Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

WASTE TREATMENT

CODE 629

(no)

DEFINITION

Use of mechanical, chemical, or biological technologies to change the characteristics of manure and agricultural waste.

PURPOSE

This practice is used to achieve one or more of the following purposes:

- Improve water quality in surface and ground water by better management of excess nutrients from manure or agricultural waste
- Improve air quality by reducing particulate and greenhous gas emissions and objectionable odors from manure or agricultural waste
- Facilitate desirable handling and storage properties of manure or agricultural waste
- Convert manure and other agricultural waste into organic amendment beneficial to soil health

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where manure and/or agricultural waste is being generated and where soils, geology, and topography are suitable for construction of the planned waste treatment system. This practice is used where surface and groundwater need to be protected as potential sources of drinking water and where degradation of water quality will impact the intended use of surface and ground waters. The practice is also used where improvements are needed to air quality to reduce air emissions and odors. This practice does not apply to waste treatment systems that fall under the scope of other currently accepted conservation practice standards.

CRITERIA

General Criteria Applicable to All Purposes

Laws and regulations

Plan, design, and construct the waste treatment facility to meet all Federal, State, Tribal, and local laws and regulations.

Locate utilities

Prior to construction, instruct the contractor to locate all buried utilities applicable to the project area, including drainage tile and other structural measures. Plan the site construction to protect natural resources and accommodate existing utilities.

Location

Locate the waste treatment facility as near the source of waste to be treated as practicable and as far as possible from neighboring dwellings, public or private water supply sources, critical aquifer protection areas, or public use areas.

Locate and design the waste treatment system such that it is outside the 100-year floodplain unless site restrictions require locating it within the floodplain. If located in the floodplain, protect the facility from inundation or damage from a 25-year flood event. Additionally, follow the policy found in the NRCS General Manual (GM) (Title 190), Part 410, Subpart B, Section 410.25, "Flood Plain Management," which may require providing additional protection for storage structures located within the floodplain.

Manure or agricultural waste characteristics
A waste treatment system may require specific total solids and nutrient contents of the waste stream. Pretreatment options such as dilution or settling may be necessary to adjust the solids content before entering the waste treatment system. Ensure the treatment system design can handle the specific total solids and nutrient content of the waste stream.

Design documentation
The provider of the planned waste treatment technology will supply to NRCS and the client or decision maker a complete detailed design of the systems and treatment process that clearly identifies the objectives and anticipated outcomes of implementing the waste treatment.

Design documentation must include appropriate system and process diagrams with operation and treatment technology guidelines, containing at a minimum—

- Waste processing rates including input, treatment stages, and portions of waste recycled.
- Waste load projections including volume, mass, and characteristics of the waste important to the waste treatment facility or process.
- Unit process volumes and hydraulic retention times where appropriate.
    - Adequately size the waste treatment system and backup capacity to store accumulated waste during operation and potential repairs following a shutdown event. Waste storage size (tanks, ponds, and pits) must be based on worst-case scenario for expected down-time due to maintenance and repair.
- Air emissions such as green house gas and ammonia projections from the system.
- Nutrient fate projections within the treatment system.
- Process monitoring and control system requirements as described in the Monitoring Criteria section.
- Operating and maintenance tasks and schedule to provide the service life as expected in the system performance.
- Troubleshooting guide for waste treatment facility operators.

Components
Waste treatment facilities and processes may consist of multiple components. Where criteria for individual components are described in other NRCS CPSs, use those CPSs and their criteria for planning, designing, and installation of such components.

Where components of a facility or process are not described in other NRCS CPSs, the system provider will furnish a minimum one-year warranty on all construction, equipment, and applied waste treatment components and systems.

All precast concrete materials shall be constructed in accordance with ASTM C913 - "Precast Concrete Water and Wastewater Structures". All other materials shall conform to the applicable ASTM specifications.

Components shall be suitable for the site conditions. These conditions include vehicular traffic and soil loads, corrosion of materials, floatation of tanks, and frost action.

Expected system performance
The provider of the waste treatment technology will clearly document to NRCS and the client or decision maker the expected system performance prior to system installation. The technology provider will provide the characteristics of the influent waste stream important to the waste treatment process. At a minimum, the technology provider will document all expected system volumetric flow rates, macronutrient reductions or changes in macronutrient form, expected pathogen reductions, and decreases or increases of emissions of particulate matter, ammonia, volatile organic compounds, oxides of nitrogen (NOx), hydrogen sulfide, methane, nitrous oxide, and carbon dioxide.

Where use of a waste treatment facility or process to improve one resource concern, such as water quality, negatively impacts another, such as air quality/odor, document the strategy to address the impacts and mitigation measures such as installation of vegetative barriers or timing of treatment to minimize impacts.

Operating costs
The provider of the planned waste treatment system will supply to NRCS and the client or decisionmaker an estimate of the annual operating costs. Include the costs for time, labor, energy, supplies, chemicals, and equipment requirements for each component of the waste treatment system. Identify any operating costs in the estimate not based on actual cost data.

Operating benefits
The provider of the planned waste treatment system will supply to NRCS and the client or decisionmaker a separate list of the benefits or savings the waste treatment will have on waste management operations.

Monitoring
Identify, design, and install the necessary monitoring methods and equipment to control, optimize, and maintain the waste treatment system and processes. Include critical recordkeeping tasks for all necessary system monitoring as specified in the operation and maintenance plan.

Handling and storage
Handle and store all byproducts to prevent exposure to hazardous or flammable material or odor nuisances to neighbors and the public at large.

Safety
- Include safety features in the design to minimize hazards.
- Document identified hazard prevention in the operation and maintenance plan.
- Provide guards and shields for moving parts of the equipment used in the facilities.
- Install exclusion fences and post warning signs where needed to prevent unauthorized entry by people or livestock.
- Design and install adequate building ventilation or removal and containment of dangerous gases.

Waste treatment performance technical review
The waste treatment technology provider must supply verification from an independent third-party source of the expected waste treatment system performance related to changes in form, nutrient fate projections, macronutrient reductions, pathogen reductions, and air emissions (particulate matter, ammonia, volatile organic compounds, oxides of nitrogen (NOx), hydrogen sulfide, methane, nitrous oxide, and carbon dioxide). Third-party verification sources can include a university, research center, or other accredited entities that have papers on the technology published in peer-reviewed journals, to document the effectiveness of the technology to achieve its intended purpose. Information must provide certifiable data demonstrating performance results of the use of the treatment system or process in similar situations and locations. If available, also document the effectiveness of the same treatment technology under different climatic factors.

Byproducts
Implementation of the waste treatment process or the operation of a waste treatment facility must not harm the environment with the handling or discharge of waste byproducts. The facility plan will include a listing of any permits or permissions required for byproduct disposal.

Byproducts utilized on cropland for plant nutrients must meet the criteria in NRCS CPS Nutrient Management (Code 590).

When not land applied, recycle the waste treatment byproducts to the extent possible.

Unmarketable/unusable byproducts must be minimized to the extent practicable and disposed of in accordance with all applicable Federal, State, Tribal, and local laws and regulations. Prepare a plan for regulatory approval for dealing with unmarketable byproducts prior to utilization of the process or installation of the waste treatment facility.

Additional Criteria Applicable to Milkhouse Wastewater Infiltration Areas
This practice is intended for milkhouse wastewater from small dairy operations where the anticipated flow is ≤ 350 gallons per day. Manure from the animals shall be excluded from the system. This practice does not apply when it is practical and reasonable to add the wastewater to the waste storage facility.

This practice shall be located and designed using the procedure shown in the Agricultural Waste Management Field Handbook (AWMFH) Chapter 10, Section 651.1004(k), Amendment VT-1, "Milkhouse Wastewater Infiltration Area".

Air Trap
An air trap shall be installed in the distribution pipeline. The purpose is to prevent gases from entering the milking center.

Air Vent
Air vents shall be installed where needed to maintain atmospheric pressure in the system. Odors may be prevalent from air vents.

Pipeline
For gravity systems the pipeline shall be PVC pipe with a minimum inside diameter of 4 inches. MInimum slope for gravity pipelines shall be 1 percent. Pipe for pumped systems shall meet the pump manufacturer's specifications for size and pressure rating. Clean out access to the pipeline shall be provided at every deflection greater than 45 degrees, system high points, system low points, and at intervals not exceeding 100 ft. Pipe shall be located at an adequate depth or otherwise protected to avoid vehicular and frost damage.

Settling Tank
A settling tank shall be used to trap heavy solids.

A grease trap shall be used to remove milk fats, grease, and other floatable solids.

The combined capacity of the solid and grease traps shall be a minimum of six (6) times the actual daily flow. The settling tank and grease trap shall be water tight, designed not to float, and be accessible year-round for periodic clean out. Clean out ports shall have risers and covers for accessibility and safety.

Effluent filter
A minimum of one effluent filter shall be installed at the outlet end of the grease trap. The maximum size opening of the filter shall be 1/32 inches and shall be designed to handle the anticipated flow rate.

This filter shall be removable for periodic cleaning and maintenance.

Pump

If necessary a pump station shall be installed to transfer wastewater from the wastewater source to the settling basin. The settling basin and grease trap shall be located to provide gravity feed to the disposal field. Pumping wastewater directly to the disposal field will not be allowed. This standard does not address or provide criteria for pressurized disposal fields.

A standard sanitary pumping station is recommended. The pump station shall have a riser and cover for year-round accessibility and safety. The pump shall be a solids handling type sewage pump designed to handle the anticipated flow rate and hydraulic head.

Disposal Field

A site investigation is required to locate the disposal field. The disposal field should be located as far as practical from water sources, property lines, and other resource concerns. See AWMFH, Amendment VT-1, Table 1 for minimum isolation distances from any edge of the disposal field.

A soil investigation, with at least one soil observation describing the representative soil profile, is needed to size and locate the disposal field. Select the soil profile shown in Table 2 of the AWMFH, Amendment VT-1, which best describes the soil on site to design the system. If possible, a soil scientist should conduct this investigation.

Soils that are in Design Class 2 or 3 as defined in Table 3 of the AWMFH, Amendment VT-1, must be modified to protect groundwater.

Exclude all surface and subsurface water from the disposal field.

Fence around the disposal field as necessary to exclude equipment and animals. Follow NRCS CPS Fence (Code 382).

CONSIDERATIONS

General Considerations

Location

Consider elevation and slope for gravity flow, transfer distance, vehicle access, wind direction, proximity to streams, water bodies, flood plains, and public visibility.

Visual screening

Consider the visual impact of the waste treatment facility or process within the overall landscape context. Use vegetative plantings, landforms, and other measures to alleviate a negative impact or enhance the view.

Milkhouse Wastewater Infiltration Area Considerations

Whenever possible, the first flush (when washing the milking system) should be diverted away from the infiltration system and used to feed the livestock.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for waste treatment facilities in accordance with the criteria of this standard and good engineering practices.

As a minimum, in the plans and specifications provide—

- Layout and installation details of livestock facilities, waste collection points, waste transfer components, waste treatment, and storage facilities with supporting documentation.
- Location of all inflow and discharge pipelines, pipeline materials, and pipe diameter, slope, and appurtenances.
- Required properties of any locally sourced materials such as sand or gravel used in the treatment

processes.

- Details of structural support systems for all components of the treatment facility.
- Fencing and signage as appropriate for safety purposes.
- Required tests of the treated waste as appropriate for confirmation of treatment effectiveness.
- Other plans to manage the system including a nutrient management plan for proper land application of byproducts if applicable.

OPERATION AND MAINTENANCE

Develop an operation and maintenance (O&M) plan and review it with the client or decision maker prior to construction of the innovative waste treatment facility or waste treatment process. Ensure the O&M plan is compatible with the proper operation of all associated system components and contains requirements including but not limited to—

- Recommended loading rates of the waste treatment facility or process for hydraulic and critical pollutant parameters.
- Proper operating procedures for the waste treatment facility or process, including the amount and timing of any chemicals added.
- Operation and maintenance manuals for pumps, blowers, instrumentation and control devices, and other equipment used as components of the waste treatment facility or process.
- Description of the planned startup and shutdown procedures, normal operation, safety issues, and normal maintenance items.
- Alternative operation procedures in the event of equipment failure.
- Troubleshooting guide.
- Monitoring and reporting plan designed to demonstrate system performance on an ongoing basis.
- The service life of each component as identified by the component manufacturer or system provider. The minimum service life for the waste treatment facility or process is 10 years. Where components have less than a 10-year service life, clearly identify their planned replacement schedule.
- Provision of personal protective equipment and clothing for proper handling of hazardous materials by workers, and worker training regarding the proper procedures for these environments and associated tasks.
- Carrying out all treatment processes in accordance with safety regulations established by Occupational Safety and Health Administration and other pertinent regulatory agencies.

Additional O&M Requirements for Milkhouse Wastewater Infiltration Areas

- ***Settling basin and grease traps shall be monitored regularly and periodically cleaned out as required. Proper disposal shall be storage in a waste storage facility, land application, or other acceptable means.***
- ***Shields and other safety features shall be installed and maintained on pumps as per manufacturer.***
- ***Vent pipes for covered tanks shall be kept clear of obstructions.***
- ***Safety precautions shall be exercised prior to entering confined spaces which may contain asphyxiating gases (i.e. self-contained breathin apparatus, proper ventilation, etc.).***
- ***Maintain adequate vegetative cover on the disposal field and adjacent areas.***
- ***Repair of damage to any earthfills, fences, pipes, and other appurtenances.***
- ***Maintain lids and openings to underground structures to ensure year-round access.***
- ***Maintain grates on drains and subsurface drainage systems to ensure they are functional.***
- ***Ensure waste milk is not dumped into the treatment system.***

- ***Strongly consider feeding out the first flush of the system to avoid excess fats from entering the system.***

REFERENCES

USDA NRCS. 2010. General Manual (Title 190), Part 410, Compliance with NEPA. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2012. National Engineering Handbook (Title 210), Part 651, Agricultural Waste Management Field Handbook. Washington, D.C. https://directives.sc.egov.usda.gov/

USDA NRCS. 2017. National Engineering Manual (Title 210). Washington, D.C. https://directives.sc.egov.usda.gov/