



Options for Handling Feedlot Runoff at Large CAFOs

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The following guidelines provide information about requirements for feedlot runoff from open lots, feed storage, milkhouse wastewater, animal mortality areas, and other process wastewaters at large CAFOs and other NPDES-permitted feedlots with 1,000 or more animal units.

Federal Feedlot Runoff Regulations

Federal regulations restricting feedlot runoff at Concentrated Animal Feeding Operations (CAFOs) with dairy and beef livestock is described in 40 CFR part 412, subpart C. Minnesota rules require all CAFOs to comply with the federal requirements (40 CFR part 412). Additionally, Minnesota rules ch. 7020.2003 subp. 2, require non-CAFOs that hold 1,000 or more animal units to also comply with federal discharge requirements in 40 CFR part 412.

The federal regulations generally require total runoff containment and zero discharge at large CAFOs, except for 1) basin overflows caused by extreme climatic events, or 2) alternatives to total containment that result in equal or less discharge than would occur with basin overflows caused by extreme climatic events. More precisely, the regulations are as follows:

“For CAFO production areas, except as provided in paragraphs (a)(1) through (a)(2) of this section, there must be no discharge of manure, litter, or process

wastewater pollutants into waters of the U.S. from the production area¹.

(a)(1) Whenever precipitation causes an overflow of manure, litter, or process wastewater, pollutants in the overflow may be discharged into U.S. waters provided:

(i) The production area is designed, constructed, operated, and maintained to contain the manure and process wastewater including the runoff and the direct precipitation from a 25-year, 24-hour rainfall event²; and

(ii) The production area is operated in accordance with the additional measures and records as required in §412.37(a) and (b) [which includes weekly inspections of impoundments and production areas, checking depth markers at open surface impoundment areas, and immediate response to actual or potential problems].

(a)(2) Voluntary alternative performance standards. Any CAFO subject to this subpart may request the Director to establish NPDES permit effluent limitations based upon site-specific

¹ The term “discharge” is defined in 40 CFR section 122.2 to mean “any addition of any pollutant or combination of pollutants to waters of the United States from a point source.”

² For new sites with swine, veal or poultry open lots, the containment structure must contain the runoff from a 100-year, 24-hour rainfall event, instead of the 25 year event required for dairy and beef CAFOs. Currently CAFOs do not exist in Minnesota with open lots holding swine, veal or poultry.

alternative technologies that achieve a quantity of pollutants discharged from the production area equal to or less than the quantity of pollutants that would be discharged under the baseline³ performance standards as provided by paragraph (a)(1) of this section.”

The supporting technical analysis for the alternative technologies must include calculation of the quantity of pollutants that would be discharged under the baseline performance standard. This mass loading must be based on a site-specific analysis of a system designed, constructed, operated, and maintained to contain all manure, litter, and process wastewater, including the runoff from a 25-year, 24 hour rainfall event.

Whenever the MPCA determines that discharge will cause, or have reasonable potential to cause, or contribute to levels of pollution that exceed water quality standards established by the state, then effluent limitations more stringent than those based on 40 CFR part 412 must be included in the permit.

Pastures

If the density of animals is such that a pasture is maintained within fenced fields, then the site is not a CAFO and therefore does not need to meet the above requirements. Winter management to protect water quality and prevent creating a “feedlot” can be challenging.

A pasture is defined in Minn. R. ch. 7020.0300 as “an area where grass or other growing plants are used for grazing and where the concentration of animals is such that a vegetation cover is maintained during the growing season except in the immediate vicinity of temporary supplemental feeding or watering devices.”

Options available with General NPDES Permits

Several options are allowed at CAFOs and other NPDES permitted facilities for managing runoff from open lots, feed storage, and animal mortality areas and other process wastewaters. Certain options will trigger the

need for an Individual NPDES permit, yet other options can be used with a General NPDES permit.

The following types of management systems can be used in conjunction with a General NPDES Permit if all requirements for the General Permit have been met in accordance with Part I of the General Permit, which can be found at: www.pca.state.mn.us/publications/feedlot-gp-permit-06.pdf.

1. Total Runoff Control and Storage

Total runoff control involves collecting all runoff in liquid manure storage areas for storage and later use as a soil amendment to cropland/grassland. All liquid storage areas must meet Minn. R. ch. 7020.2100. When new liquid manure storage areas are constructed at feedlots to hold 1,000 or more animal units, the minimum storage design capacity for new structures is nine months. All new and existing storage structures must have sufficient capacity to manage their manure in accordance with land application requirements described in their NPDES permit and the facility’s manure management plan.

2. Roofs and clean water diversions

Roofs constructed over the entire open lot, feed storage, and animal mortality areas can be used to prevent runoff at the feedlot site. Clean water diversion berms are also needed at some locations to prevent runoff waters from entering the feedlot on the upslope side of a roofed lot.

Where roofs are constructed, the solid manure must be stored and managed in a way that will prevent contaminated runoff from entering waters of the United States. Additionally, the manure must be managed in accordance with the manure management plan and permit conditions, including winter-time manure application restrictions. Make sure to contact your regional MPCA office if winter application is being considered so that all fields for winter spreading can be evaluated.

3. Runoff containment with irrigation onto cropland/grassland

This option involves constructing a manure-contaminated runoff impoundment (MCRI) to hold runoff liquids until they can be pumped out of the basin and spray irrigated onto adjacent cropland or grassland. The irrigated liquids must be applied using rates, times, and methods that meet all land application requirements described in the General NPDES permit and do not exceed the hydraulic loading capacity of the soil (i.e. no

³ Baseline consists of the capacity for the 25-year, 24-hour storm plus the capacity needed to store solids/liquids during periods when land application is prohibited under the state’s technical standards for nutrient management. (from “Managing Manure Nutrients at Concentrated Animal Feeding Operations EPA-821-B-04-006).

ponding or runoff). The following minimum requirements apply to this type of system:

- **Basin capacity:** If the basin only collects feedlot runoff, and manure is not deposited or stored in the basin, then the basin must be sized to contain the 25-year, 24-hour storm event runoff *plus* storage capacity required to contain all runoff between land application events in accordance with the facility's Manure Management Plan and permit *plus* at least one foot of freeboard. For example, the added capacity should include volume to handle runoff during the winter months and when spray irrigation will not be feasible due to stage of crop growth, wet soils, etc. If the basin is used for both manure storage and runoff collection, then the basin must be sized for a minimum storage capacity of nine months as described for the total runoff containment option noted above.
- **Liner requirements:** The basin must meet liner requirements established in Minn. Rules ch. 7020.2100
- **Solids management:** Note that manure and wastewater application during winter months is restricted on many fields. Make sure to contact your regional MPCA office if winter application is being considered.

Options available with *Individual NPDES Permits*

If an Individual NPDES permit is obtained, CAFOs can use alternatives to the options allowed under a General NPDES permit. These other options are described below:

Alternatives polluting less than a baseline performance standard

Alternatives to total containment can be used if they discharge a very low amount of contaminants over the course of time, equal or less than the quantity of pollutants considered to be a "baseline performance standard." The ***baseline performance standard*** represents the quantity of pollutants that would legally be expected to overflow and discharge from a runoff storage system over a long period of time. The baseline performance standard is calculated by the facility owner for the conditions at the feedlot site, assuming that if a runoff containment structure was used instead of the alternative design, the structure may occasionally overflow at times which are consistent with permit

conditions. Permit conditions require that the structure is constructed and managed to contain the 25-year, 24-hour storm plus the capacity needed to store solids/liquids during periods when land application is prohibited under the state's technical standards for nutrient management.

An individual NPDES permit will be required when using an alternative technology. For an existing site, the feedlot owner must also have had a good compliance history (e.g. no piping, pumping, dumping of manure, proper permits were obtained for construction activities, and no history of significant noncompliance). Water quality monitoring at the end of the treatment system will be required for discharges which leave the treatment area and which may potentially enter waters of the United States.

The individual permit for alternative designs must also include: 1) feedlot management practices necessary to achieve compliance with effluent limitations; and 2) required reporting frequencies for monitoring and added management requirements.

Potential Alternative Designs

Feedlot owners and operators considering an alternative design should involve the MPCA staff early in the process of developing the alternative system to ensure that state and federal requirements will be met. Some vegetated treatment systems may have the potential to provide equivalent or better water quality protection as compared to the baseline performance standard. Some of these possible designs include:

1. **Vegetated Infiltration Basin** – Vegetated infiltration basins are described in the Minnesota NRCS 784 standards as a level 2 system. These systems have a settling basin followed by a large flat vegetated area that is completely surrounded by berms. The settling basin must hold at least a 10 year, 1 hour rainfall. The vegetated area must:
 - maintain live vegetation during the growing season;
 - have soil permeability of 0.2 to 6 inches per hour down to a five-foot depth;
 - be large enough to assimilate all nitrogen in runoff;
 - have more than 10 feet of separation distance to fractured bedrock;
 - be relatively level with spreaders to ensure even distribution over the grass

- have a seasonal water table depth of 5 feet or more during the typical growing season; and
- provide for even distribution of runoff at the top end of the vegetative treatment area using gated pipe, small tubes, concrete curb, weir or the equivalent.

2. Tile-drained Vegetated Infiltration Basin – This design is essentially a standard infiltration basin which has tile drainage below the basin to drain saturated soils. The tile drains outlet onto a secondary vegetated treatment area that is not contained by berms. More information about this type of design can be found at <http://www.heartlandwq.iastate.edu/ManureManagement> (click on “alternative technologies” heading and then go to “VTS Guidance Document” and see - chapter 7 VIB design).

3. Sunny Day Release onto Vegetated Infiltration Basin – The grassed treatment area for this type of design is similar to a standard vegetated infiltration basin. However, instead of a settling basin, there is a runoff impoundment designed to hold runoff from Nov. 1 to May 30, or the 25-year, 24-hour event, whichever is greater. Controls on the outlet of the impoundment allow release into the vegetated basin during optimal times of growing vegetation and relatively dry soils. Note that this type of system has certain characteristics of a Minnesota NRCS PS 784 Level 3 system and some characteristics of a Level 4 system.

4. Large Natural Enclosed Depressional Area – In rare situations, the natural drainage in an area occurs in a way that does not allow runoff to reach waters of the United States, except possibly during extreme climatic events. For example, runoff may enter a cropped, grassy or natural area where there is a large depression in the landscape that has no surface flow outlet (including no drainage tile outlet). This type of runoff may be allowed at CAFOs where the feedlot owner is willing to obtain an individual NPDES permit and will assume all legal risk in the event of permit non-compliance. In addition to the required hydrologic analysis to show that federal requirements for surface water quality protection are met, an analysis must be conducted to show that infiltration in the depression area will not create a pollution hazard for ground water. The expected nitrogen loading to the depression area must be less than nitrogen losses through removal by vegetation and/or denitrification. Also, soil cover above bedrock must be sufficient to treat bacteria and other potential contaminants associated with manure.

5. Other designs – Other possible designs may be considered where the probability for discharges is low and the expected quantity and/or concentration of effluent in the event of a discharge is also low (in order to have equal or less pollutant discharge compared to the baseline performance standard).

Requirements if using alternative technologies

To be considered for approval of the above alternative systems, a site specific analysis of discharges that would occur with the proposed alternative must show equal or less quantities of pollutants than discharges allowed under the baseline performance standard. The expected frequency, duration, rate and quality (expressed in terms of mass and concentration) of discharge from the alternative system must be described.

Federal regulations (412.31(a)) require that the following technical analysis be conducted for both the baseline performance standard and the alternative technology:

- All daily inputs to the storage system, including manure, litter, all process wastewaters, direct precipitation and runoff.
- All daily outputs from the storage, including losses due to evaporation, sludge removal, and removal of waste for use on cropland;
- A calculation of the predicted median annual overflow volume based on a 25-year period of actual rainfall data applicable to the site.
- Site specific pollutant data for nitrogen (*including ammonia*), phosphorus, five day biochemical oxygen demand, and total suspended solids from representative sampling and analysis of all sources of input to the storage system or other appropriate data source.
- Predicted annual average discharge of pollutants, expressed as a daily mass discharge, and calculated based upon concentration of pollutants and annual overflow volumes.

Producers should be aware that permitting of alternative technologies requires a burden of proof that is not required when using a total containment structure. In addition, there are risks associated with alternative technologies if the burden of proof is not met during the design phase or if in-field performance is less than predicted during the operation of the alternative technology. If the alternative technology is not

sufficient, additional costs may need to be incurred to provide for greater runoff control, possibly including a total containment manure/runoff storage system.

In addition, ground water protection must be considered. For example, if vegetation is not removing nitrogen effectively due to overloading, dead grasses, or lack of harvesting, and the area is geologically sensitive, then nitrate leaching could result.

More information about use of Alternative Technologies at Large CAFOs and possible tools to use for conducting the required analyses is available at a draft document found at

<http://www.heartlandwq.iastate.edu/manuremanagement>
(use alternative technologies button - go to VTS guidance document).

For more information

Contact your regional MPCA office, or Dave Wall, MPCA, 651-296-8440, david.wall@pca.state.mn.us