

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WASTEWATER TREATMENT STRIP

(ac.)
CODE 635

DEFINITION

A treatment component of an agricultural waste management system consisting of a strip or area of herbaceous vegetation.

PURPOSE

The purpose of this practice is to improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with animal manure and other wastes, and wastewater by treating agricultural wastewater and runoff from livestock holding areas with:

Rapid infiltration;

Overland flow, or;

The slow rate process.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies:

Where a treatment strip is a component of a planned agricultural waste management system with less than 300 animal units;

Where a treatment strip can be constructed, operated, and maintained without polluting air or water resources;

To the treatment of organically contaminated runoff from feedlots, barnyards, and other livestock holding areas;

To the treatment of dilute wastewater such as milk house effluent and diluted silage leachate.

CRITERIA

Laws and regulations. This practice must meet all federal, state, and local laws and regulations. Laws and regulations of particular concern include those involving zoning, water and drainage rights, land use, land disturbance by construction, pollution control, property easements, wetlands, preservation of cultural resources, and endangered species.

Where South Dakota Department of Environment and Natural Resources (SD DENR) approval is to be obtained, SD DENR requirements must be met.

Other General Criteria. Inflow to wastewater treatment strips shall be pretreated as appropriate. Pretreatment is often needed to prevent excessive nutrient application. As a minimum, solids must be removed from the liquids before the liquids enter the treatment strip.

Clean water shall be diverted from the treatment strip to the fullest extent possible unless needed to promote vegetation growth in the treatment strip.

Discharge to and through treatment strips shall be as sheet flow. Some means, such as weirs, or gated pipe, shall be provided to disperse concentrated flow and ensure sheet flow across the width (dimension perpendicular to flow length) of the treatment strip. Land grading and structural components necessary to maintain sheet flow shall be provided as necessary.

Permanent herbaceous vegetation consisting of grasses, legumes, and/or other forbs adapted to the soil and climate shall be established in the treatment strip according to Natural Resources Conservation Service (NRCS) South Dakota Practice Standard Critical Area Planting (342). Vegetation shall be able to withstand the planned nutrient loading and anticipated wetting and/or submerged conditions.

Design the system to suspend wastewater application to treatment strips when soil temperatures are below 39°F. While soil temperatures are between 39°F and 50°F, reduce the application rate and increase the application period. Storage shall be provided for use when the amount of available wastewater exceeds the design hydraulic loading rate and for strip non-operating periods.

Polluted water discharged from the treatment strip shall be transferred to a waste storage facility, or

Conservation practice standards are reviewed periodically and updated if needed. The current version of this standard is on our eFOTG web site available at www.sd.nrcs.usda.gov or may be obtained at your local Natural Resources Conservation Service.

otherwise prevented from entering groundwater or Waters of the United States.

Treatment strips should be located outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 100-year flood event except as approved by SD DENR.

Designs shall be based on the latest edition of the U.S. Environmental Protection Agency Technology Transfer Process Design Manual for Land Treatment of Municipal Wastewater or other technically acceptable reference.

Additional Criteria For Rapid Infiltration Treatment

Rapid infiltration treatment refers to a specific remediation technique that utilizes the filtering capabilities of moderately and highly permeable soils. Treatment for this purpose shall consist of directing wastewater or contaminated runoff from a small livestock holding area into a uniformly graded strip or area of herbaceous vegetation and allowing it to flow over and infiltrate the treatment strip. This method is not appropriate for treatment of water containing high nutrient concentrations.

The treatment strip shall be a uniformly graded strip or wide-bottomed trapezoidal channel.

The treatment strip design shall be based on runoff volume from the 25-year, 24-hour storm event from the drainage area. It may be designed to infiltrate a portion or the entire volume of the design storm. The portion of the design volume not infiltrated shall be transferred to a waste storage facility or otherwise prevented from entering groundwater or Waters of the U.S.

The treatment strip's area requirements shall be based on the soil's capacity to infiltrate and retain runoff within the root zone and the vegetation's capability to utilize the nutrient loading. The soil's ability to infiltrate and retain runoff shall be based on its water holding capacity in the root zone, infiltration rate, permeability, and hydraulic conductivity. This determination shall be based on the most restrictive soil layer within the root zone regardless of its thickness. The anticipated nutrient loading shall not exceed the vegetation's agronomic nutrient requirements.

The upper soil profile must remain unsaturated except during storm events and must return to an unsaturated condition within two days following storm events. Either naturally or by design, the water table shall not be closer than two feet to the

root zone or to infiltrated, polluted water. Infiltration strips shall not be planned where soil features such as cracking will result in flow paths that transport polluted water from the surface to below the root zone.

Additional Criteria For Overland Flow Treatment

Overland flow treatment refers to a specific microbial remediation technique that has minimal infiltration of wastewater. Treatment consists of the application of wastewater along the upper portion of a uniformly sloped strip of herbaceous-vegetation, allowing it to flow over the vegetated surface for aerobic treatment to a collection ditch.

The design hydraulic loading rate and application rate shall be based on anticipated levels of pretreatment, content of effluent, and climatic conditions such as temperature. The hydraulic loading rate shall not exceed 2.0 inches per day and the application rate shall not exceed 8 gallons per hour per foot of slope width, except where higher rates can be justified by on-site studies.

The application period shall not exceed 12 hours per day and the application frequency shall not exceed 5 days per week except where justified by local conditions.

The nutrients anticipated to infiltrate the treatment strip shall not exceed the vegetation's agronomic nutrient requirement.

Soils with low permeability are required for overland flow treatment. The design shall be based on the most restrictive soil layer within the root zone. The maximum allowable permeability shall be 0.2 inches per hour unless a natural or constructed barrier within the soil profile prevents ground water contamination.

The minimum slope length for the applied wastewater shall be 100 feet.

The sloped areas to receive wastewater shall be uniformly graded to eliminate wastewater ponding and short-circuiting for the length of the flow. Slopes shall be between 2.0 percent and 8.0 percent.

Additional Criteria For Treating Wastewater With The Slow Rate Process

The slow rate process refers to a specific remediation technique involving the application of wastewater to a vegetated surface for treatment as it flows down through the plant-soil matrix.

Design hydraulic loading shall be based on the more restrictive of either soil permeability or nitrogen concentration in water percolating below the root zone. Percolate nitrate-nitrogen concentration leaving the root zone shall not exceed 10 mg/L. The anticipated nutrient loading shall not exceed the vegetation's agronomic nutrient requirement.

Wastewater shall be applied evenly over the entire treatment strip at a rate that does not exceed the soil infiltration rate.

CONSIDERATIONS

More than one treatment strip should be considered to allow for resting, harvesting, maintenance, and to minimize overloading.

PLANS AND SPECIFICATIONS

Plans and specifications shall meet this standard and shall describe the requirements needed to achieve its purpose. Plans and/or specifications must include:

Location, construction sequence, and length, width, and slope of the treatment strips;

Site preparation requirements;

Herbaceous species, seed selection, seeding rates, planting dates, and other items needed to assure an acceptable rate of survival.

OPERATION AND MAINTENANCE

An Operation and Maintenance Plan shall be developed for use by the owner/operator. The plan shall include, as appropriate:

Harvest of vegetation as appropriate to encourage dense growth, maintain upright plant habit, and remove nutrients and contaminants that are contained in the plants.

Control undesired weed species, especially state-listed noxious weeds.

Control rodent and other animal damage.

Inspect and repair treatment strips after storm events to remove sediment, fill in gullies, prevent concentrated flow and re-seed disturbed areas.

Apply supplemental nutrients as needed to maintain the herbaceous vegetation.

De-thatch and/or aerate treatment strips to promote infiltration where appropriate.

Conduct maintenance activities only when the treatment strip is dry.

Prevent inappropriate grazing.

Prevent using the strips as a road or for routine equipment travel.

Monitor salinity and/or sodicity (sodium content) as appropriate for excessive salt and sodium buildup. Take appropriate corrective action.