The “Feed Storage Area Runoff Controls for CAFOs” guidance was developed to provide assistance to the DNR Runoff Management Program, CAFO owners and operators, and consultants who work with CAFOs. The guidance document describes how feed storage area runoff controls can be designed and operated to meet the requirements of Chapter NR 243 of the Wisconsin Administrative Code for Animal Feeding Operations.

The Department is soliciting comments from the public on this draft guidance. Once the 21 day notice period is complete, all comments will be considered by the Department. After considering all public comments, revisions may be made to the guidance document and final guidance will be made available to internal and external stakeholders. Comments related to this draft guidance document should be sent to: DNRGUIDANCEDOCUMENTS@Wisconsin.Gov.

# BUREAU OF WATERSHED MANAGEMENT PROGRAM GUIDANCE

**Agricultural Runoff Program**

Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
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# Feed Storage Area Runoff Controls for CAFOs

X/X/2016

EGAD Number: 3800-XXXX-XX



*Notice: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.*

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APPROVED:

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Pam Biersach, Director Date
Bureau of Watershed Management

## A. Introduction/Statement of Problem Being Addressed

This guidance has been developed in response to U.S. EPA communications regarding the use of Wisconsin NRCS Conservation Practice Standard 635 (NRCS 635) to design feed storage area runoff controls (feed runoff controls) for CAFOs in Wisconsin. U.S. EPA inspections and field observations have shown NRCS 635 does not reliably ensure no discharge of pollutants to navigable water, as required by the Federal Clean Water Act, and described in U.S. EPA's Effluent Limitations Guideline for Concentrated Animal Feeding Operations (CAFOs).

This same issue may impact medium sized animal feeding operations if they have a discharge to navigable waters.

## B. Objectives

This guidance describes how feed runoff controls can be designed and operated to meet the requirements of NR 243 and provides a reference for DNR engineering review. This guidance does not address runoff controls for feedlots, barnyards, and other livestock holding areas. This will be addressed in a separate guidance document.

## C. Background and Definitions

NRCS 635, titled Vegetated Treatment Areas (VTAs) includes criteria for practices intended to treat runoff with low concentration of nutrients. U.S. EPA is not aware of any other states that consistently allow VTAs for CAFO feed runoff control. WPDES permits and ch. NR 243, Wis. Adm. Code, reflect federal requirements that most CAFOs cannot have production area discharges of pollutants to navigable waters, directly or indirectly, except under certain circumstances summarized as follows (specified in s. NR 243.13)[(1)]:

- The discharge must be the result of a precipitation related overflow of a containment or storage facility that is properly designed, constructed and maintained to contain all manure or wastewater from the CAFO and the runoff and direct precipitation from a 25-yr, 24-hour rain event.

- The production area must also be operated in accordance with the inspection, maintenance and record keeping requirements in s. NR 243.19, Wis. Adm. Code, which include weekly inspection of containment or storage facilities for leakage, seepage, erosion and excessive vegetation.

The term "storage facility", as used in s. NR 243 means a facility designed to contain stored waste materials (not to leak, infiltrate, or treat wastes). A VTA as specified in NRCS 635 is intended to treat runoff with low concentration of nutrients and is not a containment or storage facility. NRCS 635 feed runoff control systems were not intended to prevent releases of runoff for storm events less than the 25-yr, 24-hr storm. Although NRCS 635anticipated the released runoff would contain little or no pollutants, NR 243 requires that no pollutants from the production area reach navigable water. Therefore, NRCS 635 criteria do not result in a "no discharge" system.

(1) New source swine, veal and non-duck poultry may not have discharges of pollutants from the production area under any circumstances.

For Options 3 and 4 below, the Department is considering the infiltration structure volume holding capacity to be equivalent to a "storage facility" for the purposes of preventing an overflow of the 25-yr, 24-hr storm. The Department is doing this in accordance with NR 243.15(1)(c).

The most current National NRCS 635 Standard (9/2015) indicates that runoff up to the 25-yr, 24-hr rain event must be infiltrated or stored, unless discharge is allowed by applicable regulations. Such discharge is not allowed under NR 243. A Wisconsin NRCS Standard cannot typically be less stringent than the corresponding National NRCS Standard. As a result, the Wisconsin NRCS 635 is currently being updated.

## D. Guidance

**IMPLEMENTATION**

WPDES Permitted CAFOs:

- CAFOs with VTA projects approved by DNR prior to January 1, 2016, but not yet built, should reassess their planned construction for compliance with the "no discharge" requirement and contact DNR.
- Projects currently under review by the DNR that do not yet meet "no discharge" will be required to modify their design. Evaluations currently under review will also be asked to evaluate the design consistent with "no discharge".
- At reissuance, a permittee will need to evaluate existing facilities and provide interim measures to meet "no discharge" as well as implement any long term solutions.
- All new permittees will need to meet the "no discharge" standard either with an appropriately designed facility or with interim practices and a construction schedule to evaluate any existing facilities and provide designs under a schedule. If the permit is for a "green site" (all new facilities), then all new facilities need to meet the "no discharge" requirement.
- Longer term implementation will result in all feed storage runoff control engineering plans meeting the "no discharge" requirement.

**OPTIONS**

Provided below are options of "no discharge" feed runoff control systems for storm events up to and including the 25-yr, 24-hour storm. The runoff, particularly at the beginning of a rainfall, may include feed leachate (the liquid released from silage) that contains high concentrations of nutrients. Feed leachate and runoff are considered process wastewater under NR 243.

The options below can be combined, and other options may also be possible. This guidance is not meant to exclude other systems that could meet "no discharge" requirements. The DNR will review all feed runoff control systems on a case by case basis.

**Requirements that Apply to All Options Listed:**

Runoff Storage: A specified portion of the feed runoff must be collected to a DNR approved storage facility. If the storage is dedicated to just feed storage runoff, then it is to be designed in accordance with ch. NR 213 (see NR 243.15(3)(d)). In accordance with s. NR 243.15(3)(c) and (d), the Department may allow or require different design criteria on a case by case basis to

protect water quality. Such a case could be the design for concrete liners, which is not included in NR 213. Another case could be situations where the runoff is comingled with other sources of manure. Permanent markers are required in accordance with NR 243.15(3)(e).

Rainfall Data: In accordance with s. NR 243.04, the DNR is requiring the use of rainfall depths and storm distributions from NOAA Atlas 14 (in lieu of the rainfall data in Table 1).

Days of Storage: If the runoff storage is also used for liquid manure, a minimum 180 days of storage must be provided for the combined liquid waste. For a storage dedicated to feed runoff, the 180 days storage requirement for liquid manure does not apply, but there must be adequate storage to meet the requirements of NR 243.14(9) which includes maintaining adequate storage to meet the conditions, timing and restrictions of the permit, the Nutrient Management Plan (NMP) and NR 243.

Discharges Impacting Outstanding and Exceptional Resource Waters (ORW/ERW) and 303(d) Listed Waters. The Department may require additional design practices in instances where discharges impact ORW/ERW and 303(d) listed waters.

**Option 1 - Runoff Storage with NMP Managed Application**

a) Runoff Storage Facility: Feed runoff is collected into a storage facility (see "Requirements that Apply to All Options Listed" above).

   Required minimum storage volume for all of the following:
   - The 25-yr, 24-hr storm over the feed storage area and on the storage surface.
   - The maximum runoff/precipitation volume generated between land applications.
   - Anticipated leachate generation volume within 4 weeks of silage harvest
   - A 1 foot margin of safety.

b) Runoff Storage Facility Drawdown: Runoff must be removed from storage as needed to maintain capacity for another 25-yr, 24-hr rain event. Runoff is removed from the storage for land application according to NR 243.14 and the approved NMP; or when land application is not possible, the runoff is transferred to another storage.

c) NMP: Runoff from the feed storage facility is land applied in accordance with an approved NMP.

   As required by NR 243.14, the collected runoff cannot be applied when the soil is saturated or when precipitation will produce runoff. The applied runoff cannot pond or run off the application site, and must be so that minimal movement occurs. All other application restrictions in NR 243.14, the NMP and applicable sections of NR 214 apply.

   Like with liquid manure, monitoring the volume and nutrient concentration of the feed runoff is needed to determine allowable field application rates. (If feed runoff is stored with liquid manure, testing will be on the co-mingled wastes.)

   Use the current version of SnapPlus or other approved nutrient management methodology to determine application rates and areas. Initial annual nutrient loading can be based on annual nutrient loading per acre of feed storage or flow weighted mean nutrient concentration information in the UW Discovery Farms study "Evaluation of Silage Leachate and Runoff Collection Systems on Three Wisconsin Dairy Farms" (4/11/2016).

Once the runoff storage is constructed, collected runoff volumes and nutrient concentrations must be monitored in accordance with the NMP. The land application acreage must be adjusted based on actual nutrient content of the runoff being land applied.

Land application methods may include irrigation systems which are subject to NR 243.15(6).

**Option 2 - Runoff Storage with NMP Managed Application onto a VTA** This may be used to retrofit an existing VTA.

a) Runoff Storage Facility: Feed runoff is collected into a storage facility (see Option 1a above).

b) Runoff Storage Facility Drawdown: Runoff must be removed from storage as needed to maintain sufficient available capacity (see Option 1b above).

c) NMP: Runoff from the feed storage facility is applied to the VTA in accordance with an approved NMP (see Option 1c above). The nutrient loading onto the VTA must be balanced with the nutrient uptake of the vegetation on an average annual basis. The vegetation is to be cut and removed at least annually. The initial size of the VTA can be established with SnapPlus and the UW Discovery Farms study information discussed in Option 1c above. Actual measurement of all nutrients applied is required by the NMP. Soil samples should be taken in the upper, middle and lower thirds of the VTA. One sample should be taken every five acres or less, every four years. Each soil sample is a composite sample of ten cores collected in a "W" pattern. The Department may require more frequent soil sampling (e.g. annually) to determine an even distribution of nutrients over the VTA. The VTA area must be increased or nutrient loading reduced if actual nutrient loading and soil testing results indicate the VTA vegetation nutrient requirements are not keeping up with the loading rate. The VTA size could be reduced with the use of a low flow collection system to remove nutrients and wastewater volume applied. The VTA size would be reduced according to the proportion of nutrients removed to storage as determined by wastewater sampling results.

d) VTA Land Application: The VTA land application area is permanently vegetated. Runoff may only be applied during the growing season of the VTA vegetation. During runoff application, no discharge is allowed to exit the VTA, and the runoff is not allowed to pond. Runoff application volumes and rates must balance with the capacity of VTA soil to retain the runoff within the root zone. The exception is if there is excess surface runoff which is appropriately collected. Infiltration past the root zone to groundwater is not allowed. The runoff application rate must be controllable and it must be uniformly applied over the entire VTA. Measures to prevent discharges from the end of the VTA during application, such as collection devices (berm or storage) or extra-long VTAs may be necessary. The method of runoff application must comply with NR 243 and use the following methods:
   - An irrigation system that complies with NR 243.15(6).
   - A spreader bar, or other gravity or pumped systems providing even surface distribution may be used in conjunction with a graded and moderately sloped VTA. Multiple discharge locations may be necessary to provide uniform application over the entire VTA.

**Option 3 - Infiltration Basin**

a) Runoff Storage Facility: Feed runoff is collected into a storage facility (see "Requirements that Apply to All Options Listed" above). Operators shall collect at least up to the peak flow from a 1-inch storm (or 20% of the 25-year, 24-hour peak flow), or the first 1-inch of runoff, to a storage facility for land application according to the NMP and NR 243.14. The DNR believes this is the minimum amount necessary to protect groundwater quality in the infiltration basin area. This runoff amount represents approximately 90% of the average annual runoff volume. Runoff also needs to be collected to storage when the infiltration basin bottom is frozen and unable to infiltrate. The minimum required storage volume would be the maximum runoff/precipitation volume generated between land applications and also include a 1 foot margin of safety.

b) Solids Collection: Runoff solids are separated and not released to the infiltration basin. The solids may be collected to the runoff storage facility.

c) Infiltration Basin: The remainder of the feed runoff up to the 25-yr, 24-hr storm is diverted to an infiltration basin designed in accordance with DNR Conservation Practice Standard 1003 (Infiltration Basin). This includes a flat bottom. There should also be a minimum separation of 5 feet from the basin bottom to bedrock and the calculated sub-surface saturation level (consistent with absorption pond criteria in s. NR 214.12, and the post-construction infiltration practice criteria in NR 151).

Required minimum infiltration basin volume for all of the following:

- The 25-yr, 24-hr storm over the feed storage area and on the infiltration basin surface (minus any flow diverted to the runoff storage facility).
- A 1 foot margin of safety.

Required minimum infiltration basin area based on all the following:

- The infiltration basin area is sized according to the infiltration capacity of the local soils with a target drawdown time of 72-hours for the 25-yr, 24-hr rainfall depth (minus any flow diverted to storage) to minimize plant mortality and to maintain capacity for another 25-yr, 24-hr rain event.
- The infiltration rate (static infiltration rate) is determined by either soil texture or in situ field measurements according to DNR Conservation Practice Standard 1002 (Site Evaluation for Stormwater Infiltration).

Vegetation: Cut and remove vegetation at least annually to reduce nutrient loading.

Discharge to Infiltration: Multiple discharge points may improve infiltration.

Soil Amendments: The infiltration effectiveness may be improved with soil amendments.

d) Infiltration Basin Drawdown: If the 72-hr drawdown time is not met accumulated runoff must be removed for application to land application areas according to NR 243.14 and the approved NMP; or when land application is not possible, the runoff is transferred to another storage.

e) Groundwater Monitoring: On a case by case basis, groundwater monitoring may be required under the authority of NR 243.15(6). If the infiltration basin causes an

exceedance of groundwater quality standards, the DNR will take action under NR 140 to address the exceedance.

**Option 4 - Sloped Infiltration with Recirculation:** This may be used to retrofit an existing VTA.

a) Runoff Storage Facility: Feed runoff is collected into a storage facility (see Option 3a above).

b) Solids Collection: Runoff solids are separated as described in Option 3b above.

c) Infiltration Area: The remainder of the feed runoff is diverted to an infiltration area which has been graded and is moderately sloped. There should be a minimum separation of 5 feet from the infiltration area surface to bedrock and sub-surface saturation (consistent with absorption pond criteria in NR 214 and the post-construction infiltration practice criteria in NR 151).

An end collection device is installed at the downstream end of the infiltration area to prevent discharge from the infiltration area up to the 25-yr, 24-hr storm. This collection could be a storage facility (see "Requirements that Apply to All Options Listed", above) or a bermed area with a sump. A pump is installed to recirculate accumulated runoff back to the top of the VTA.

The infiltration area should be sized to infiltrate the runoff from a 25-year storm (minus any flow diverted to storage) within 72- hours as described for the Infiltration Basin example above. The infiltration area should have a design infiltration rate that is ½ of that used for an infiltration basin, because the infiltration area is sloped so the runoff is flowing and a "dynamic" infiltration rate applies (see DNR Conservation Practice Standard 1005 Vegetated Infiltration Swale).

Hydraulic modeling of the infiltration area, end collection volume and pump system can be used to demonstrate no discharge of runoff from the 25-yr, 24-hr rain event.

Vegetation: Cut and remove vegetation at least annually to reduce nutrient loading.

Soil Amendments: The infiltration effectiveness may be improved with soil amendments.

d) Infiltration Facility Drawdown: If target drawdown times are not met extra steps must be taken (see Option 3d above).

e) Groundwater Monitoring: As described in Option 3e above, groundwater monitoring may be required on a case by case basis, and appropriate action may be pursued if groundwater quality exceedances occur.

f) Example: A storage facility sized for the runoff from the 25-yr, 24-hr rain event, with metered release to an infiltration area. If the collected runoff is released at a rate that matches the infiltration capacity of the infiltration area, there is no runoff at the end of the infiltration area to pump for recirculation.

**Option 5 – VTA discharging to an Internally Drained Area**:

VTAs designed according to the previous NRCS 635 standard could possibly be considered compliant with the "no discharge" requirement by the Department on a case by case basis if the ultimate destination of the VTA discharge is an internally drained area. It must be demonstrated that the internally drained area has enough capacity to hold all of the runoff from the entire drainage area (including the feed storage area) up to and including the 25-yr, 24-hr storm prior to flowing beyond the internally drained area. If the internally drained area has drain tile, it is likely a surface water discharge would occur and this practice would not be considered compliant. The discharged runoff shall not cause exceedances of groundwater quality standards according to NR 243.13(5) and shall not impair wetland functional values according to NR 243.26(4)3. Discharge to internally drained areas considered to be susceptible to groundwater contamination as described in NR 243.15(3)(c)2.a. would likely not be considered acceptable. On a case by case basis, groundwater monitoring within the internally drained area may be required under the authority of NR 243.15(6). If there is an exceedance of groundwater quality standards, the DNR will take action under NR 140 to address the exceedance.

**Option 6 – Covered Feed Storage**:

The feed storage area is permanently covered (such as with a roof) so that rainfall cannot come into contact with stored feed. This includes the area in front of the working face of the feed. A variation would be to configure the feed storage drainage and plastic tarps such that runoff from the tarps is diverted off the feed storage, without coming into contact with silage. Runoff control requirements could be reduced according to how much rainfall can be prevented from making contact with silage. Non-rainfall related leachate collection to a DNR approved storage is required.

**Option 7 – Enhanced Treatment**:

The feed storage runoff goes through a treatment system (such as a reverse osmosis system) to separate out nutrients and other pollutants, creating a concentrated waste and a relatively clean effluent. The resulting effluent could be used for other on-farm uses. If treatment achieves low enough contaminant concentrations, the permittee may apply to discharge the effluent to a surface water under a WPDES CAFO permit, however, additional discharge restrictions, limitations and monitoring requirements apply to such discharges.

CREATED:

_____ _____

Bernie Michaud, Water Resources Engineer Date
On behalf of the Ag. Runoff Program

APPROVED:

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