third exceedance of 30-ppb within any 5-day period.

To assess the potential for odor episodes, the estimated atmospheric concentrations of hydrogen sulfide and ammonia were compared to each gas's reported odor threshold concentration. The odor threshold concentration is defined as the gas-phase concentration at which 50 percent of the population can detect the gas's odor. For this presentation, odor number is defined as the ratio of the estimated atmospheric concentration for a specific odorous gas divided by its odor threshold concentration. An odor number equal to 1 suggests that 50 percent of the population can detect the estimated atmospheric concentration for a specific gas. An odor number greater than 1 suggests that more than 50 percent of the population can detect the gas, while a value less than 1 indicates that less than 50 percent of the population can detect the gas. Typically, an odor number below about 0.1 suggests that less than 1 percent of the population can detect the gas.[8] The odor threshold concentrations used in this assessment are presented in Table 2.

[8] Nagy G. Z. 1991. The odor impact model. *Journal of Air & Waste Management Association* 41(10): 1360-1362.

Table 2. Odor threshold concentrations.[9, 10]

Odorous Gas	Odor Threshold Concentration (ppb, v/v)
Hydrogen Sulfide	9.4
Ammonia	5,800

As a second means of assessing potential odor impacts, the AERMOD-calculated odor intensities (expressed as detection-threshold odor units) were compared to the reference odor intensities provided in Table 3. An odor intensity of 72 detection-threshold odor units (OU) is defined as a faint odor and is the odor intensity that "an average person might detect if attention is called to the odor, but the odor would not otherwise be noticed."[11]

Table 3. Odor intensity classification.[12]

Odor Intensity Number	Odor Strength	*n*-Butanol Reference Solution (ppm)	Detection-Threshold Odor Units (OU, D/T)
0	no odor	0	0
1	very faint	250	25
2	faint	750	72
3	moderate	2,250	212
4	strong	6,750	624
5	very strong	20,250	1,834

[9] AIHA. 1989. *Odor Thresholds for Chemicals with Established Occupational Health Standards*. American Industrial Hygiene Association, Akron, OH. This reference provided the odor threshold concentrations for hydrogen sulfide.

[10] Devos M., Patte F, Rouault J., Laffort P., and Van Gemert L. J. 1990. *Standardized Human Olfactory Thresholds*. Oxford University Press, New York, NY. This reference provided the odor threshold concentrations for the ammonia.

[11] Jacobson L. D. and Guo H. 2000. Odor from feedlots setback estimation tool (OFFSET). In: *Livestock and Poultry Odor Workshop II*, Dept. of Biosystems & Agricultural Engineering, University of Minnesota, St. Paul, MN, 39 pp.

[12] Jacobson L. D. *et al.* 2000. Development of an odor rating system to estimate setback distances from animal feedlots: odor for feedlots setback estimation tool (OFFSET). Final Report. Prepared by the Department of Biosystems and Agricultural Engineering, University of Minnesota, St. Paul, MN. 26 pp.

Source Characterizations

The emissions from the mechanically-ventilated hog barns at the expanded Schilling feedlot and at Feedlot #8 were characterized as single horizontal point sources to approximate a buoyant volume source.[13]

Each modeled horizontal point source was defined in terms of its location, gas emission rate, effective stack diameter, hourly-varying stack velocity, release height, and the temperature of the air exhausted from the barns.[14] The emission rate of each horizontal stack equaled the total emission rate for the modeled barn divided by the horizontal point sources used to characterize the barn. The effective stack diameter was obtained from the following equation:

$$SD = 2\sqrt{\frac{G_{max}}{n\pi u_{s,max}}} \qquad (1)$$

in which SD is the effective stack diameter (m), G_{max} is the maximum hot-weather airflow rate for the entire barn (m^3/sec), n is the number of horizontal point sources used to characterize the barn, and $u_{s,max}$ is the maximum air velocity leaving the horizontal point source (m/sec). G_{max} was calculated by multiplying the number of each type of pig housed in the barn by the respective Midwest Plan Service recommended airflow rate per pig for hot temperatures.[15, 16] A maximum stack velocity of 7.0 m/sec was assumed.[17] The release height was equal to one-half the height of the barn. The estimated temperature difference between the air inlet and outlet for the barns is provided in Figure 2.

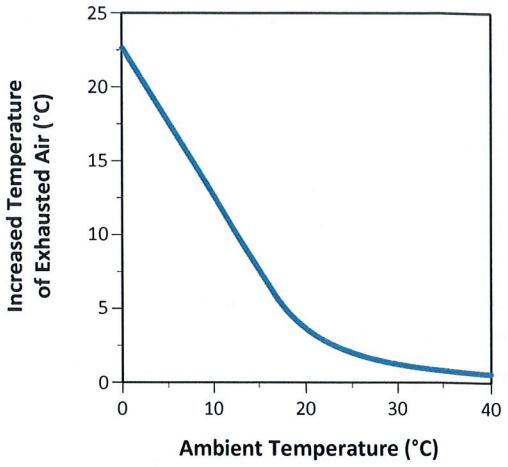

Figure 2. Modeled temperature difference between the inlet air and the exhausted air for mechanically-ventilated hog-barns.[18]

The hourly-varying exhaust velocity (u_s, m/sec) was calculated from the following re-arrangement of equation (1):

$$u_s = \frac{G}{n\pi\left(\frac{SD}{2}\right)^2} \qquad (2)$$

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[13] Gantzer C. 2014. Characterization of Livestock Barns as Potentially-Buoyant Emission Sources. November 4, 2014 Memorandum submitted to the Minnesota Pollution Control Agency. 3 pp.

[14] U.S. EPA. 2014. *Addendum. User's Guide for the AMS/EPA Regulatory Model—AERMOD.* U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/B-03-001.

[15] Harmon J. D. 1999. Mechanical Ventilation Design Worksheet for Swine Housing. Iowa State University Extension, PM 1780, 12 pp.

[16] Jacobson L. D. 2004. Mechanical Ventilation of Pig Housing. http://www.thepigsite.com/articles/186/mechanical-ventilation-for-pig-housing.

[17] BESS. 2014. Agricultural Ventilation Fans. Department of Agricultural and Biological Systems, University of Ilinois at Urbana-Champaign. http://www.bess.illinois.edu The 7.0 m/sec stack velocity is representative of fans with diameters ranging from 36 to 50 inches.

[18] MPCA. 2003. Hancock Pro-Pork Hog Feedlot Project. Final Environmental Impact Statement. Minnesota Pollution Control Agency, September 15, 2003.

in which G is the hourly-varying barn air flow rate (m^3/sec). With varying ambient air temperatures, the airflow rates ranged from the minimum cold-weather airflow rate (G_{min}) to the maximum hot-weather airflow rate (G_{max}). The G_{min} and G_{max} values for each hog barn were calculated from Midwest Plan Service ventilation factors that are provided in Table 4. Typically, hog barns ventilate at G_{min} when ambient air temperatures are less than 5°C (41°F) and ventilate at G_{max} when ambient air temperatures are greater than 24 °C (75°F). Between ambient air temperatures of 5°C to 24°C, an approximate linear relationship exists between airflow rate and ambient air temperature.[19] The modeled relationship between ambient air temperature and airflow rate is illustrated in Figure 3.

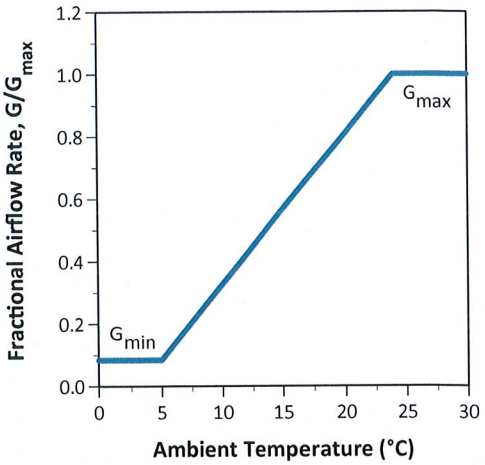

Figure 3. Modeled response of airflow rate to ambient air temperature for a mechanically-ventilated hog barn, where *G* is the airflow rate (m^3/sec). The graph assumes G_{min} and G_{max} values of 10 and 120 cfm per finishing pig, respectively.[22, 23]

Table 4. Ventilation rate factors.[20, 21]

Barn	Units	G_{min}	G_{max}
Gestation	CFM/sow	12	150
Farrowing	CFM/sow	20	500
Finishing	CFM/pig	10	120

The naturally-ventilated livestock barns at the neighboring feedlots were characterized as either line sources or volume sources using the approaches described in EPA air quality modeling documentation.[24, 25] A barn with a length greater than twice its width (aspect ratio greater than 2) was represented as a line source, *i.e.*, a line of separated square volume subsources. A barn with an aspect ratio less than or equal to 2 was modeled as a square volume source.

[19] Hoff, S.J. *et al.* 2004. Real-Time Ventilation Measurements from Mechanically Ventilated Livestock Buildings for Emission Rate Estimations. ASAE/CSAE Annual International Meeting, August 1-4, 2004, Paper No. 044178.

[20] Harmon J. D. 1999. Mechanical Ventilation Design Worksheet for Swine Housing. Iowa State University Extension, PM 1780, 12 pp.

[21] Jacobson L. D. 2004. Mechanical Ventilation of Pig Housing. http://www.thepigsite.com/articles/186/mechanical-ventilation-for-pig-housing.

[22] Harmon J. D. 1999. Mechanical Ventilation Design Worksheet for Swine Housing. Iowa State University Extension, PM 1780, 12 pp.

[23] Jacobson L. D. 2004. Mechanical Ventilation of Pig Housing. http://www.thepigsite.com/articles/186/mechanical-ventilation-for-pig-housing.

[24] *U.S. EPA. 1995. User's Guide for the Industrial Source Complex (ISC3) Dispersion Models. Volume II– Description of Model Algorithms*. U.S. Environmental Protection Agency, Office of Air Quality, Research Triangle Park, NC, EPA-454/B-95-003b.

[25] U.S. EPA. 2004. *User's Guide for the AMS/EPA Regulatory Model—AERMOD*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-454/B-03-001.

The dairy manure storage basins at two of the neighboring feedlots were characterized as non-buoyant area sources. The BASINODOR algorithms calculated hourly emission rates based on the water-phase concentration of the modeled gas, the estimated water temperature, and the recorded wind speed. BASINODOR uses EPA-recommended mass-transfer algorithms to estimate emission rates.[26] The liquid-phase mass transfer coefficient in the BASINODOR algorithms were defined by modified Mackay-Yeun correlations.[27, 28, 29]

The overall mass transfer coefficients for the dairy manure basins at Feedlot #2 and Feedlot #5 were adjusted to account for the presence of a crust. The dry crust was assumed to be 1-inch thick and to prevent the wind-induced mixing of the liquid surface. While the crust was assumed to reduce the gas-phase mass transfer coefficient, no chemical or biological reactions was assumed to occur within the crust. The modeled effectiveness of a 1-inch thick dry crust in reducing emissions is provided in Figure 4.

Hourly water temperatures within the dairy manure storage basins were estimated by the heat balance approach described in Thomann and Mueller (1987).[30] The approach assumes that the basin is completely-mixed vertically and that the sky is free of clouds. The EPA's PCRAMMET algorithms[31] were used to estimate the hourly variation in solar radiation based on day of the year, hour of the day, site latitude, and site longitude. Basin depth was assumed constant and equal to maximum design capacity depth. When the water temperature algorithms predict water temperatures less than or equal to 0°C (32°F), the emission algorithms assumed that the basin was ice covered and that no gas emissions were emitted into the atmosphere.

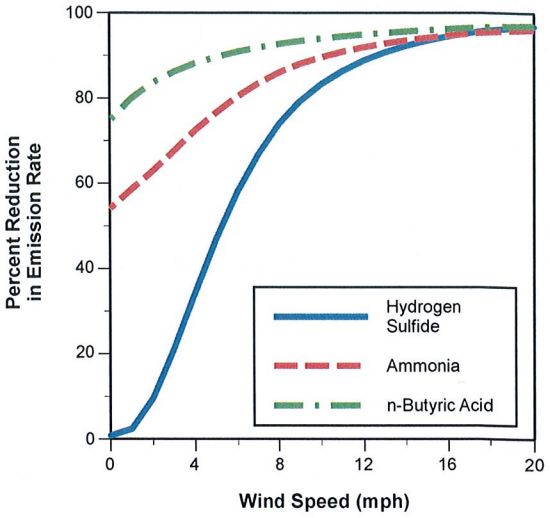

Figure 4. Modeled percent reduction in emission rates from a crust-covered basin compared to a crust-free basin. The gas-specific responses to wind speed are due to differences in the Henry's Law coefficients and diffusion coefficients for the three gases. A uniform temperature of 20°C (68°F) is assumed.

For the open cattle and dairy lots at nine of the neighboring feedlots, the OPENLOTFLUX

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[26] U.S. EPA. 1994. *Air Emissions Models for Waste and Wastewater*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC, EPA-453/R-94-080A.

[27] Hedden T. 1982. *Volatile Organic Chemical Emissions from Wastewater Impoundments Under No-Wind Conditions*. Master's thesis, University of Arkansas, Fayetteville, AR

[28] Lunney P. D. 1983. *Characterization of Wind and Depth Effects upon Liquid Phase Mass Transfer Coefficients: Simulation Studies*. Master's thesis, University of Arkansas, Fayetteville, AR.

[29] Blunden J., Anega V. P. and Overton J. H. 2008. Modeling hydrogen sulfide emissions across the gas-liquid interface of an anaerobic swine waste treatment storage system. *Atmospheric Environment* 42: 5602-5611.

[30] Thomann R. V. and Mueller J. A. 1987. *Principles of Surface Water Quality Modeling and Control*. Harper & Row, Publishers, Inc., New York, NY, 644 pp.

[31] U.S. EPA. 1999. *PCRAMMET User's Guide*. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, NC. EPA-454-B-96-001 (Revised June 1999).

algorithms calculated the hourly hydrogen sulfide, ammonia, and odor emission flux rates based on the hourly boundary-layer parameters obtained from the AERMET weather file. OPENLOTFLUX uses mass transfer algorithms obtained from the agricultural and micro-meteorological literature.[32, 33] OPENLOTFLUX uses the average effective hydrogen sulfide and ammonia concentrations at the surface of the manure pack obtained from cattle feedlot monitoring data.[34, 35] An average effective odor surface concentration was obtained from the flux chamber measurements of Duysen *et al.* (2003)[36] and the ratio of ammonia fluxes measured with flux chambers and micro-meteorological techniques reported by Beak *et al.* (2006).[37] The impact of manure pack temperature on hydrogen sulfide and ammonia flux rates was calculated using the correlations of Koziel *et al.* (2005).[38] Manure pack temperatures were assumed equal to the historical soil temperatures at 4-inch below the surface near Lamberton, MN.[39] Monthly scalars were used to address temperature impacts on odor emission flux rates.[40]

Neighboring Residences

The air quality modeling calculated the odorous gas concentrations at the 21 neighboring residences shown in Figure 5.

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[32] Sommer S. G. and Olesen J. E. 2000. Modeling ammonia volatilization from animal slurry applied with trail hoses to cereals. *Atmospheric Environment* 34(15): 2361-2372.

[33] Arya S. P. 2001. *Introduction to Micrometeorology. Second Edition.* Academic Press, San Diego, CA.

[34] Todd R. W. *et al.* 2005. Ammonia and gaseous nitrogen emissions from a commercial cattle feedyard estimated using the flux-gradient method and the N:P ratio analysis. In: State of the Science, Animal Manure and Waste Management, January 4-7, 2005, San Antonio, TX.

[35] Baek B. H. *et al.* 2006. Ammonia and hydrogen sulfide flux and dry deposition velocity estimates using vertical gradient method at a commercial beef cattle feedlot. *International Journal of Global Environmental Issues* 6(2-3): 189-203.

[36] Duysen R. D. *et al.* 2003. Ammonia, hydrogen sulfide and odor emissions from a beef cattle feedlot. ASAE Meeting Paper No. 034109. St. Joseph, MI.

[37] Baek B. H. *et al.* 2006. Ammonia and hydrogen sulfide flux and dry deposition velocity estimates using vertical gradient method at a commercial beef cattle feedlot. *International Journal of Global Environmental Issues* 6(2-3): 189-203.

[38] Koziel, J. *et al.* 2005. Ammonia and hydrogen sulfide emissions from beef cattle feedlots. Livestock Emissions Research Symposium, California Air Resources Board, Fresno, CA.

[39] www.swroc.coafes.umn.edu/weather/Reports/soil_hist_ave.PDF

[40] Duysen R. D. *et al.* 2003. Ammonia, hydrogen sulfide and odor emissions from a beef cattle feedlot. ASAE Meeting Paper No. 034109. St. Joseph, MI.

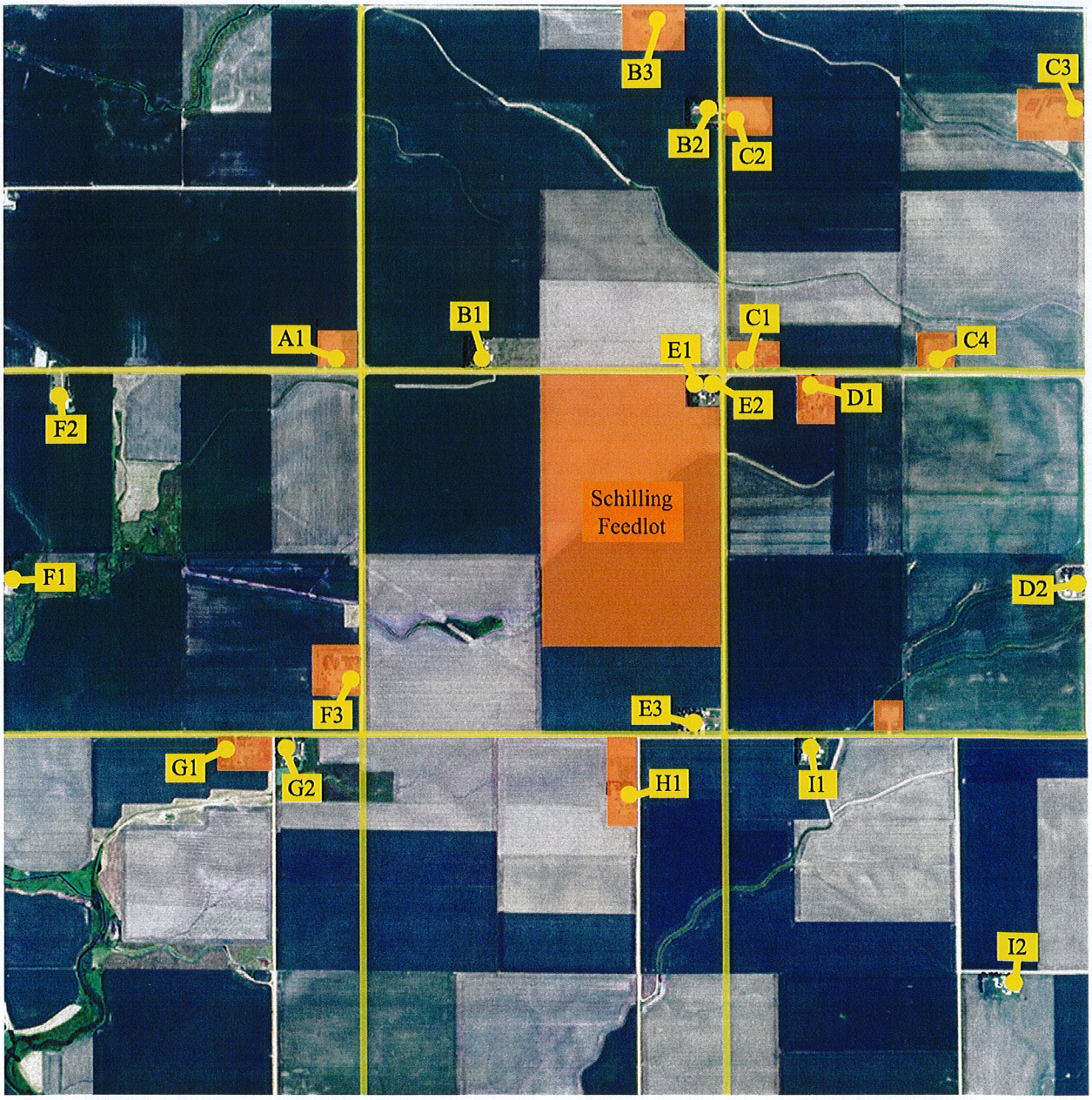

Figure 5. Modeled locations of the expanded Curt Schilling hog feedlot (E ½ of Section 34, Grand Prairie Township), the 11 neighboring feedlots (not labeled), and 21 neighboring residences.

Site Descriptions

Expanded Schilling Hog Feedlot

After the proposed expansion, the Schilling hog feedlot will consist of two 2,400-head mechanically-ventilated hog-finishing barns. The modeled locations of the two hog barns are provided in Figure 6. Finishing #1 is the existing barn and Finishing #2 is the proposed barn. The setback distances from the barns to the property lines range from 245 to 2,170 feet.

The physical characteristics of the hog barns are provided in Table 5. Both barns were modeled as buoyant volume sources.

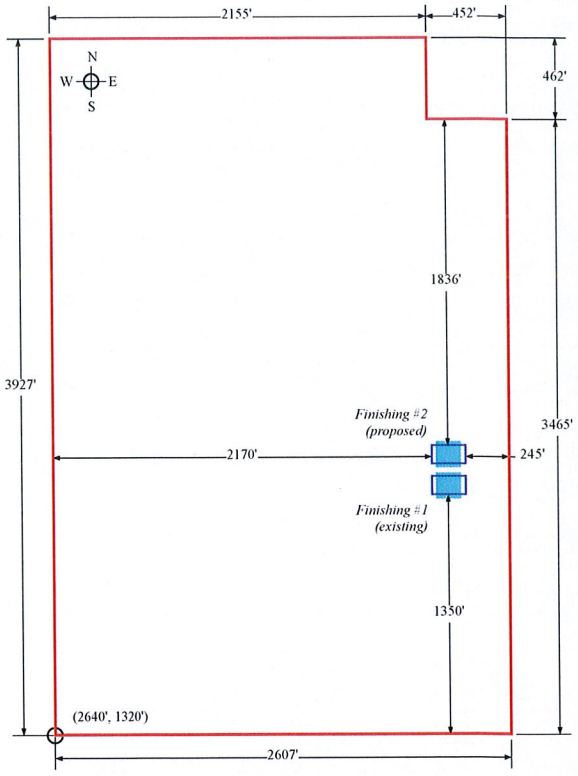

Figure 6. Modeled locations of the hog barns and effective property lines at the expanded Schilling feedlot.

Table 5. Dimensions and capacities of the hog barns at the expanded Schilling feedlot.

Hog Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)	Number of Housed Pigs
Finishing #1	192	102	25	2,400
Finishing #2	192	102	25	2,400

Feedlot #1

Feedlot #1 consists of a 150-ft by 115-ft open lot that is permitted for 80 cow-calf pairs. The lot was modeled as a non-buoyant area source. The modeled location of the lot is provided in Figure 7.

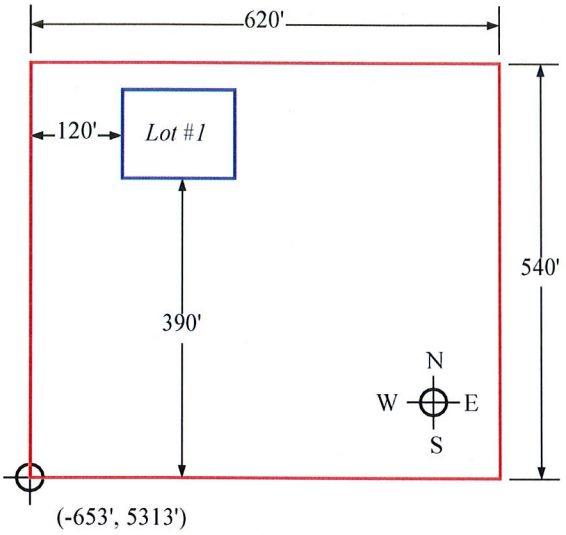

Figure 7. Modeled location of the modeled open cattle lot at Feedlot #1.

Feedlot #2

Feedlot #2 is a dairy with two total confinement barns, an open lot, and a crust-covered manure storage basin. The modeled locations of the barns, lot, and basin are provided in Figure 8.

The physical characteristics of the freestall barn (Dairy #1) and the calf barn (Calf #1) are provided in Table 6. Dairy #1 was modeled as a line source and Calf #1 was modeled as a volume source.

The 500-ft by 150-ft open lot (Lot #1) and the 46-ft by 46-ft manure basin (Basin #1) were modeled as a non-buoyant area sources.

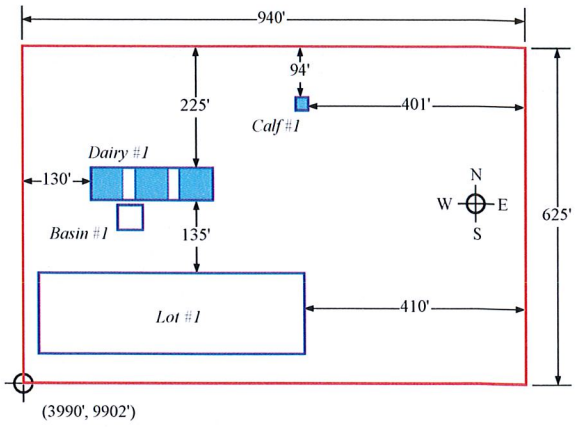

Figure 8. Modeled locations of the barns, open lot, and manure basin at Feedlot #2.

Table 6. Dimensions and capacity of the dairy barns at Feedlot #2.

Dairy Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)	Number of Housed Animals
Dairy #1	225	60	20	150 dairy cows
Calf #1	24	24	15	20 dairy calves

Feedlot #3

Feedlot #3 is a 400-head cattle feedlot with a 156-ft by 181-ft open lot. The lot was modeled as a non-buoyant area source. The modeled location of the lot is provided in Figure 9.

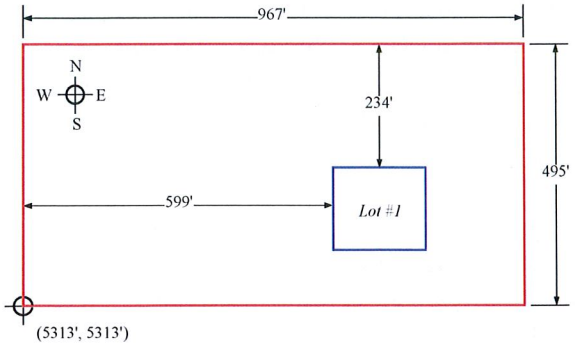

Figure 9. Modeled location of the modeled open cattle lot at Feedlot #3.

Feedlot #4

Feedlot #4 consists of three hog-finishing barns. The modeled locations of the barns are provided in Figure 10.

The physical characteristics of the hog barns are provided in Table 7. Finishing #1 and Finishing #2 were modeled as line sources. Finishing #3 was modeled as a volume source.

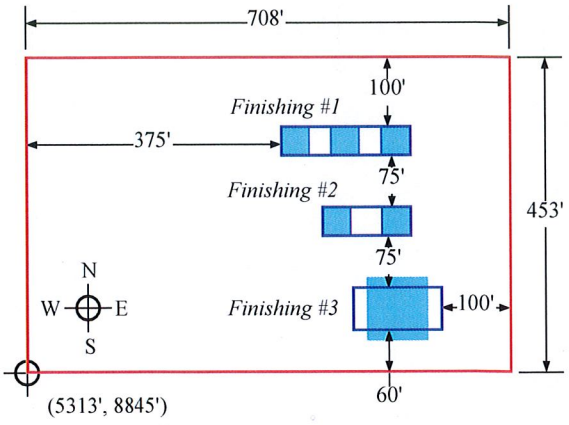

Figure 10. Modeled locations of the hog barns at Feedlot #4.

Table 7. Dimensions and capacity of the hog barns at Feedlot #4.

Hog Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)	Number of Housed Pigs
Finishing #1	188	41	17	900
Finishing #2	128	41	17	600
Finishing #3	128	61	20	600

Feedlot #5

Feedlot #5 is a dairy with a total confinement freestall barn, two open lots, and a crust-covered manure storage basin. The modeled locations of the barn, lots, and manure basin are provided in Figure 11.

The physical characteristics of the freestall barn are provided in Table 8.

The 125-ft by 120-ft open lot (Lot #1), the 125-ft by 75-ft open lot (Lot #2), and the 250-ft by 150-ft manure basin (Basin #1) were modeled as a non-buoyant area sources.

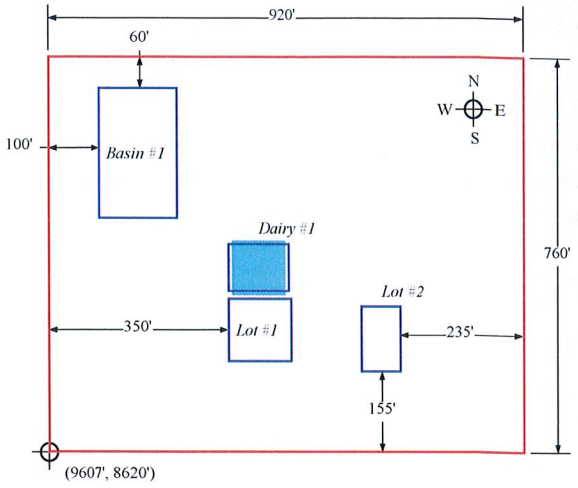

Figure 11. Modeled locations of the barns, open lots, and mature basin at Feedlot #5.

Table 8. Dimensions and capacity of the dairy barn at Feedlot #5.

Dairy Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)	Number of Housed Animals
Dairy #1	120	90	24	110 dairy cows

Feedlot #6

Feedlot #6 is a cattle feedlot with a 156-ft by 181-ft open lot and is permitted for up to 285 head of cattle and 60 calves. The lot was modeled as a non-buoyant area source. The modeled location of the lot is provided in Figure 12.

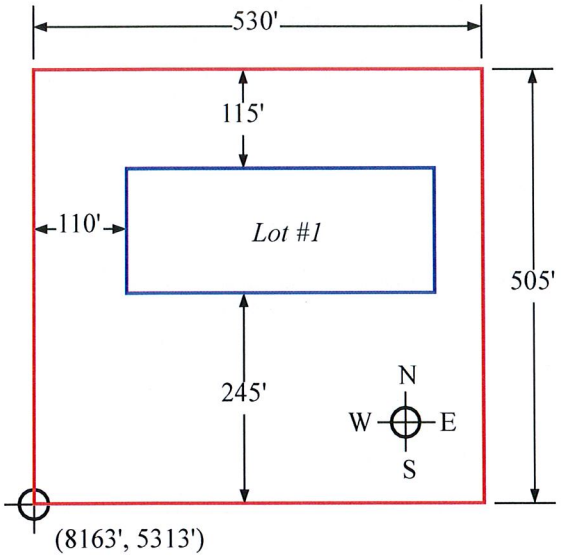

Figure 12. Modeled location of the modeled open cattle lot at Feedlot #6.

Feedlot #7

Feedlot #7 is a cattle feedlot with two open lots and is permitted for 20 head of cattle and 20 cow-calf pairs. The 130-ft by 65-ft lot (Lot #1) and the 590-ft by 135-ft lot (Lot #2) were modeled as non-buoyant area sources. The modeled locations of the lots are provided in Figure 13.

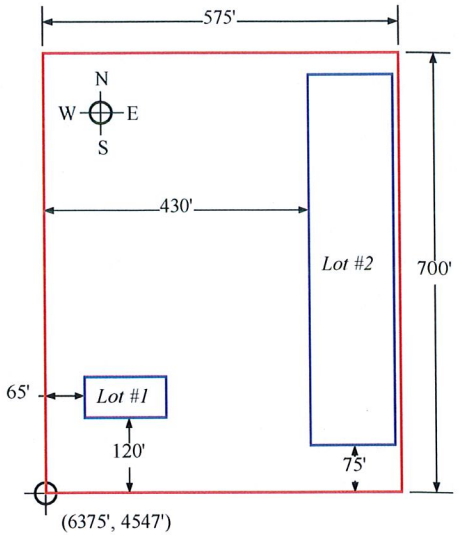

Figure 13. Modeled location of the modeled open cattle lots at Feedlot #7.

Feedlot #8

Feedlot #8 consists of two 1,200-head mechanically-ventilated hog-finishing barns. The modeled locations of the two hog barns are provided in Figure 14.

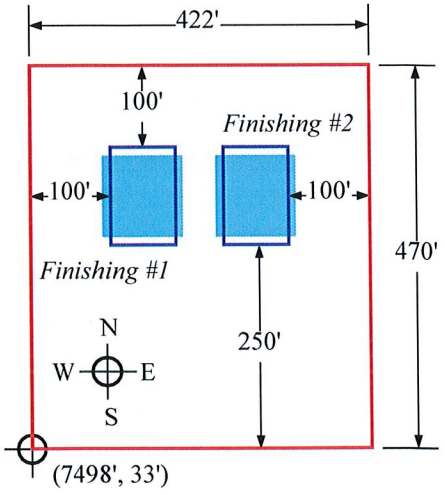

Figure 14. Modeled locations of the hog barns at Feedlot #8.

The physical characteristics of the hog barns are provided in Table 9. Both barns were modeled as buoyant volume sources.

Table 9. Dimensions and capacities of the hog barns at Feedlot #8.

Hog Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)	Number of Housed Pigs
Finishing #1	120	81	22	1,200
Finishing #2	120	81	22	1,200

Feedlot #9

Feedlot #9 is a cattle feedlot with two open lots and one partial confinement barn. The permitted capacity is 100 cow-calf pairs. The modeled locations of the lots and barn are provided in Figure 15.

The physical characteristics of the cattle barn are provided in Table 10. The barn was modeled as a volume source.

The 145-ft by 100-ft lot (Lot #1) and the 145-ft by 80-ft lot (Lot #2) were modeled as a non-buoyant area sources.

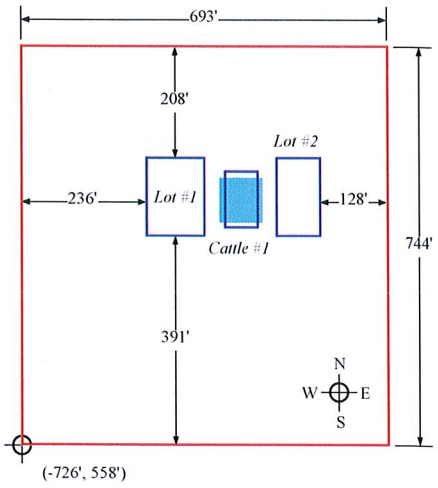

Figure 15. Modeled locations of the open lots and the cattle barn at Feedlot #9.

Table 10. Dimensions of the cattle barn at Feedlot #9.

Barn	Barn Length (feet)	Barn Width (feet)	Barn Height (feet)
Cattle #1	104	64	20

Feedlot #10

Feedlot #10 is a cattle feedlot with a 445-ft by 240-ft open lot. The lot was modeled as a non-buoyant area source. The modeled location of the lot is provided in Figure 16.

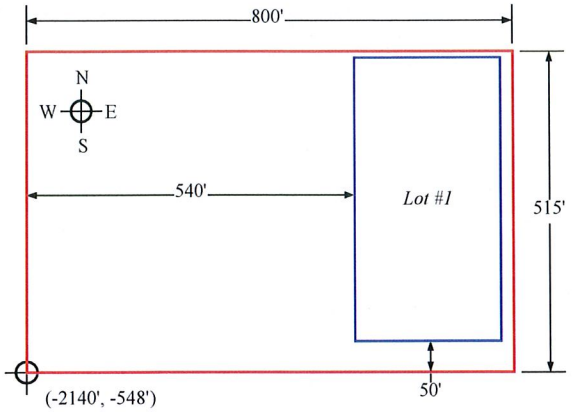

Figure 16. Modeled location of the open lot at Feedlot #10.

Feedlot #11

Based on aerial photographs, Feedlot #11 appears to have a 250-ft by 160-ft open lot. The lot was modeled as a non-buoyant area source. The modeled location of the lot is provided in Figure 17.

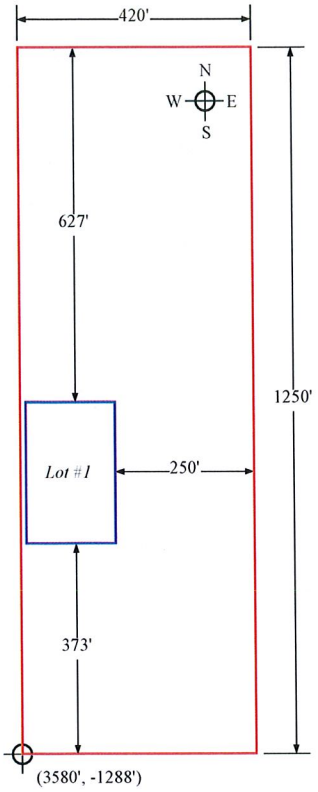

Figure 17. Modeled location of the open lot at Feedlot #11.

Gas Emission Rates

Hog-Finishing Barns

The mechanically-ventilated hog-finishing barns at the expanded Schilling hog feedlot and at Feedlot #8 were modeled as sources of hydrogen sulfide, ammonia, and odor. The estimated hydrogen sulfide and ammonia emission rates were based on the following constant emission factors:

- 3.35 µg $H_2S/(m^2 \cdot sec)$
- 53.3 µg $NH_3/(m^2 \cdot sec)$.[41]

Estimated odor emission rates varied hourly based on the following median finishing-pig specific emission factor:

- 6.63 $OU \cdot m^3/(pig \cdot sec)$.[42]

Odor emissions varied based on exhausted air temperature, barn ventilation rate, and hog diurnal activity cycle.[43]

For the naturally-ventilated hog-finishing barns at Feedlot #4, the estimated barn emission rates were based on the following constant emission factors:

- 3.35 µg $H_2S/(m^2 \cdot sec)$
- 53.3 µg $NH_3/(m^2 \cdot sec)$
- 6.86 $OU \cdot m^3/(m^2 \cdot sec)$.[44]

Cattle, Dairy, and Calf Barns

The cattle, dairy, and calf barns at several of the neighboring feedlots were modeled as sources of hydrogen sulfide, ammonia, and odor. The barn emission rates were based on following constant emission fluxes:

- 0.55 µg $H_2S/(m^2 \cdot sec)$[45]
- 33.5 µg $NH_3/(m^2 \cdot sec)$[46]
- 1.34 $OU \cdot m^3/(m^2 \cdot sec)$.[47]

Open Cattle and Dairy Lots

The open cattle and dairy lots at nine of neighboring feedlots were modeled as sources of odor, hydrogen sulfide, and ammonia. Emission rates were equal to the surface area times the estimated emission flux rate. The modeled hydrogen sulfide and ammonia emission flux rates from the manure pack of the open lots variedy hourly. The OPENLOTFLUX algorithms calculated the emission flux rates, based on the wind speed, manure pack temperature, effective surface concentrations, and AERMET-generated micro-meteorological parameters. Temperature effects on hydrogen sulfide and ammonia flux rates were calculated using the correlations of Koziel *et al.* (2005).[48] The impact of temperature

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[41] Gay S. W. *et al.* 2003. Odor, total reduced sulfur, and ammonia emissions from animal housing facilities and manure storage units in Minnesota. *Applied Engineering in Agriculture* 19(3): 347-360.

[42] Schauberger G. *et al.* 2013. Empirical model of odor emission from deep-pit swine finishing barns to derive a standardized odor emission factor. *Atmospheric Environment* 66: 84-90. The median finishing-pig specific odor emission factor assumes a time-averaged pig mass of 69 kg (152 pounds).

[43] *Ibid.*

[44] Gay S. W. *et al.* 2003. Odor, total reduced sulfur, and ammonia emissions from animal housing facilities and manure storage units in Minnesota. *Applied Engineering in Agriculture* 19(3): 347-360.

[45] Smith J. F. *et al.* 2007. Comprehensive evaluation of a low-profile cross-ventilated freestall barn. Western Dairy Management Conference, Reno, NV, March 7-9, 2007.

[46] *Ibid.*

[47] Gay S. W. *et al.* 2003. Odor, total reduced sulfur, and ammonia emissions from animal housing facilities and manure storage units in Minnesota. *Applied Engineering in Agriculture* 19(3): 347-360.

[48] Koziel, J. *et al.* 2005. Ammonia and hydrogen sulfide emissions from beef cattle feedlots. Livestock Emissions Research Symposium, California Air Resources Board, Fresno, CA.

on odor emission flux rates was addressed by the monthly scalars listed in Table 11.

To illustrate the range and variability in the hourly emissions, the estimated 2006 noon-hour emission flux rates for hydrogen sulfide are provided in Figure 18.

Table 11. Odor emission scalars for lots.[49]

Month	Odor Emission Scalar
January	0.38
February	0.38
March	0.38
April	1.00
May	1.00
June	0.67
July	0.67
August	0.64
September	0.38
October	0.38
November	0.38
December	0.38

Dairy Manure Storage Basins

The dairy manure storage basins at Feedlot #2 and Feedlot #5 were modeled as a sources of odor, hydrogen sulfide, and ammonia. The basins were assumed to have a 1-inch thick crust floating on the manure surface. The odor emission rate for the basins was based on a constant odor flux of 8.7 OU•m^3/(m^2•sec).[50]

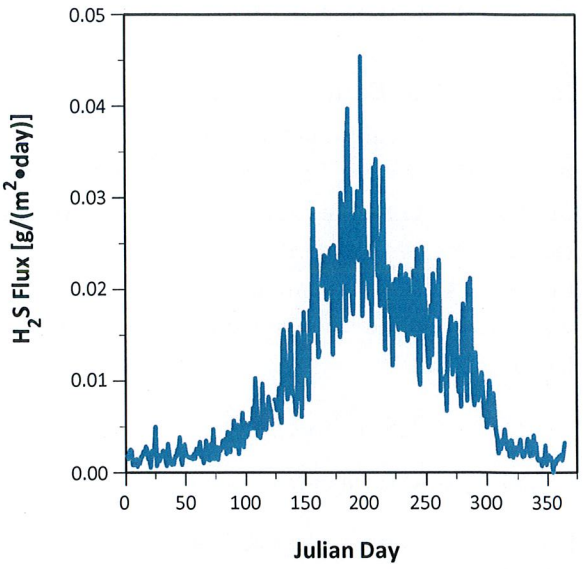


Figure 18. Estimated 2006 noon-hour hydrogen sulfide (H_2S) emission flux rates for an open cattle lot.

The BASINODOR algorithms calculated the hourly hydrogen sulfide and ammonia emissions from the basins based on the manure chemistry provided in Table 12. To illustrate the range and variability in the hourly emissions, the estimated 2006 noon-hour emission flux rates for hydrogen sulfide and ammonia are provided in Figures 19 and 20, respectively.

Table 12. Chemical characteristics of stored dairy manure.

Parameter	Units	Value
pH	$-\log_{10}[H^+]$	7.8
Sulfide	mg S/L	1.3
Ammonia	mg N/L	856

[49] Duysen R. D. *et al.* 2003. Ammonia, hydrogen sulfide and odor emissions from a beef cattle feedlot. ASAE Meeting Paper No. 034109. St. Joseph, MI

[50] Gay S. W. *et al.* 2003. Odor, total reduced sulfur, and ammonia emissions from animal housing facilities and manure storage units in Minnesota. *Applied Engineering in Agriculture* 19(3): 347-360. This flux is the geometric mean odor flux for all listed earthen storage basins for dairy cows.

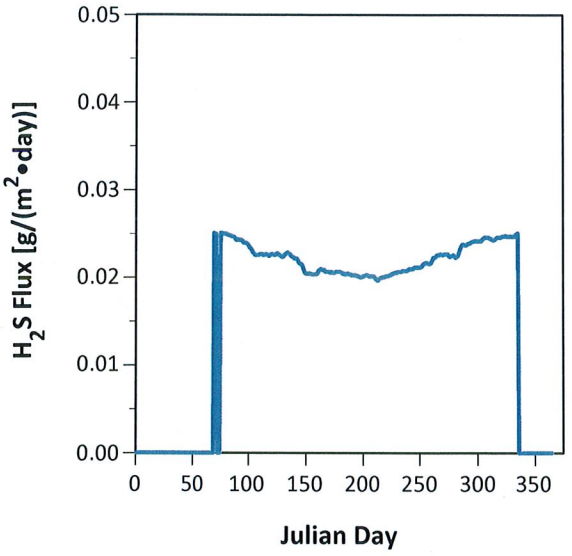


Figure 19. Estimated 2006 noon-hour hydrogen sulfide flux rates for a crust-covered dairy manure storage basin.

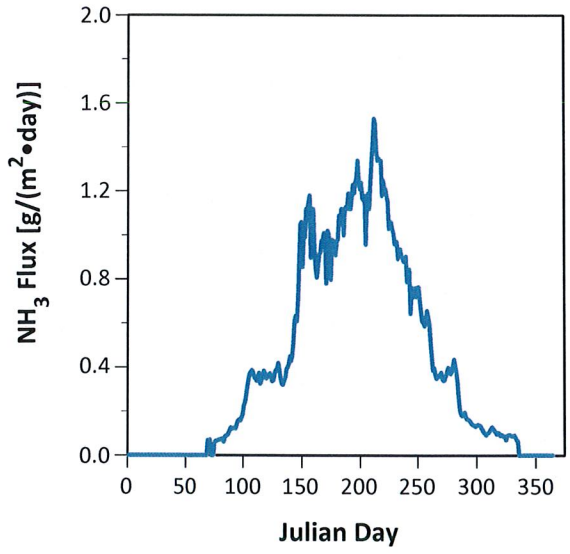


Figure 20. Estimated 2006 noon-hour ammonia flux rates for a crust-covered dairy manure storage basin.

Hydrogen Sulfide at Property Lines and Neighbors

The AERMOD results suggest that the expanded Schilling hog feedlot will comply with the Minnesota ambient air quality standard for hydrogen sulfide (H_2S). The estimated high-third-high (H3H) concentrations at the expanded feedlot's property lines are provided in Table 13. When a background concentration of 17 ppb is added to the AERMOD-calculated concentrations, the maximum H3H hydrogen sulfide concentration is 18.47 ppb, which does not exceed the standard of 30 ppb. Thus, no violations of the hydrogen sulfide standard were modeled.

Table 13. High-third-high hourly property-line hydrogen sulfide concentrations for the expanded Schilling hog feedlot.

Feedlot Property Line	High-Third-High H_2S Concentration Without Background (ppb, v/v)	High-Third-High H_2S Concentration With a 17 ppb Background (ppb, v/v)
North	1.47	18.47
Near North	1.45	18.45
East	1.20	18.20
Near East	1.46	18.46
South	0.72	17.72
West	0.81	17.81

The maximum AERMOD-calculated hourly hydrogen sulfide concentrations (without background) are plotted in Figure 21. The plotted 10-ppb concentration isopleth is assumed to represent the the maximum extent of detectable hydrogen sulfide odors. This assumption slightly underestimates the extent of detectable odors, because the reported odor threshold concentration

for hydrogen sulfide is 9.4 ppb (Table 2). The 10-ppb isopleth in Figure 21 suggests that detectable concentrations of hydrogen sulfide will be confined to the expanded Schilling feedlot.

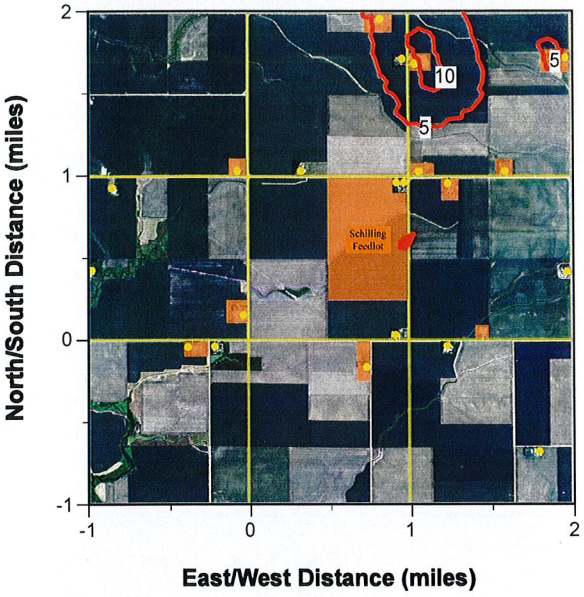


Figure 21. Maximum AERMOD-generated hourly hydrogen sulfide concentrations in ppb for the expanded Schilling hog feedlot and the 11 neighboring feedlots. The contour lines represent 5 and 10 ppb of hydrogen sulfide. The plotted concentrations do not include the 17-ppb back-ground hydrogen sulfide concentration.

The AERMOD results also suggest that the expanded Schilling hog feedlot and the 11 neighboring feedlots will not create exceedances of the subchronic (13-week) hydrogen sulfide iHRV at the neighboring residences. As provided in Table 14, when a background concentration of 1.00 µg/m^3 is added to the AERMOD-calculated concentrations, the maximum monthly hydrogen sulfide concentration for a neighboring residence is 1.50 µg/m^3, which is below the subchronic iHRV for hydrogen sulfide of 10 µg/m^3.

Table 14. Maximum monthly H_2S concentrations for neighboring residences. (* = feedlot residence)

Neighbor	H_2S Concentration Without Background (µg/m^3)	H_2S Concentration With a 1 µg/m^3 Background (µg/m^3)
A1*	0.03	1.03
B1	0.02	1.02
B2	0.30	1.30
B3*	0.37	1.37
C1*	0.07	1.07
C2*	0.50	1.50
C3*	0.29	1.29
C4*	0.10	1.10
D1*	0.15	1.15
D2	0.02	1.02
E1	0.04	1.04
E2	0.05	1.05
E3	0.02	1.02
F1	0.01	1.01
F2	0.01	1.01
F3*	0.17	1.17
G1*	0.07	1.07
G2	0.10	1.10
H1*	0.14	1.14
I1	0.05	1.05
I2	0.02	1.02

Ammonia at Property Lines and Neighbors

The AERMOD-calculated maximum hourly property-line ammonia (NH_3) concentrations at the expanded Schilling feedlot's property lines are provided in Table 15. The highest calculated property-line concentration with a background concentration of 148 µg/m³ is 310.16 µg/m³, which is below the acute iHRV for ammonia of 3,200 µg/m³. Thus, no exceedances of the acute ammonia iHRV were modeled.

Table 15. Maximum hourly property-line ammonia concentrations for the expanded Schilling hog feedlot.

Feedlot Property Line	NH_3 Concentration Without Background (µg/m³)	NH_3 Concentration With a 148 µg/m³ Background (µg/m³)
North	61.44	209.44
Near North	57.20	205.20
East	162.16	310.16
Near East	60.33	208.33
South	27.46	175.46
West	36.09	184.09

The maximum AERMOD-calculated hourly ammonia concentrations (without background) are plotted in Figure 22. The reported odor threshold concentration for ammonia is 4,125 µg/m³ or 5,800 ppb (Table 2). Because all plotted ammonia concentrations are less than 4,125 µg/m³, Figure 22 suggests that the expanded Schilling feedlot and the 11 neighboring feedlots will not generate detectable offsite concentrations of ammonia.

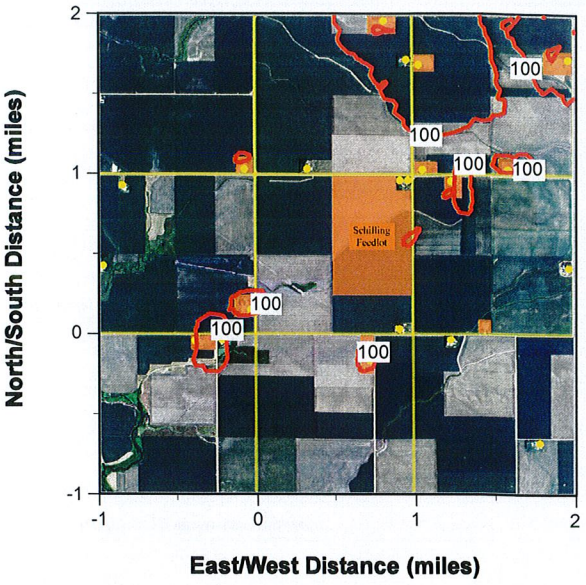


Figure 22. Maximum AERMOD-generated hourly ammonia concentration in µg/m³ for the expanded Schilling hog feedlot and the 11 neighboring feedlots. The contour lines represent 100 and 500 µg/m³ of ammonia. The plotted concentrations do not include the 148 µg/m³ background ammonia concentration.

The AERMOD results also suggest that the ammonia emissions from the expanded Schilling feedlot and the 11 neighboring feedlots will not cause exceedances of the chronic ammonia iHRV at the nearest neighbors. As provided in Table 16, the highest annual ammonia concentration for a neighbor with a background concentration of 5.72 µg/m³ is 20.11 µg/m³, which is below the chronic ammonia iHRV of 80 µg/m³.

Table 16. Maximum annual NH_3 concentrations for neighbors residences. (* = feedlot residence)

Neighbor	NH_3 Concentration Without Background ($\mu g/m^3$)	NH_3 Concentration With a 5.72 $\mu g/m^3$ Background ($\mu g/m^3$)
A1*	1.48	7.20
B1	0.37	6.09
B2	3.45	9.17
B3*	14.39	20.11
C1*	0.94	6.66
C2*	4.73	10.45
C3*	13.03	18.75
C4*	5.56	11.28
D1*	6.80	12.52
D2	0.39	6.11
E1	0.72	6.44
E2	0.75	6.47
E3	0.39	6.11
F1	0.15	5.87
F2	0.16	5.88
F3*	7.85	13.57
G1*	2.67	8.39
G2	4.78	10.50
H1*	5.89	11.61
I1	0.47	6.19
I2	0.23	5.95

Odorous Gas Concentrations

AERMOD calculated the ground-level atmospheric concentrations of hydrogen sulfide and ammonia at the property lines for the expanded Schilling hog feedlot and at the neighboring non-feedlot residences. The calculated maximum property-line concentration was 227 ppb for ammonia (without background) and 7.12 ppb for hydrogen sulfide (without background). The corresponding odor numbers for the maximum property-line concentrations are 0.8 for hydrogen sulfide and 0.0 for ammonia. Population response curves suggest that 34 percent of the population could detect the calculated maximum property-line hydrogen sulfide concentration and 0 percent the ammonia concentration.

The estimated maximum hourly concentrations for the neighboring non-feedlot residences are 251 ppb for ammonia (without background), and 7.64 ppb for hydrogen sulfide (without background). The corresponding odor numbers for the maximum neighbor concentrations are 0.8 for hydrogen sulfide and 0.0 for ammonia. Population response curves suggest that 38 percent of the population could detect the calculated maximum neighbor hydrogen sulfide concentration and 0 percent the ammonia concentration. The population response curves assume the presence of individual gases.

Odor Intensities at Property Lines and Neighbors

AERMOD calculated the ground-level odor intensities at the property lines for the expanded Schilling hog feedlot and at 21 of feedlot's neighboring residences. As indicated in Table 17, the maximum hourly odor intensity at the expanded feedlot's property lines is 52 odor units (OU), which is below the "faint" odor threshold of 72 OU (Table 3).

Figure 23 suggests that any "faint" odors generated by the expanded Schilling feedlot will be confined to the feedlot.

Table 17. Maximum hourly property-line odor intensities and the frequency at which the "faint" odor threshold of 72 OU is equaled or exceeded for the expanded Schilling hog feedlot.

Feedlot Property Line	Maximum Hourly Odor Intensity (OU, d/t)	Frequency at Which the "Faint" Odor Threshold is Exceeded (percent)
North	14	0.00
Near North	14	0.00
East	52	0.00
Near East	15	0.00
South	10	0.00
West	11	0.00

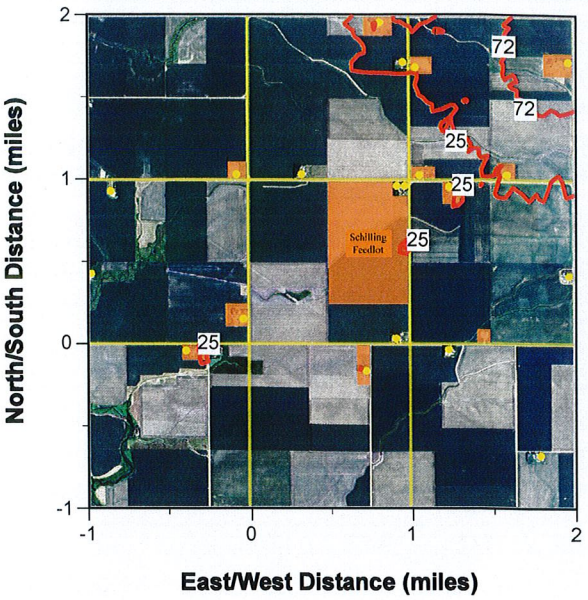


Figure 23. Maximum AERMOD-generated hourly odor intensities for the expanded Schilling hog feedlot and the 11 neighboring feedlots. The threshold for "very faint" odors is 25 OU and for "faint" odors is 72 OU (Table 3).

The AERMOD-calculated ground-level odor intensities at the 21 neighboring residences are provided in Table 18. The estimated maximum odor intensity for a non-feedlot neighboring residence is 43 OU at Neighbor B2, which is below the 72-OU threshold for "faint" odors.

Table 18. Maximum neighbor odor intensities. (* = feedlot residence)

Neighbor	Maximum Hourly Odor Intensity (OU, d/t)	Frequency at Which the "Faint" Odor Threshold is Exceeded (percent)
A1*	8	0.00
B1	9	0.00
B2	43	0.00
B3*	44	0.00
C1*	16	0.00
C2*	41	0.00
C3*	136	0.38
C4*	34	0.00
D1*	18	0.00
D2	14	0.00
E1	15	0.00
E2	16	0.00
E3	9	0.00
F1	4	0.00
F2	5	0.00
F3*	11	0.00
G1*	12	0.00
G2	13	0.00
H1*	12	0.00
I1	10	0.00
I2	5	0.00

Summary

The AERMOD modeling results suggest that the expanded Schilling hog feedlot will comply with the ambient air quality standard for hydrogen sulfide at the feedlot's property lines. The results also suggest that the expanded feedlot will not create exceedances of the acute ammonia iHRV at its property lines.

The modeling results suggest that the expanded Schilling hog feedlot and the 11 neighboring feedlots will not create exceedances of the subchronic iHRV for hydrogen sulfide and of the chronic iHRV for ammonia at the neighboring residences.

The modeled maximum property-line odor intensities for the expanded Schilling hog feedlot were less the 72-OU threshold for "faint" odors. The modeled odor intensities for the non-feedlot neighboring residences were also below the 72-OU threshold for "faint" odors.

Minnesota P Index Report

Farm : Grand Prairie 27, NE1/4
Field : Grand Prairie 27, NE1/4
County : Nobles

Average P Index:

Total P Index:	1.0
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.3
Snowmelt P:	0.2

Site characteristics:

Initial soil test P:	66 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

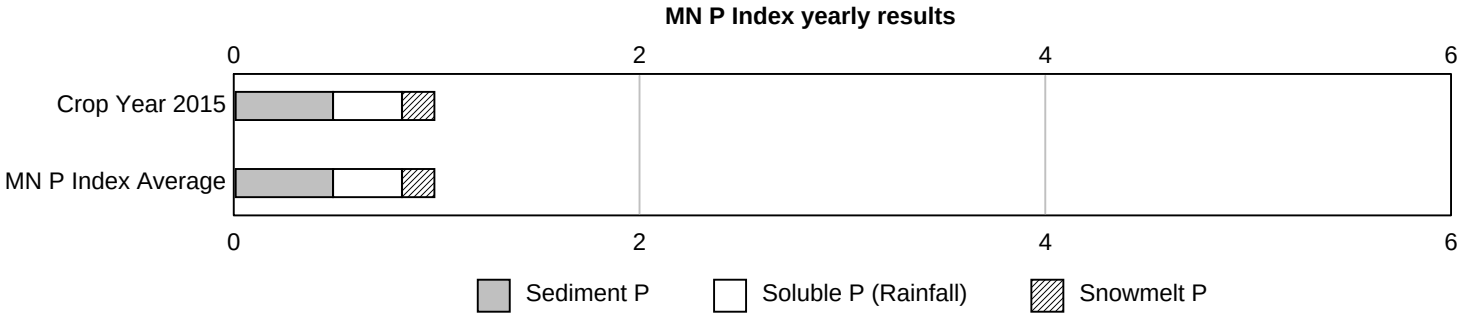
Soil and slope	**Slope Segment 1**
Soil series	clay loam (mod-high OM)
Slope:	150 feet @ 4 %

Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	50 ppm Olsen P
Sediment delivery:	0.8 t/ac/yr
Total P Index:	1.0
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.3
Snowmelt P:	0.2

Recommendations

1.0 is a very low risk rating. No management changes are recommended.

Farm : Grand Prairie 27, NE1/4, Field : Grand Prairie 27, NE1/4



From File Name :

Minnesota P Index Report

Farm : Grand Prairie 26, NW1/4
Field : Grand Prairie 26, NW1/4
Scenario : Fall Hog Manure
County : Nobles

Average P Index:

Total P Index:	1.0
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.1
Snowmelt P:	0.7

Site characteristics:

Initial soil test P:	12 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

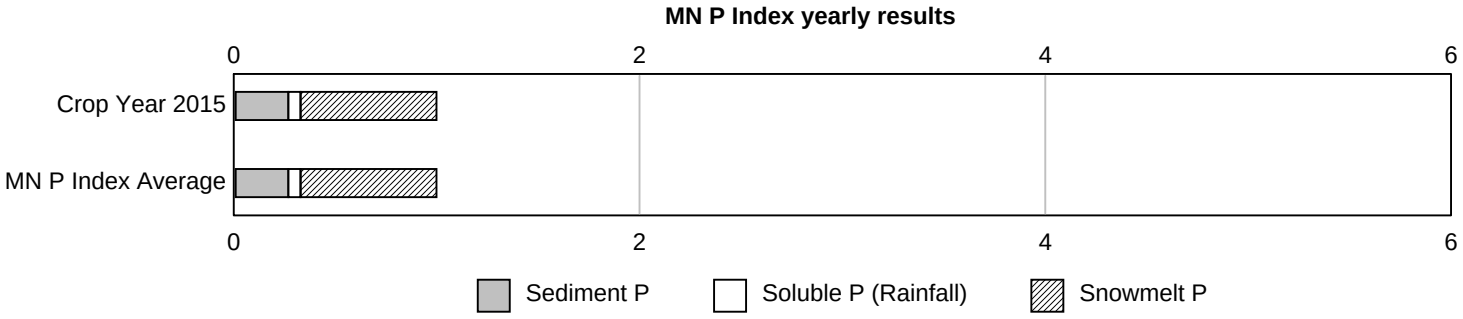
Soil and slope	Slope Segment 1	Slope Segment 2
Soil series	clay loam (low-mod OM)	KaB Kanaranzi loam
Slope:	75 feet @ 4 %	75 feet @ 4 %

Management	2015
Crop:	Corn, grain
Yield:	180 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	No Tillage
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	12 ppm Olsen P
Sediment delivery:	0.6 t/ac/yr
Total P Index:	1.0
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.1
Snowmelt P:	0.7

Recommendations

1.0 is a very low risk rating. No management changes are recommended.

Farm : Grand Prairie 26, NW1/4, Field : Grand Prairie 26, NW1/4, Scenario : Fall Hog Manure



From File Name :

Minnesota P Index Report

Farm : Grand Prairie 26, SE1/4
Field : Grand Prairie 26, SE1/4
County : Nobles

Average P Index:

Total P Index:	1.1
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.2
Snowmelt P:	0.7

Site characteristics:

Initial soil test P:	48 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

Soil and slope	Slope Segment 1	Slope Segment 2
Soil series	clay loam (low-mod OM)	Ra Ransom silty clay loam
Slope:	75 feet @ 4 %	75 feet @ 2 %

Management	2015
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	No Tillage
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	37 ppm Olsen P
Sediment delivery:	0.4 t/ac/yr
Total P Index:	1.1
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.2
Snowmelt P:	0.7

Recommendations

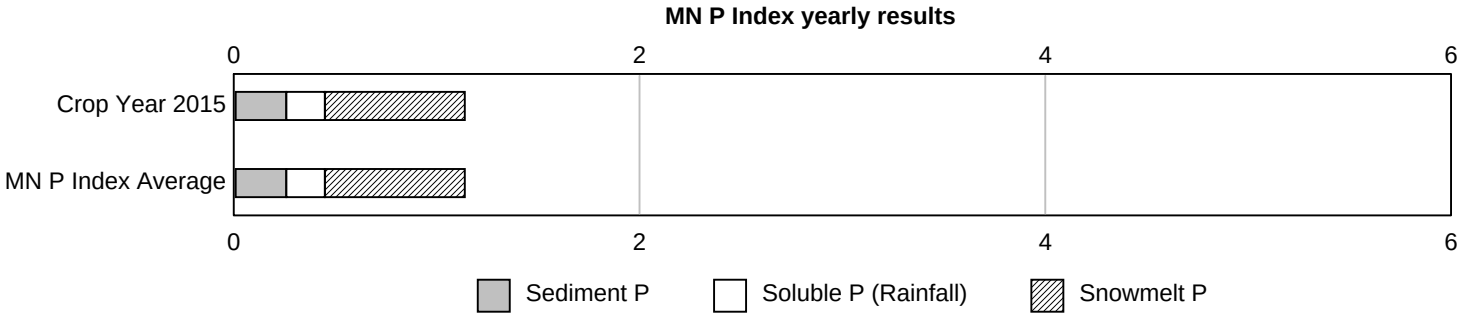
1.1 is a low risk rating. Minor management changes are recommended.

Divert runoff to protect surface water from adjacent cropping (e.g., Diversion, 386; Field Border, 386; Filter Strip, 393).

Prevent build-up of excess soil P by applying P at less than crop P removal rates (e.g., Nutrient Management, 590).

If snowmelt P losses are high from fields with no fall tillage, consider ways to fracture the soil in the fall while minimizing burial of residue, such as by chisel plowing with narrow straight shovels, fall-applying anhydrous ammonia in regions where it is appropriate, or by using strip-till approaches.

Farm : Grand Prairie 26, SE1/4, Field : Grand Prairie 26, SE1/4



From File Name :

Minnesota P Index Report

Farm : Grand Prairie 33, NW1/4
Field : Grand Prairie 33, NW1/4
County : Nobles

Average P Index:

Total P Index:	0.6
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Site characteristics:

Initial soil test P:	26 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

Soil and slope	**Slope Segment 1**
Soil series	clay loam (mod-high OM)
Slope:	150 feet @ 2 %

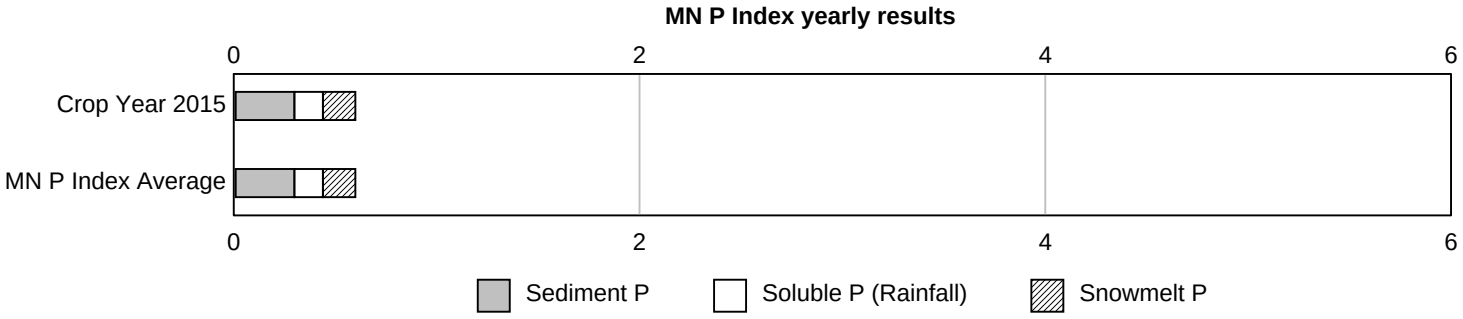
Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%

Results	
Adjusted soil test P:	21 ppm Olsen P
Sediment delivery:	0.5 t/ac/yr
Total P Index:	0.6
Sediment-bound P:	0.3
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Recommendations

0.6 is a very low risk rating. No management changes are recommended.

Farm : Grand Prairie 33, NW1/4, Field : Grand Prairie 33, NW1/4



From File Name :

Minnesota P Index Report

Farm : Grand Prairie 34, NE1/4
Field : Grand Prairie 34, NE1/4
County : Nobles

Average P Index:

Total P Index:	0.7
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Site characteristics:

Initial soil test P:	21 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

Soil and slope	**Slope Segment 1**
Soil series	Ra Ransom silty clay loam
Slope:	150 feet @ 4 %

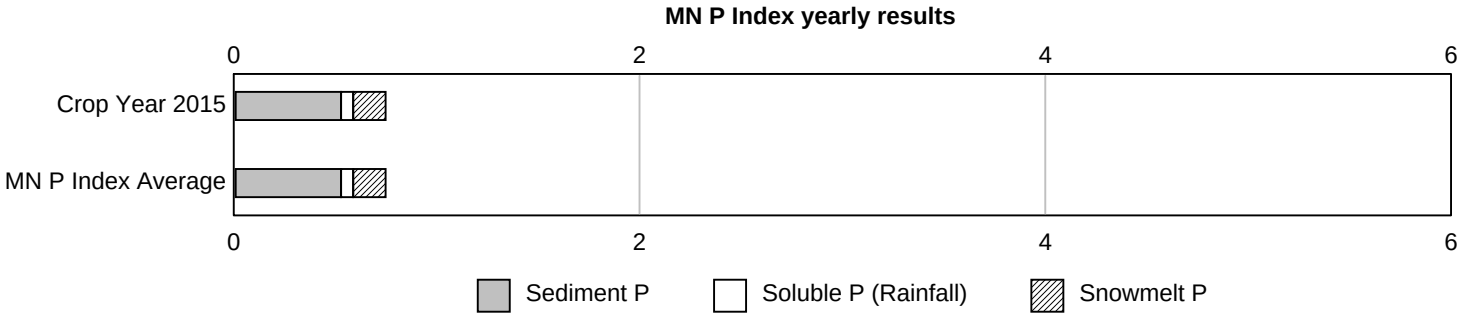
Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%

Results	
Adjusted soil test P:	18 ppm Olsen P
Sediment delivery:	1.0 t/ac/yr
Total P Index:	0.7
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Recommendations

0.7 is a very low risk rating. No management changes are recommended.

Farm : Grand Prairie 34, NE1/4, Field : Grand Prairie 34, NE1/4



From File Name :

Minnesota P Index Report

Farm : Grand Prairie 34, N1/2 of SE1/4
Field : Grand Prairie 34, N1/2 of SE1/4
County : Nobles

Average P Index:

Total P Index:	0.7
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Site characteristics:

Initial soil test P:	18 ppm Olsen P
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

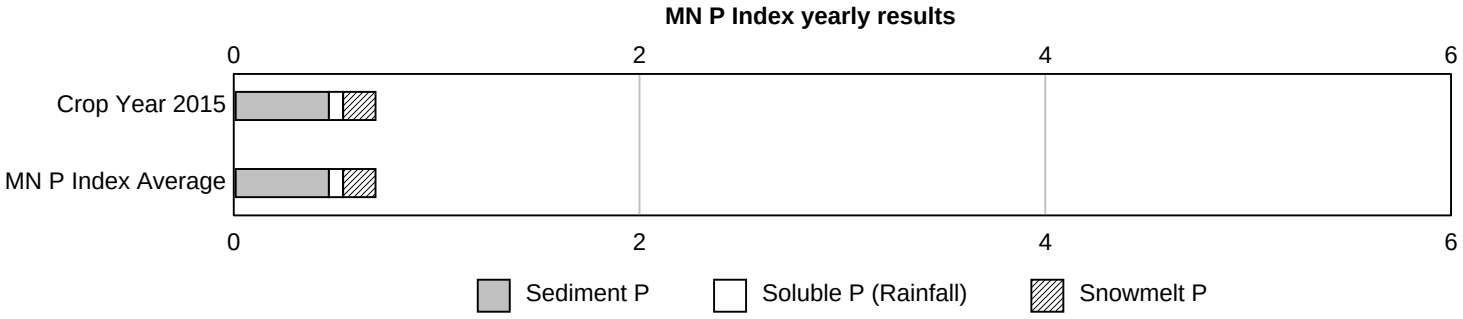
Soil and slope	**Slope Segment 1**
Soil series	Ra Ransom silty clay loam
Slope:	150 feet @ 3 %

Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	21 ppm Olsen P
Sediment delivery:	0.8 t/ac/yr
Total P Index:	0.7
Sediment-bound P:	0.5
Soluble P (Rainfall):	0.1
Snowmelt P:	0.2

Recommendations

0.7 is a very low risk rating. No management changes are recommended.

Farm : Grand Prairie 34, N1/2 of SE1/4, Field : Grand Prairie 34, N1/2 of SE1/4



From File Name :

Minnesota P Index Report

Farm : Kanaranzi 14, SW1/4
Field : Kanaranzi 14, SW1/4
County : Rock

Average P Index:

Total P Index:	0.7
Sediment-bound P:	0.4
Soluble P (Rainfall):	0.1
Snowmelt P:	0.1

Site characteristics:

Initial soil test P:	31 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

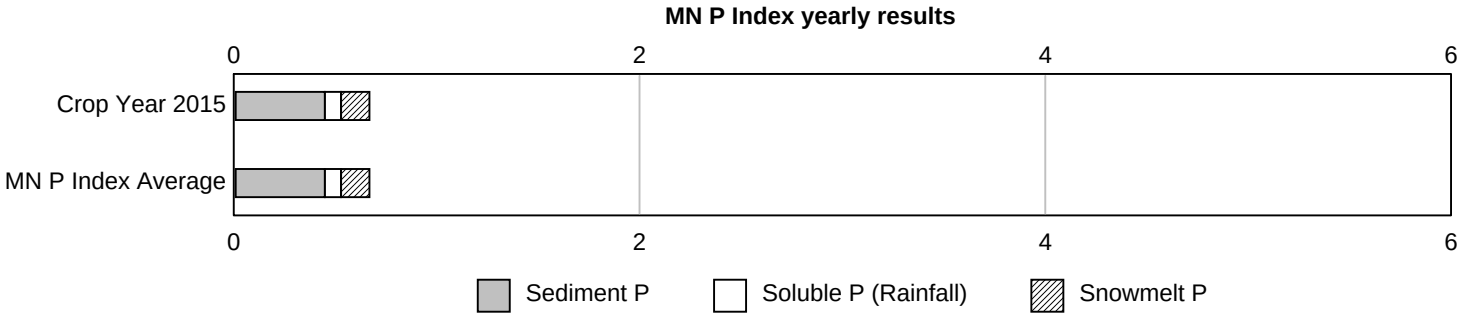
Soil and slope	**Slope Segment 1**
Soil series	P30B Sac silty clay loam
Slope:	150 feet @ 4 %

Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	25 ppm Olsen P
Sediment delivery:	0.9 t/ac/yr
Total P Index:	0.7
Sediment-bound P:	0.4
Soluble P (Rainfall):	0.1
Snowmelt P:	0.1

Recommendations

0.7 is a very low risk rating. No management changes are recommended.

Farm : Kanaranzi 14, SW1/4, Field : Kanaranzi 14, SW1/4



From File Name :

Minnesota P Index Report

Farm : Kanaranzi 24, SW1/4
Field : Kanaranzi 24, SW1/4
County : Rock

Average P Index:

Total P Index:	0.4
Sediment-bound P:	0.2
Soluble P (Rainfall):	0.1
Snowmelt P:	0.1

Site characteristics:

Initial soil test P:	18 ppm Bray P-1
Sediment traps:	None
Depressions and inlets:	None
Tillage orientation:	Cross slope
Distance to water:	10 feet

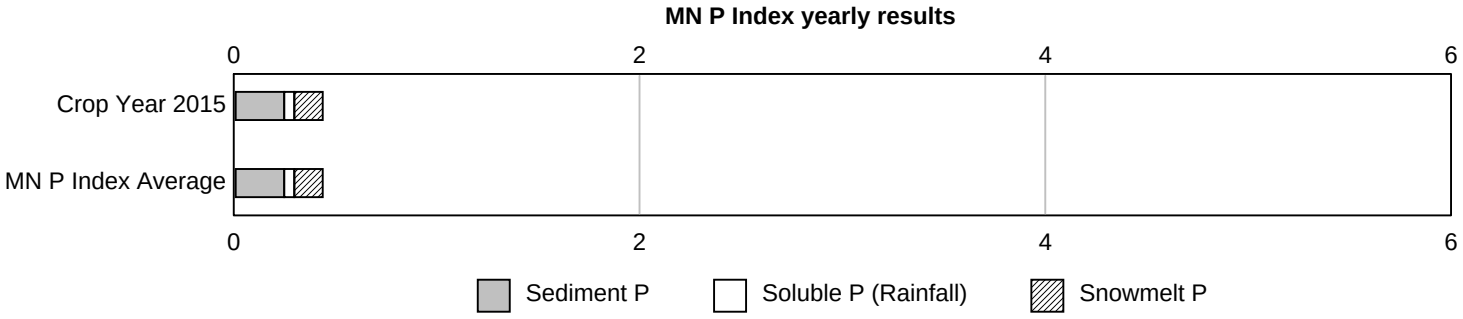
Soil and slope	**Slope Segment 1**
Soil series	P27A Primghar silty clay loam
Slope:	150 feet @ 2 %

Management	**2015**
Crop:	Corn, grain
Yield:	185 bu/ac
Annual manure app:	165 lbs P2O5 / acre
Manure app method:	Injected or Planter Applied
Annual fert app:	None
Previous fall tillage:	Chisel or Heavy Disk
Previous fall N:	No Anhydrous
Spring tillage:	Disk or Field Cultivate
Cover after planting:	Cover 5% to 20%
Results	
Adjusted soil test P:	16 ppm Olsen P
Sediment delivery:	0.5 t/ac/yr
Total P Index:	0.4
Sediment-bound P:	0.2
Soluble P (Rainfall):	0.1
Snowmelt P:	0.1

Recommendations

0.4 is a very low risk rating. No management changes are recommended.

Farm : Kanaranzi 24, SW1/4, Field : Kanaranzi 24, SW1/4



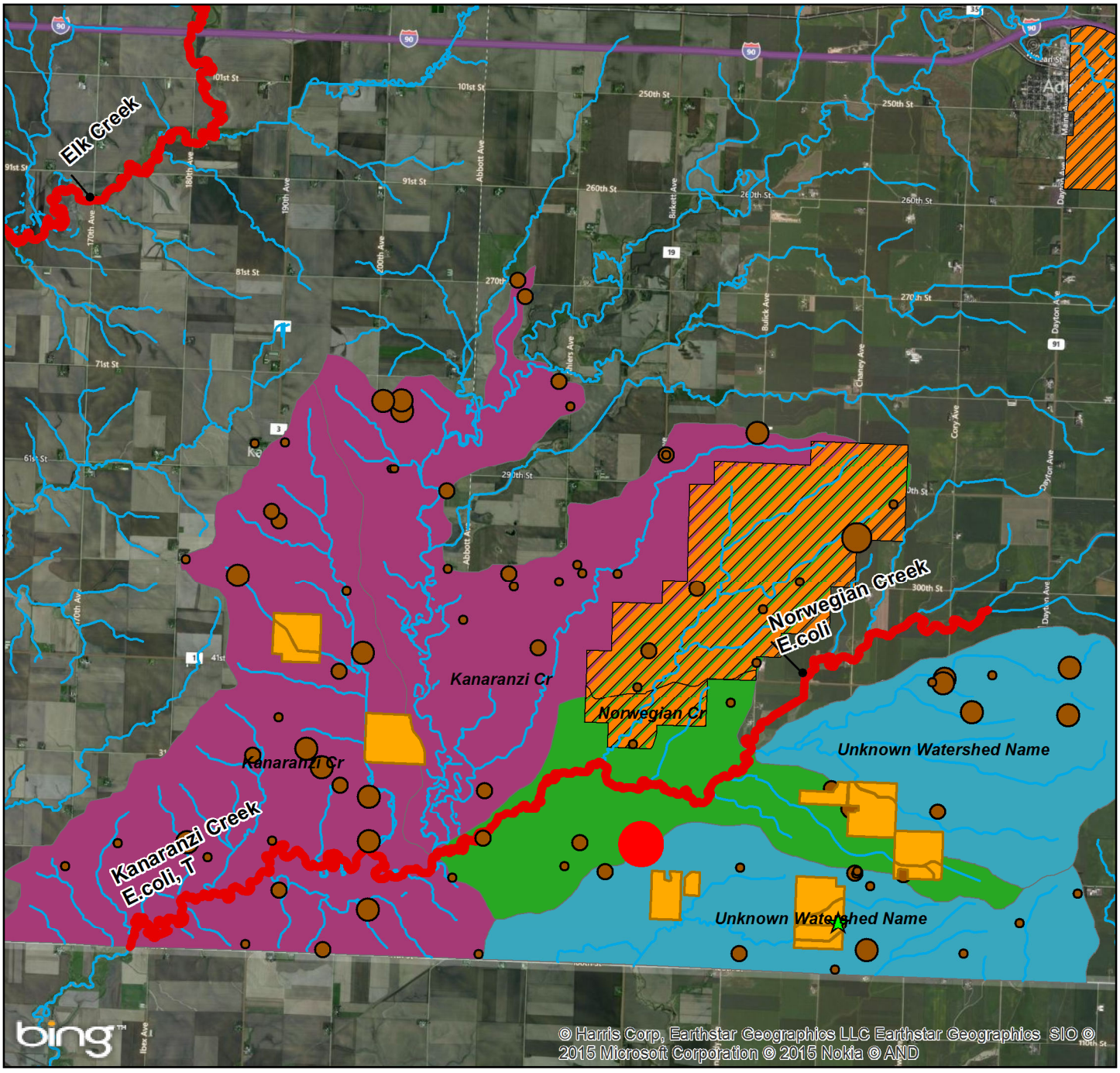
From File Name :

Curt Schilling Swine Facility
Cumulative Impacts Map

ATTACHMENT K

Nobles County, MN

Grand Prairie Twp.



Map Notes:

Legend

- Site Location
- Field Boundary
- 2012 TMDL Streams
- Waterway

MINORWATERSHEDS

Minor Watershed

- Harrison Cr
- Kanaranzi Cr
- Norwegian Cr
- Unknown Watershed Name

Feedlots (AU)

0.0 - 100 AU
100.1 - 300 AU
300.1 - 999 AU
999.1 - 2000 AU
+2000 AU

- DWSMA
- Source Water Assessment

Aerial Imagery Courtesy of Bing Maps.

1:98,000

0 1,600 3,200 6,400 9,600 12,800 Feet

EXTended Ag Services, Inc.

Data courtesty of the Minnesota Pollution Control Agency (2014). Minnesota Department of Natural Resources (2014).

OFFSET CALCULATOR

© 2003 University of Minnesota Extension Service
Version 1.01

Description or comments: Curt Schilling Swine Facility

Source #	Source Description	Emission Number	# Similar sources	Width (feet)	Length (feet)	Odor Control Technology	Control Factor	Odor Emission Factor
1	Finishing-deep pit	34	1	101	192	None	1	66
2	Finishing-deep pit	34	1	101	192	None	1	66
3	None	0	1			None	1	0
4	None	0	1			None	1	0
5	None	0	1			None	1	0
6	None	0	1			None	1	0
7	None	0	1			None	1	0
8	None	0	1			None	1	0
9	None	0	1			None	1	0
10*		0	1				1	0

*Use for other source, emission number, or control factor not currently listed.

Total Odor Emission Factor= 132

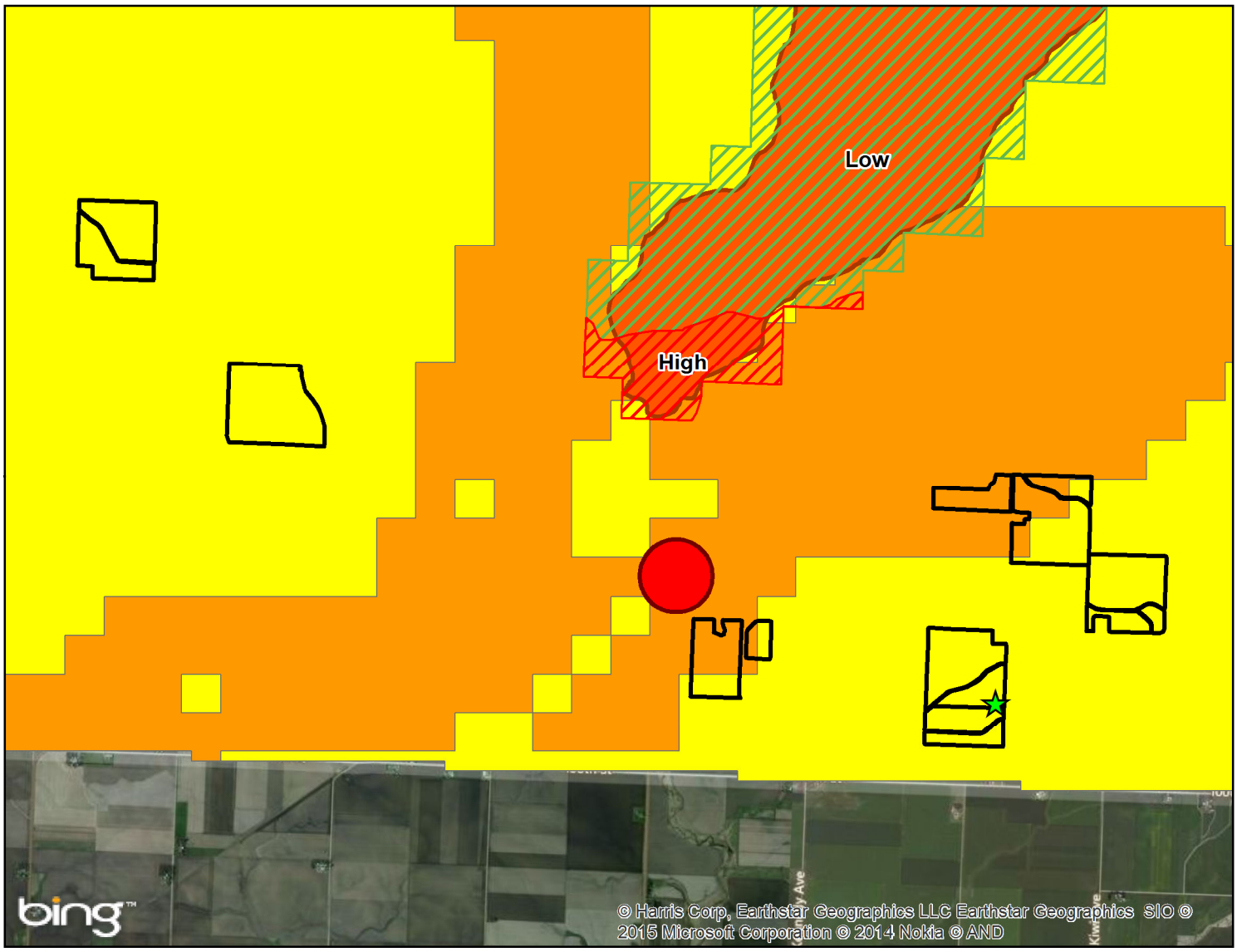
% odor annoy free	Hours per month	Setback Distance miles	Setback Distance feet
99%	7	1.45	7637
98%	15	0.87	4596
97%	22	0.56	2937
96%	29	0.42	2215
94%	44	0.30	1589
91%	66	0.21	1135

For more information, see

Jacobson, L.D., D. R. Schmidt, and S. Wood., 2001.*OFFSET: Odor from Feedlots Setback Estimation Tool*. FO-07680-C. St. Paul, Minn.: University of Minnesota Extension Service. (http://www.extension.umn.edu/distribution/livestocksystems/DI7680.html)

Curt Schilling Swine Facility
Groundwater Pollution Sensitivity Map

ATTACHMENT M



Feet
0 2,000 4,000 8,000 12,000 16,000

N

Imagery Courtesy of BING.

EXTended Ag Services, Inc.

Legend

- SiteLocation
- Field Boundary
- Wellhead Protection Area
- Source Water Assessment

DWSMA

Vulnerablity

- High
- Low

Groundwater Contamination

- Insufficient Data to Rank
- Lowest Susceptibility
- Low Susceptibility
- Medium Susceptibility
- High Susceptibility
- Highest Susceptibility

Source:
Groundwater pollution sensitivity assessment was developed by the MN DNR (Geologic Sensitivity Group, 1991). Assessments are based on the geologic and hydrogeologic factors affect the ability of geologic materials to restrict the downward migration of contaminants to the groundwater of interest. Geologic sensitivity assessments are typicall done on a 1:100,000 scale.