Natural Resources Conservation Service
CONSERVATION PRACTICE STANDARD
VEGETATED TREATMENT AREA
Code 635
(Acre)

DEFINITION

An area of permanent vegetation used for agricultural wastewater treatment.

PURPOSE

Improve water quality by using vegetation to reduce the loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- A vegetated treatment area (VTA) can be constructed, operated and maintained to treat wastewater (contaminated runoff from such areas as animal lots, feed storage areas, compost areas, barnyards, and other livestock holding areas; or milking center wastewater) from agricultural operations.
- A VTA is a component of a planned agricultural waste management system in accordance with Natural Resources Conservation Service (NRCS) Agricultural Waste Management Field Handbook (AWMFH), Chapter 9.

This practice does not apply to:

- Treatment of undiluted leachate.
- Treatment of runoff from manure stacks or waste storage facilities.
- Treatment of milking center wastewater or contaminated runoff using annually grown crops.

CRITERIA

General Criteria

VTAs shall comply with all federal, tribal, state, and local laws, rules, or regulations. The operator is responsible for securing required permits. This standard does not contain the text of the federal, tribal, state, or local laws.

Management Assessment

Perform a management assessment with the owner/operator to determine planned management and explore design options. Conduct, document, and incorporate the assessment into the design. In addition to the Waste Management System Inventory and Planning Worksheet contained in the Wisconsin supplement to Chapter 9 of the AWMFH, the management assessment for a VTA shall address the following:

1) Animal Lot
    a. Animal types and numbers
    b. Cleaning methods and frequency
    c. Drainage area

d. Feeding locations and methods
e. Animal time on lot
f. Existing pretreatment
g. Waste characterization
h. Type of existing surface
i. Type of proposed surface

2) Feed Storage Area
a. Feed storage method (e.g. bunker, bag, pile)
b. Feed storage area dimensions
c. Drainage area contributing contaminated runoff
d. Feed type
e. Handling, cleaning methods, and frequency
f. Type of existing surface
g. Type of proposed surface

3) Milking Center Wastewater
a. Daily milking center wastewater volume
b. Existing handling of milking center wastewater

Site Assessment

Conduct, document, and incorporate a site assessment into the design. The assessment will determine physical site characteristics that may influence the placement, construction, maintenance, and environmental integrity of the VTA. Site assessment shall include, but is not limited to:

1) Distances to the nearest feature listed in the separation distances for the applicable size category and specific criteria.
2) Karst features within 500 feet of the proposed VTA outlet.
3) Location and identification of physical site features contributing to the characteristics of the runoff.
4) Soil investigation, including:
a. A description of the soil layers using the Unified Soil Classification System and the USDA Textural Classification.
b. The factors to identify subsurface saturation, as defined in Wisconsin NRCS Conservation Practice Standard (WI CPS), Waste Storage Facility (Code 313).
c. Soil boring logs to characterize the soils and to a minimum depth below the planned VTA grade to ensure separation distances are achieved by conducting borings within 50 feet of the VTA footprint. Perform a minimum of one test pit or boring per 30,000 square feet of footprint, with a minimum of two per facility.
d. Depth to bedrock encountered in soil borings and bedrock type.
e. Depth to subsurface saturation encountered in the borings.

Tributary Water Exclusion

Divert uncontaminated water from the tributary area. The design shall account for precipitation, runoff, or subsurface flow entering the VTA up to the 25-year, 24-hour storm event. When planning to exclude outside tributary water with other conservation practices, their design shall be in accordance with WI Standards located in the Field Office Technical Guide (FOTG).

Cattle Access

Exclude all livestock, including grazing, from the VTA.

Vegetation in Treatment Areas

Wastewater shall be diverted from the VTA until vegetation required in the design is well established.

Establish permanent vegetation in the VTA using a single species or a mixture of grasses, legumes, and other forbs adapted to the soil and climate. Select species to meet the site conditions and intended use. Selected species will have the capacity to achieve adequate density, vigor, and yield within an appropriate time frame to treat wastewater.

Select, establish, and maintain vegetation in VTAs in accordance with criteria specified in WI CPS, Critical Area Planting (Code 342), or WI CPS, Tree/Shrub Establishment (Code 612).

Harvest VTA vegetation when appropriate to encourage dense, upright growth, and remove nutrients and other contaminants that are contained in the plant tissue at least annually. Care shall be taken to minimize damage to the VTA during harvest.

Siting Parameters

Locate or construct the VTA with 2 foot minimum depth of soil with at least 20 percent passing the No. 200 sieve (i.e., P200 $\geq$ 20%).

Take care during construction to prevent soil compaction from construction machinery.

Separation is the closest distance from the finished VTA ground surface to the features listed below:

1) Minimum separation to bedrock shall be 4 feet. Excavation of bedrock is permitted to achieve the required separation distance. Do not remove bedrock by blasting. Evaluate the exposed bedrock surface to ensure a sound base for soil material. Treat fractures or voids to prevent migration of soil material. The surface of excavated bedrock shall have a minimum slope of 1 percent under and away from the VTA to prevent significant ponding on the rock surface. If bedrock is excavated, the material placed on the bedrock shall have a minimum of 20 percent passing the No. 200 sieve.
2) Minimum separation to subsurface saturation shall be 2.5 feet for feed storage contaminated runoff and 3 feet for animal lot contaminated runoff and milk center wastewater.

Subsurface drainage within the VTA is not allowed. Subsurface drain lines are to be at least 10 feet away from the VTA boundary.

Locate the VTA outside of regulated floodplains if possible. Provide protection from inundation or damage from a 25-year, 24-hour storm event.

Specific Criteria

Applicable to operations with over 500 Animal Units

The VTA shall be:

1) ≥ 250 feet from any private well,
2) ≥ 1000 feet from any community well,
3) ≥ 35 feet from wetlands and navigable streams and rivers, and
4) ≥ 75 feet from navigable lakes, ponds and flowages.

Limit the natural or constructed slope of the VTA from 0.3 to 6 percent.

The minimum size of the VTA shall be the area required to balance both the contributing site's 25- year, 24-hour water runoff and delivered nutrients.

1) Water balance is the soil's capacity to infiltrate and retain runoff within the root zone. Base the infiltration determination on the most restrictive soil layer within the root zone regardless of its thickness. Use the soil's water holding capacity in the root zone, infiltration rate, permeability, and hydraulic conductivity to determine its ability to absorb and retain runoff.
2) Nutrient balance utilizes the nutrients from the waste runoff to meet the nutrient removal requirements in the harvested vegetation. Base the nutrient balance on the most limiting nutrient (i.e., nitrogen or phosphorus)

Design a Waste Storage Facility* (criteria contained within WI CPS, Waste Storage Facility (Code 313)) when required to hold leachate, wastewater, and manure during the growing and non-growing season with freeboard of 1 foot for operations ≥ 1000 animal units and 0.25 feet for all others.

Wastewater Application

Application by surface flow across the full width of a sloped VTA **is not** permissible. Distribute the wastewater uniformly over the entire VTA through sprinkler irrigation or other uniform application system. Match the sprinkler nozzle(s) application rate to the most restrictive soil infiltration rate or other factors to prevent non-uniform absorption and treatment in the VTA.

Apply wastewater only during the growing season of the VTA vegetation.

Apply wastewater only when soils are below field capacity. Avoid percolation below the root zone by not exceeding field capacity during application.

Use Table 1 for Available Water Capacity (AWC) in the VTA's root zone. Use the typical AWC unless lab data or specific soil map unit data found in NRCS Web Soil Survey are used.

Annual nutrient uptake of VTA vegetation shall be obtained from University of Wisconsin Extension publication A2809 "Nutrient Application Guidelines for Field, Vegetable, and Fruit Crops in Wisconsin" or other science-based publications.

Table 1. Available Water Capacity by Texture.[1]

Texture	Typical AWC (in./ft.)
Loamy sand	0.85
Loamy fine sand	1.25
Sandy loam	1.45
Fine sandy loam	1.70
Loam	2.00
Silt loam	2.40
Silt	2.00
Sandy clay loam	1.80
Clay loam	2.40
Silty clay loam	2.40
Sandy clay	1.90
Silty clay	1.90
Clay	1.80

[1]Adapted from NRCS National Engineering Handbook, Part 652 Irrigation Guide (1997).

Applicable to operations with over 300 and 500 or less Animal Units

Criteria for sites where the down gradient end of the VTA is:

1) ≥ 1000 feet from navigable lakes, ponds and flowages,
2) ≥ 300 feet from wetlands and navigable streams and rivers,
3) ≥ 500 feet from conduits to groundwater,
4) ≥ 300 feet from surface inlets that discharge to navigable waters,
5) ≥ 150 feet from channelized flow (i.e., a drainage area of ≥ 5 acres), and
6) ≥ 150 feet from subsurface drains.

Locate the VTA > 100 feet from any private water well.

Limit the natural or constructed slope of the VTA from 1 to 6 percent. Each VTA shall treat a single source of wastewater.

Design shall use a Manning's n = 0.30 for shallow flow conditions.

Provide an analysis demonstrating wastewater applied to the VTA does not discharge to navigable waters for rainfall up to the 25-year, 24-hour storm event.

Apply wastewater uniformly across the full width of the VTA (e.g., level spreader, distribution pipe) or uniformly over the VTA. Place additional devices at intervals not to exceed 150 feet to maintain sheet flow down the length of the VTA.

Animal Lot

A collection practice is needed to operate the system throughout the year. Below are options:

- Design a Livestock Area Sediment Basin (criteria contained within WI CPS, Waste Separation (Code 632) to retain 100 percent of the 25-year, 24-hour storm event during the growing season.
- Design a Waste Storage Facility (criteria contained within WI CPS, Waste Storage Facility (Code 313) when required to hold contaminated runoff and manure during the non-growing season with 0.25 feet of freeboard.

Apply contaminated runoff only during the growing season for the VTA vegetation.

Apply contaminated runoff not to exceed the 25-year, 24-hour storm event volume per application.

Allow the VTA to rest 3 days between applications of contaminated runoff collected during the non-growing season.

Commence VTA application at least 24 hours after cessation of a $\geq$ 0.5 inch rain event (i.e., sunny day release), or immediately after cessation of a < 0.5 inch rain event.

Design each VTA to treat $\leq$ 10,000 square feet of animal lot area and not more than 98 animal units.

Design the VTA for a flow depth of 0.5 to 1.0 inches for the water separation facility's flood-routed 25-year, 24-hour storm event.

Design the minimum VTA size to be 150 percent of the animal lot size for paved lots and 100 percent of the animal lot size for earth lots.

The annual output of phosphorus from the VTA shall be 5 pounds or less as determined based on potentially affected resources documented in the site assessment, using the Agricultural Research Service procedure outlined in "An Evaluation System to Rate Feedlot Pollution Potential" and a series of rainfall events for a year contained in the Wisconsin supplement to Chapter 10 of the AWMFH.

Feed Storage

Design the feed storage area/collection system to achieve a maximum VTA flow depth of 1.75 inches for the 25-year, 24-hour storm event.

Design the VTA for a minimum flow through time of 22 minutes. The maximum VTA width shall not be greater than 200 feet.

Feed storage contaminated runoff can be applied year-round.

Collect all leachate and the initial runoff volume of 0.20 inches from each rain event in a Reception Structure designed in accordance with the criteria contained in WI CPS, Waste Transfer (Code 634). This leachate and runoff shall not be applied to the VTA.

Milking Center Wastewater

VTA treatment is applicable for operations producing a maximum of 500 gallons of milking center wastewater per day.

Provide Reception Structure in accordance with criteria contained in WI CPS, Waste Transfer (Code 634) (i.e., pretreatment tanks), and size it to provide a minimum three-day hydraulic retention time prior to discharge to the VTA. The outlet from the pretreatment tank(s) shall be gravity flow to a dosing tank or chamber which shall be separate from the pretreatment tank(s). Locate a pump or siphon for pressure distribution of milking center wastewater in the dosing tank or chamber.

Size the VTA on the greater of either:

1) A minimum flow through time of 30 minutes at a maximum flow depth of 0.5 inches, or
2) A minimum area to accommodate up to an application depth of 0.9 inches per week.

The allowable soil dosing rate is shown in Table 2.

Evenly distribute milking center wastewater across the VTA discharging a minimum of 1.0 foot above the ground.

Applicable to operations up to 300 Animal Units

1) Criteria for sites where the down gradient end of the VTA is:
    a. ≥ 1000 feet from navigable lakes, ponds and flowages,
    b. ≥ 300 feet from wetlands and navigable streams and rivers,
    c. ≥ 500 feet from conduits to groundwater,
    d. ≥ 300 feet from surface inlets that discharge to navigable waters,
    e. ≥ 150 feet from channelized flow (i.e., a drainage area of ≥ 5 acres), and
    f. ≥ 150 feet from subsurface drains.

Locate the VTA > 100 feet from any private water well.

Infiltrate and treat a portion of the 25-year, 24-hour storm event and provide additional above separations to prevent significant discharges of pollutants (Wisc. Admin. Code NR 243.26(2)).

Limit the natural or constructed slope of the VTA from 1 to 6 percent. Each VTA shall treat a single source of wastewater.

Apply wastewater uniformly across the full width of the VTA (e.g., level spreader, distribution pipe), or uniformly apply over the VTA. Place additional devices at intervals not to exceed 150 feet to maintain sheet flow down the length of the VTA.

Design shall use a Manning's n = 0.30 for shallow flow conditions. Wastewater is allowed to be applied year round.

Animal Lot

Design a collection practice using the Livestock Area Sediment Basins criteria contained within WI CPS, Waste Separation (Code 632) or Reception Structures, Channels, Hoppers, and Pumps criteria contained in WI CPS, Waste Transfer (Code 634).

Design each VTA to treat ≤ 10,000 square feet of animal lot area and not more than 98 animal units.

Design the VTA for a flow depth of 0.5 to 1.0 inches for the waste separation and holding facility's flood-routed 25-year, 24-hour storm event.

Design the minimum VTA size to be 150 percent of the animal lot size for paved lots and 100 percent of the animal lot size for earth lots.

The annual output of phosphorus from the VTA shall be 5 pounds or less as determined based on potentially affected resources documented in the site assessment, using the Agricultural Research Service procedure outlined in "An Evaluation System to rate Feedlot Pollution Potential" and a series of rainfall events for a year contained in the Wisconsin supplement to Chapter 10 of the AWMFH.

Feed Storage

Design the feed storage area/collection system to achieve a maximum VTA flow depth of 1.75 inches for the 10-year, 24-hour storm event.

Design the VTA for a minimum flow through time of 22 minutes. The maximum VTA width shall not be greater than 200 feet.

Collect all leachate and the initial runoff volume of 0.10 inches from each rain event to a Reception Structure designed in accordance with the criteria contained in WI CPS, Waste Transfer (Code 634). This leachate and runoff shall not be applied to the VTA.

Milking Center Wastewater

VTA treatment is applicable for operations producing a maximum of 500 gallons of milking center wastewater per day.

Design a Reception Structure in accordance with the criteria contained in WI CPS, Waste Transfer (Code 634) (i.e., pretreatment tanks) and size it to provide a minimum three-day hydraulic retention time prior to discharge to the VTA. The outlet from the pretreatment tank(s) shall be gravity flow to a dosing tank or chamber which shall be separate from the pretreatment tank(s).

Locate a pump or siphon for pressure distribution of milking center wastewater in the dosing tank or chamber.

Size the VTA on the greater of either:

- A minimum flow through time of 20 minutes at a maximum flow depth of 0.5 inches, or
- A minimum area to accommodate up to an application depth of 0.9 inches per week.

The allowable soil dosing rate is shown in Table 2.

Table 2. Allowable soil dosing rates (gal/ft.^{2} of VTA)

Soil Drainage Class	Soil Depth > 40"	Soil Depth 24" - 40"
Well Drained	0.300	0.250
Moderately Well Drained	0.250	0.200
Somewhat Poorly Drained	0.125	0.075

Evenly distribute milking center wastewater across the VTA discharging a minimum of 1.0 foot above the ground.

2) Criteria for sites where the down gradient end of the VTA (x) is between:
   a. $250 \leq x < 1000$ feet from navigable lakes, ponds and flowages,
   b. $150 \leq x < 300$ feet from wetlands and navigable streams and rivers,
   c. $250 \leq x < 500$ feet from conduits to groundwater,
   d. $150 \leq x < 300$ feet from surface inlets that discharge to navigable waters,
   e. $50 \leq x < 150$ feet from channelized flow (i.e., a drainage area of ≥ 5 acres), and
   f. $50 \leq x < 150$ feet from subsurface drains.

Locate the VTA > 100 feet from any private water well.

Infiltrate and treat a portion of the 25-year, 24-hour storm event and provide additional above separations to prevent significant discharges of pollutants (Wisc. Admin. Code NR 243.26(2)).

Limit the natural or constructed slope of the VTA from 1 to 6 percent. Each VTA shall treat a single source wastewater.

Uniformly apply wastewater across the full width of the VTA (e.g., level spreader, distribution pipe), or uniformly over the VTA. Place additional devices at intervals not to exceed 150 feet to promote sheet flow down the length of the VTA.

Animal Lot

A collection practice is needed to operate the system throughout the year. Below are options:

- Design a Livestock Area Sediment Basin (criteria contained within WI CPS, Waste Separation (Code 632)) to retain 100 percent of the 25-year, 24-hour storm event during the growing season.
- Design a Waste Storage Facility (criteria contained within WI CPS, Waste Storage Facility (Code 313)) when required to hold contaminated runoff and manure during the non-growing season with 0.25 feet of freeboard.

Apply contaminated runoff only during the growing season for the VTA vegetation.

Apply contaminated runoff not to exceed the 25-year, 24-hour storm event volume per application.

Allow the VTA to rest 3 days between applications of contaminated runoff collected during the non-growing season.

Commence VTA application at least 24 hours after cessation of a ≥ 0.5 inch rain event (i.e., sunny day release), or immediately after cessation of a < 0.5 inch rain event.

Design each VTA to treat $\leq 10{,}000$ square feet of animal lot area and not more than 98 animal units.

Design the VTA for a flow depth of 0.5 to 1.0 inches for the water separation facility's flood-routed 25-year, 24-hour storm event.

Design the minimum VTA size to be 150 percent of the animal lot size for paved lots and 100 percent of the animal lot size for earth lots.

The annual output of phosphorus from the VTA shall be 5 pounds or less as determined based on potentially affected resources documented in the site assessment, using the Agricultural Research Service procedure outlined in "An Evaluation System to rate Feedlot Pollution Potential" and a series of rainfall events for a year contained in the Wisconsin supplement to Chapter 10 of the AWMFH.

Feed Storage

Design the feed storage area/collection system to achieve a maximum VTA flow depth of 1.75 inches flow depth on the VTA for the 25-year, 24-hour storm event.

Design the VTA for a minimum flow through time of 22 minutes. The maximum VTA width shall not be greater than 200 feet.

Feed storage contaminated runoff can be applied year-round.

Collect all leachate and the initial runoff volume of 0.20 inches from each rain event to a Reception Structure designed in accordance with the criteria contained in WI CPS, Waste Transfer (Code 634). This leachate and runoff shall not be applied to the VTA.

Milking Center Wastewater

VTA treatment is applicable for operations producing a maximum of 500 gallons of milking center wastewater per day.

Design a Reception Structure in accordance with criteria contained in WI CPS, Waste Transfer (Code 634) (i.e., pretreatment tanks), and size it to provide a minimum three-day hydraulic retention time prior to discharge to the VTA. The outlet from the pretreatment tank(s) shall be gravity flow to a dosing tank or chamber which shall be separate from the pretreatment tank(s). Locate a pump or siphon for pressure distribution of milking center wastewater in the dosing tank or chamber.

Size the VTA on the greater of either:

- A minimum flow through time of 30 minutes at a maximum flow depth of 0.5 inches, or
- A minimum area to accommodate up to an application depth of 0.9 inches per week.

The allowable soil dosing rate is shown in Table 2.

Evenly distribute milking center wastewater across the VTA discharging a minimum of 1.0 foot above the ground.

3) Criteria for sites where the down gradient end of the VTA is:
    a. < 250 feet from navigable lakes, ponds and flowages,
    b. < 150 feet from wetlands and navigable streams and rivers,
    c. < 250 feet from conduits to groundwater,
    d. < 150 feet from surface inlets that discharge to navigable waters,
    e. < 50 feet from channelized flow (i.e., a drainage area of ≥ 5 acres), or
    f. < 50 feet from subsurface drains.

See criteria for operations with over 300 and 500 or less Animal Units

CONSIDERATIONS

Provide more than one VTA to allow for resting, harvesting vegetation, and maintenance, and to minimize the potential for overloading.

To maximize nutrient uptake, use warm and cool season species in separate areas to ensure that plants are actively growing during different times of the year.

Supplement water as necessary to maintain plants in a condition suitable for the treatment purpose.

Direct wastewater to a waste storage facility during excessively wet or cold climatic conditions.

Consider suspension of application to VTA when weather conditions are not favorable for aerobic activity or when soil temperatures are lower than 39° F. When soil temperatures are between 39° F and 50° F, consider reducing application rate and increasing application period while maintaining a constant hydraulic loading rate.

Consider installing a berm and/or a pumping system at the downstream end of the VTA to contain and/or recirculate the wastewater to the top of the VTA or transfer to a waste storage facility.

Consider storing wastewater from the VTA for land application, recycling through the VTA, or otherwise used in the agricultural operation.

Install fences or other measures to exclude or minimize access of the VTA to humans or animals.

PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard that describe the requirements for applying the practice to achieve its intended use. Include critical construction parameters, necessary construction sequence, vegetation establishment requirements, and nutrient removal.

Plans and specifications will include:

- A plan view showing the location of the VTA,
- Details of the length, width, elevation, and slope of the VTA to accomplish the planned purpose,
- Herbaceous species, seed selection, and seeding rates to accomplish the planned purpose,
- Planting dates, care, and handling of the seed to ensure that planted materials have an acceptable rate of survival, and
- Site preparation sufficient to establish and grow selected species.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its design. The plan may include the following items as appropriate:

- Scheduling of wastewater application, depth of application, rates, resting periods, etc. as applicable.
- Empty waste transfer structures after rainfall and runoff events to maintain storage for the next event.
- Control undesired weed species, especially state-listed noxious weeds, and other pests that could inhibit proper functioning of the VTA.
- Inspect and repair VTAs after storm events to address gullies, remove flow-disrupting sediment accumulation, reseed disturbed areas, and take other measures to prevent concentrated flow.

- Apply supplemental nutrients and soil amendments as needed to maintain the desired species composition and stand density of herbaceous vegetation.
- Maintain or restore the VTA as necessary by periodically grading or removing excess material when deposition or signs of burned-out areas persist and jeopardize its function. Re-establish herbaceous vegetation.
- Manage the VTA to maintain vegetative treatment effectiveness throughout the growing season. Time the harvest of the VTA plants so vegetation can regrow to a sufficient height to effectively filter wastewater late in the growing season.
- Routinely dethatch or aerate a VTA in order to promote infiltration.
- Conduct harvesting and other maintenance activities only when the VTA is dry and moisture content in the surface soil will not result in compaction or rutting.
- Clean the animal lot and/or settling areas as needed or before rain events when possible to prevent migration of solids to the VTA.
- Maintain the VTA spreader to the initial design function.
- Harvest VTA vegetation as appropriate to encourage dense growth, maintain upright growth, and remove nutrients and other contaminants that are contained in the plant tissue.
- Monitor all VTAs to maintain optimal crop growth and environmental protection.
- Periodic checks of nozzles and spray heads for proper operation and wear
- Schedule of soil sampling and testing to ensure that neither phosphorus is accumulating in the soil profile, nor nitrogen is leaching below the root zone.
- Prior to construction, the owner/operator shall sign the operation and maintenance plan to indicate an understanding of the requirements and a commitment to operate and maintain the practice as specified.

REFERENCES

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Young, R.A., Otterby M.A., and Roos, A. 1982. An Evaluation System to Rate Feedlot Pollution Potential, Agricultural Research Service, USDA, ARM-NC-17.

DEFINITIONS

Animal lots – An animal lot is an area, a building, or combination of contiguous areas and buildings intended for the confined feeding, breeding, raising or holding of beef and/or dairy cattle. An animal lot is specifically designed as a confinement area in which beef/dairy waste may accumulate, or where the concentration of beef or dairy animals is such that a vegetative cover is denuded and cannot be maintained within the enclosure.

Animal Units – A unit of measurement used to determine the total number of single animal types or combination of animal types, as specified in NR 243, which are fed, confined, maintained or stabled in an animal feeding operation.

Available water capacity (AWC) – The portion of water in a soil that can be readily absorbed by plant roots of most crops, expressed in inches per inch, inches per foot, or total inches for a specific soil depth. It is the amount of water stored in the soil between field capacity (FC) and permanent wilting point (PWP). Also called available water holding capacity (AWHC).

Bedrock – The solid or consolidated rock formation typically underlying loose surficial material such as soil, alluvium or glacial drift. Bedrock includes but is not limited to limestone, dolomite, sandstone, shale and igneous and metamorphic rock.

Note: Although solid or consolidated bedrock can sometimes be removed with typical excavation equipment, these materials are included in the above definition.

Channelized flow – Water movement in a surface drainage feature including, but not necessarily limited to: swales, draws, grass waterways, ditches, gullies, creeks, or rivers.

Conduits to groundwater – Sinkholes, swallets, fractured bedrock at the surface, mine shafts, non-metallic mines, tile inlets discharging to groundwater, quarries, or depressional groundwater recharge areas over shallow fractured bedrock. Wells were intentionally left out of this NR 151 list.

Contaminated Runoff – Runoff that has come through or across a barnyard or animal lot or feed storage area. It generally includes the runoff and any manure, sediment, feed, or other material carried in the runoff. It contains lower concentrations of contaminants than leachate from feed or manure.

Feed Storage Area – An area used to store livestock feed. Livestock feed may include field corn silage, haylage, and industrial by-products (i.e., distillers grain, brewers grain, candy, pizza crust, bakery waste, cotton seed, soy bean meal, animal fats, blood meal, fish meal, cannery waste, beet pulp, citrus pulp, soy hulls, corn midlings, whey, potatoes, grocery store vegetables). This is the area defined by the outside edge of the surface of where the feed is stored, including the apron.

Field capacity – The amount of water retained by a soil after it has been saturated and has drained freely by gravity. Can be expressed as inches, inches per inch, bars suction, or percent of total available water.

Hydraulic Loading Rate – Considered as the flow rate distributed over the surface area calculated as: HLR = Flow Rate / Surface Area.

Karst – Refers to areas of land underlain by carbonate bedrock (limestone or dolomite). Typical land features in karst areas include sinkholes, disappearing streams, closed depressions, blind valleys, caves, and springs. See the companion document in Chapter 10 of the AWMFH for additional discussion of karst features.

Leachate – Concentrated liquid which has percolated through or drained from animal feed. It contains much higher concentrations of contaminants than feed storage contaminated runoff. See WI CPS Waste Treatment (Code 629), for leachate quantity calculations.

Milking Center Wastewater – Consists of wash water used to clean the milk harvesting and milk cooling equipment. Other contaminated sources of wastewater (water softener) and wash water used to clean the floors and walls can be included in the combined flow of the milking center wastewater discharge. Wastewater from the floor of the holding area is excluded from treatment systems specified by this standard. Clean discharge water sources (plate cooler, roof water) and sanitary wastewater (toilets, sinks, clothes laundry) must be excluded from the treatment system.

Navigable Waters – As defined in Section 30.01 (4m) of the Wisconsin State Statutes, "navigable waters" means any body of water which is navigable under the laws of the State of Wisconsin. (Navigable stream, rivers, lakes, pond, flowages, etc.)

Permanent wilting point (PWP) – The moisture percentage, on a dry weight basis, at which plants can no longer obtain sufficient moisture from the soil to satisfy water requirements. Plants will not fully recover when water is added to the crop root zone once permanent wilting point has been experienced. Classically, 15 atmosphere (15 bars) or 1.5 mPa, soil moisture tension is used to estimate PWP.

Root Zone – Depth to which the roots of mature crops will extract available soil water.

Waste storage facility* (used for feed storage wastewater or a combination of manure and feed storage wastewater) – This is a new category of waste storage facilities that must meet the most stringent criteria contained in WI CPS Waste Storage Facility (Code 313), and Wisconsin administrative code NR-213.

Well Established – Vegetation is well established when there is 100% ground cover. This can be achieved by adequate existing sod, installed sod that is rooted and growing, or newly established vegetation that has gone through a growing season and provides 100% ground cover.

Wetlands – For the purposes of this technical standard, this includes all wetlands, including areas determined as prior converted (PC) in accordance with the 1985 Food Security Act (or similar FSA determinations), which retain wetland characteristics. This includes areas that may be exempt under the Wetland Conservation (WC) provisions, but that meet wetland criteria.