NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

VEGETATED TREATMENT AREA

(Ac.)

CODE 635

DEFINITION

An area of permanent vegetation used for agricultural wastewater treatment.

PURPOSE

To improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.

CONDITIONS WHERE PRACTICE APPLIES

Where a vegetated treatment area (VTA) can be constructed, operated, and maintained to treat contaminated runoff from such areas as feedlots, compost areas, barnyards, and other livestock holding areas; or to treat process wastewater from agricultural operations.

CRITERIA

Vegetated treatment areas shall comply with all applicable laws, rules, regulations, and permit requirements including those applicable to the discharges of waters to the state.

Base the total treatment area for the VTA on the soil's capacity to infiltrate and retain runoff within the root zone and the vegetation's agronomic nutrient requirements. 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. Base the runoff determination on the most restrictive soil layer within the root zone regardless of its thickness.

Divert uncontaminated water from the treatment area to the fullest extent possible unless additional moisture is needed to manage vegetation growth in the treatment area.

Design the VTA based on the need to treat the runoff volume from the 25-year, 24-hour storm event from the agricultural animal management facility. Infiltrate a portion or the entire volume of the design storm, based on management objectives. The portion of the design volume not infiltrated shall be stored for utilization or treatment unless discharge is permitted by applicable regulations.

The VTA design for processed water shall be based on the nutrient contents of the processed water and the VTA's ability to hold and uptake the nutrients.

Nutrient loading of VTAs shall be based on crop removal of the vegetation used in the VTA.

A sediment basin or other solids removal method designed according to an appropriate South Dakota (SD) Natural Resources Conservation Service (NRCS) Conservation Practice Standard (CPS) must be used to minimize entry of solids into the VTA. The design and construction of sediment basins shall be according to SD NRCS CPS Sediment Basin (350).

Permanent vegetation consisting of a single species or a mixture of grasses, legumes, and/or other forbs adapted to the soil and climate shall be established in the treatment area. Selected species shall be suited to current 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 contaminated runoff. Site preparation and seeding shall be done at a time and in a manner that best ensures survival and growth of the selected species. Specific seeding requirements shall meet the VTA criteria located in SD Range Technical Note No. 4 and

the SD NRCS CPS Critical Area Seeding (342).

Vegetation shall be able to withstand anticipated wetting and/or submerged conditions. Harvest VTA, as appropriate, to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue. Care shall be taken during harvest of the VTA area to not damage the functionality of the treatment area. Any wheel tracks, ruts, or other surface damage shall be repaired and revegetated.

Exclude livestock access to the VTA.

Locate VTAs outside of floodplains. However, if site restrictions require location within a floodplain, the site shall be protected from inundation and damage that may occur during the 100-year frequency, 24-hour duration flood event. The analysis of the floodplain or storm event must be completed at the site-specific project location. For a structure to be protected from inundation, the lowest part of the VTA or containment berm shall be at least 1 foot above the elevation of the 100-year frequency, 24-hour duration flood event.

The water table shall be either naturally deep enough or artificially lowered so that the infiltrated runoff does not mingle with the ground water at the bottom of the root zone. Subsurface drainage shall not be provided within the VTA. Subsurface drainage may be used to lower the seasonal high water table to an acceptable level provided the subsurface drain lines are at least 10 feet away from the VTA.

Infiltration areas shall not be planned where soil features such as cracking will result in preferential flow paths that transport untreated runoff from the surface to below the root zone, unless the soil moisture can be maintained to prevent drying and cracking.

Additional Criteria for Sloped VTA Application Areas

Discharge into and through treatment areas shall be applied as sheet flow. Where sheet flow is planned, some means, such as a ditch, curb, gated pipe, level spreader, or a sprinkler system, shall be provided to disperse concentrated flow and ensure sheet flow across the treatment area. Land grading and structural components necessary to maintain sheet flow throughout the treatment area shall be provided as necessary.

Sloped vegetated treatment areas must have a minimum flow length of 100 feet. The natural or constructed slope of the VTA shall be 0.3 to 6 percent. The entrance slope to the VTA shall not be flatter than one percent.

CONSIDERATIONS

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

Utilize a level vegetated infiltration basin (VIB) and/or containment berm at the downstream end of the sloped VTA to intercept runoff especially when runoff from the VTA will flow into surface water.

Locate VTAs in areas that will reduce the impact on wells.

Utilize a sprinkler VTA system to promote even application of runoff water to the VTA.

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

Utilize inlet control structures to prevent undesirable debris from entering the VTA, to control the rate and timing of inflow during normal operations, and to control inflow as necessary for operation and maintenance.

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

Store seasonal contaminated water upstream of the VTA during excessively wet or cold climatic conditions.

Consider suspension of application to treatment area when weather conditions are not favorable for aerobic activity or when soil temperatures are lower than 39^0F. When soil temperatures are between 39^0F and 50^0F, consider reducing application rate and

increasing application period while maintaining a constant hydraulic loading rate.

Manage the VTA to maintain effectiveness throughout the growing season. Time the harvest of the VTA plants so vegetation can regrow to a sufficient height to effectively filter effluent late in the growing season.

Effluent from the VTA may be stored for land application, recycled through the wastewater management system, or otherwise used in the agricultural operation.

Fences or other measures may be needed to exclude or minimize access of the VTA to humans or animals that would inhibit its function.

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 perimeters, 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, and slope of the treatment area to accomplish the planned purpose (length refers to flow length down the slope of the treatment area);
- 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

Develop an Operation and Maintenance Plan that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its design.

The plan shall include the following as appropriate:

- Control undesired weed species, especially state-listed noxious weeds, and other pests that could inhibit proper functioning of the VTA.
- Inspect and repair treatment areas after storm events to fill in 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 treatment area as necessary by periodically grading when deposition jeopardizes its function, and then reestablishing to herbaceous vegetation.
- Routinely de-thatch and/or aerate treatment areas used for treating runoff from livestock holding areas in order to promote infiltration.
- Conduct maintenance activities only when the surface layer of the VTA is dry enough to prohibit compaction.

Treatment areas in arid or semiarid regions that potentially could be affected by high salinity and/or sodium content should be monitored for excessive salt and sodium buildup. If excessive salt or sodium is found, an appropriate corrective action shall be taken.

REFERENCES

USDA/NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook. 1992. Last revised, June 1999.

Koelsch, R., B., Kintzer, and D. Meyer. (ed.), 2006. Vegetated Treatment Systems for Open Lot Runoff - A Collaborative Report. USDA, NRCS. http://www.heartlandwq.iastate.edu/ManureManagement/AlternativeTech/Avtsguidance/.