

Minnesota Pollution Control Agency and Environmental Quality Board Animal Feedlot Guidance

This document is designed to help project proposers utilize the [Minnesota Climate Calculator](#) (Calculator) to answer Item 18: Greenhouse Gas (GHG) Emissions/Carbon Footprint, specifically for animal feedlots. Project proposers **must** include the excel file when submitting the Environmental Assessment Worksheet (EAW).

Project information

The first step is to enter the basic information of the project including construction start date, operation year, lifetime, acreage, and square footage of buildings as highlighted in red below. Per the [U.S. Energy Information Administration](#), agricultural operations are classified as industrial buildings.

The cells highlighted in green allows project proposers to identify energy that is from renewable sources. Entering a percentage value in either field will result in lower emission under the building energy category. The top cell in highlighted in green asks project proposers if any of the electricity generated **onsite** is from renewable sources, or if any of the electricity comes from renewable energy credits. The second asks project proposers if any of the natural gas comes from renewable sources.

Project Information

Enter information into all yellow cells. Results may not calculate if fields are left blank, as highlighted by the red x marks construction projects, select the Apply Defaults button to populate the Construction Duration with the default data from t

Project Name	Feedlot Operations	
Project Category (primary)	Subp. 29, Animal feedlots	✓
Project Category (secondary)		
Location (County)	Cottonwood	✓

Construction Start Date	1/1/2026	✓	Building Construction Project?	Yes
Operational Year	2027	✓		
Operational Lifetime (Years)	40	✓		

Construction Stage	Duration (Days)	Default*	✓
Demolition	20.0	300.0	
Site Preparation	10.0	180.0	
Grading	30.0	465.0	
Building Construction	300.0	4,650.0	
Architectural Coatings	20.0	330.0	
Paving and Landscaping	20.0	330.0	

*Defaults are dependent on total project acreage and are only applicable to bui

Total Project Acreage	300.0	✓
Residential Building Area (sq ft)		✓
Commercial Building Area (sq ft)		✓
Industrial Building Area (sq ft)	169,415.0	✓
Institutional Building Area (sq ft)		✓
Other Building Area (sq ft)		✓

Electricity Provider	Grid Average
Portion of Building Electricity Consumption to be Generated On-Site via Renewables or Supplied through the Purchase of Renewable Energy Credits (RECs)	50%
Portion of Building Natural Gas Consumption to be Supplied from Renewable Sources	50%

Applicable emission sources

Next is to determine what the applicable emission sources. Project proposers are advised to start with “Apply Defaults” but then to review what information they have available and modify which sources to include. The Applicable Emission Sources are broken out into two project phases, Construction and Operation.

Applicable Emission Sources

Information is provided below on emission sources potentially applicable to your project depending on the project category selected in the section above. Select the 'Apply Defaults' button to include all applicable sources, or manually select "Yes" or "No" to indicate which emission sources to estimate GHG emissions for in this calculator. The red x mark will appear until a selection is made for all emission sources.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
Construction	Material inputs	Yes	Yes
Construction	Transportation of material inputs	Yes	Yes
Construction	Employee commuting	Yes	Yes
Construction	Construction equipment	Yes	Yes
Construction	Land use change (construction)	Yes	Yes
Construction	Construction waste	Yes	Yes
Operation	Building energy consumption	Yes	Yes
Operation	Coal production	No	No
Operation	Natural gas and oil products	No	No
Operation	Industrial processes	No	No
Operation	HFC leakage	No	No
Operation	Land use change (operations)	No	No
Operation	On-road vehicles	No	No
Operation	Treatment of waste on-site	No	No
Operation	Treatment of wastewater on-site	No	No
Operation	Treatment of waste off-site	Yes	Yes
Operation	Enteric fermentation	Yes	Yes
Operation	Manure management	Yes	Yes

Apply Defaults
Reset Button

User inputs

After determining the Applicable Emission Sources, project proposers move on to the User Inputs tab to populate specific information within each emission source.

Construction phase

There are six emission sources under the construction phase. Project proposers should attempt to populate each source; however, it is understood that data may not be available at the time of preparing the EAW. When data is not available, project proposers may use defaults when available. Project proposers should note that defaults are used. If project proposers think the default values are not appropriate for the project, then they can toggle the “Include Emission Source to ‘No’.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
Construction	Material inputs	No	Yes
Construction	Transportation of material inputs		

- Material Inputs:
 - Project proposers should enter the estimated amount of material such as concrete, asphalt, etc. (if known). The Calculator will calculate the transportation of the material depending on where the material was sources (domestic or imported).
- Employee Commuting:
 - Daily average number of employees commuting to the site during different staged of construction.
 - The average one-way commute length.
 - The percentage of transportation mode. If employee commuting habits are unknown, then 100% single occupancy vehicle should be used.

Note: Employee commuting calculations are tied to the Construction Stage duration input fields on the Project Background tab. If these fields are blank, the Calculator will create a warning that inputs are incomplete.

Construction Stage	Duration (Days)	Default*
Demolition		26.7
Site Preparation		4.0
Grading		8.0
Building Construction		293.3
Architectural Coatings		13.3
Paving and Landscaping		13.3

Apply Defaults

Reset Button

Data must be entered to quantify emissions from employee commuting.

*Defaults are dependent on total project acreage and are only applicable to building construction projects.

- Construction Equipment:
 - There are 15 types of construction equipment listed. Project proposers will enter the number of hours per day that a piece of equipment is used (if known).
 - The default number of hours per day is based on the project acreage input in D17 on the Project Background tab.
 - If a piece of equipment used on site is not included on the list, project proposers may model the equipment after a similar piece of equipment. Equipment information can be found below or on the Assumptions Tab starting on B101. MPCA recommends including any assumption on the Notes Tab.

Table 1. Construction equipment.

Equipment type	Horsepower	Load factor	Btu/hp-hr
Air Compressors	37	0.48	7,684.73
Cement and Mortar Mixers	10	0.56	7,709.24
Concrete/Industrial Saws	33	0.73	7,774.65
Cranes	367	0.29	7,133.38
Excavators	36	0.38	7,938.58
Forklifts	82	0.20	7,126.94
Generator Sets	14	0.74	7,684.18
Graders	148	0.41	7,182.18
Pavers	81	0.42	7,119.22
Paving Equipment	89	0.36	7,134.75
Rollers	36	0.38	7,935.40
Rubber Tired Dozers	367	0.40	7,195.40
Scrapers	423	0.48	7,151.74
Tractors/Loaders/Backhoes	84	0.37	7,164.18
Welders	46	0.45	7,683.89

- A second options for calculating emissions from construction equipment is as follows:
 - Project proposers enter the estimated fuel consumption of equipment in the natural gas and oil products emission source within the Operation Emission Phase.
 - If this option is utilized, project proposers must change the option to ‘yes’ to include natural gas and oil products.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
Construction	Material inputs	Yes	Yes
Construction	Transportation of material inputs	Yes	Yes
Construction	Employee commuting	Yes	Yes
Construction	Construction equipment	Yes	Yes
Construction	Land use change (construction)	Yes	Yes
Construction	Construction waste	Yes	Yes
Operation	Building energy consumption	Yes	Yes
Operation	Coal production	No	No
Operation	Natural gas and oil products	Yes	No

- Land Use Change (Construction):
 - This section account for emissions associated with modifying the land; as in converting grassland to an impervious surface (i.e. new building). Project proposers should enter changes that occur under the construction section.
- Construction Waste:
 - Only enter material from any demolition that occurred.

Operation phase

- Building Energy Consumption:
 - Building energy consumption is determined based on the type of building and square footage.
 - There are two options for feedlots. The generic industrial operations or the dairy product industry selection. These default values are derived the EIA Manufacturing Energy Consumption Survey (MECS), <https://www.eia.gov/consumption/manufacturing/data/2018/#r11> and are listed below.
 - Project proposers are strongly encouraged to use real world data if available.

Table 2. Energy consumption.

Building type	Energy intensity (Btu/sq ft/year)			
	Electricity	Natural gas	Propane	Kerosene or fuel oil
Industrial	299,952	656,393	0	8,192
Dairy Product	299,643	624,595	NA	NA

- Coal Production:
 - There are no anticipated emissions associated from animal feedlots.
- Natural Gas and Oil Products:
 - Project proposers may enter any additional fuel (i.e. natural gas, renewable natural gas, gasoline, etc.) utilized to run the animal feedlot not accounted for in the Building Energy Consumption section.
 - This could include mobile sources such as nonroad or on-road (if not accounted for in the designated On-Road Vehicles section).
- Industrial Process Emissions:
 - This section accounts for the emissions associated with the extraction of raw materials. There are no anticipated emissions associated from animal feedlots.
- HFC Leakage:
 - These emissions are based on the square footage of the building(s) and percentage of the building(s) that utilize air conditioning.
- Land Use Change (Operation):
 - See Land Use Change (Construction) above. There are no anticipated emissions from animal feedlots.

- On-Road Vehicles:
 - Enter the estimated vehicle miles traveled per year for the associated speed bin.
 - Vehicles include the hauling of manure to a secondary location.
 - An alternative for on-road vehicles, if the speed bins are unknown, is to enter the amount of fuel used in the natural gas and oil products.
- Treatment of waste on-site:
 - Feedstock associated with anaerobic digesters goes in two separate locations.
 - Non-manure feedstock goes under this section in tons treated per year.
 - Manure feedstock is accounted for in the Enteric Fermentation and Manure Management section.
- Treatment of wastewater on-site:
 - Wastewater treatment within the Calculator calculates emissions from municipal treatment facilities and a few industrial processes. Any wastewater associated with the operations of the feedlot should be accounted for in the manure management section.
- Treatment of waste off-site:
 - This section accounts for waste generated by households and is not applicable to feedlots.
- Enteric Fermentation and Manure Management:
 - Project proposers enter the population of animals on the feedlot. If the population varies throughout the year, project proposers should use their best estimate to describe the population.
 - Project proposers enter, by percentage, how the manure is treated. Depending on the type of animal, there are multiple manure management selections. If manure management occurs using several different methods, the project proposers should enter the percentage managed under each strategy.

Table 3. Enteric fermentation and manure management input view.

Enteric Fermentation and Manure Management

Enter the average annual number of animals across the operational lifetime of the project that will be managed during feedlot operation as a result of the project. Additionally, enter the portion of manure that will be treated by each manure management system. Values by livestock type must sum to 100%.

Beef Cattle	Population	Percentage of Manure Management System								
		Anaerobic digester	Cattle deep litter	Composting	Daily spread	Deep pit	Dry lot	Liquid/slurry	Pasture, range, paddock	Solid storage
Bulls										
Beef cows										
Beef heifers										
Steer stockers										
Heifer stockers										
Feedlot beef										
Beef calves										

Dairy Cattle	Population	Percentage of Manure Management System							
		Anaerobic digester	Anaerobic lagoon - liquid	Daily spread	Deep pit	Dry lot	Liquid/slurry	Pasture, range, paddock	Solid storage
Dairy heifers									
Dairy cows									
Dairy calves									

Swine	Population	Percentage of Manure Management System					
		Anaerobic digester	Anaerobic lagoon - liquid	Deep pit	Liquid/slurry	Pasture, range, paddock	Solid storage
Swine, <55 lbs							
Swine 55-330 lbs							
Swine 330+ lbs							

Poultry	Population	Percentage of Manure Management System								
		Anaerobic digester	Anaerobic lagoon - liquid	Composting	Liquid/slurry	Pasture, range, paddock	Poultry with litter	Poultry without litter	Solid storage	
Poultry, layers										
Poultry, pullets										
Poultry, chickens										
Poultry, broilers										
Turkeys										