NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
ARIZONA

WASTE TREATMENT

(No.)

CODE 629

DEFINITION

The mechanical, chemical or biological treatment of agricultural waste.

PURPOSE

To use mechanical, chemical, or biological treatment facilities and/processes as part of an agricultural waste management system:

- To improve ground and surface water quality by reducing the nutrient content, organic strength, and/or pathogen levels of agricultural waste.
- To improve air quality by reducing odors and gaseous emissions
- To produce value added byproducts
- To facilitate desirable waste handling, storage, or land application alternatives.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where the form and characteristics of agricultural waste make it difficult to manage so as to prevent it from becoming a nuisance or hazard or where changing the form or composition provides additional utilization alternatives, and where conventional waste management alternatives are deemed ineffective. More specifically, *this practice may be applied as part of an agricultural waste management system where*:

- Liquids and solids need to be separated for further processing or for effective transport and subsequent utilization.
- Raw agricultural waste contains excess nutrients for land application based on crop utilization requirements or nutrient ratios need to be modified to be more consistent with crop utilization requirements.
- There is a need to reduce the potential for leaching or runoff of nutrients.
- Odors and/or gaseous emissions from livestock production facilities and waste storage/treatment system components must be reduced.
- Value-added byproducts can be produced to offset treatment costs.
- Reduction of pathogens is required.

CRITERIA

General Criteria Applicable to All Waste Treatment Purposes

Waste treatment facilities shall be designed on an individual basis to meet site conditions and functional requirements. They shall be part of an approved and overall engineering plan for irrigation, drainage, wildlife, recreation, channel improvement, or similar purposes.

Design and implementation of subsidiary components and/or structures shall meet all applicable Natural Resource Conservation Service (NRCS) conservation practice standards. The criteria for the design of any components not specifically addressed in NRCS practice standards or specifications shall be consistent with sound engineering principles and/or manufacturer recommendations.

Laws and Regulations. Waste treatment facilities and processes must be planned, designed and constructed to meet all federal, state, *Tribal* and local laws, *rules,* and regulations. *Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, preservation of cultural resources,*

and endangered species. State water and air quality standards shall be followed.

The owner is responsible for securing necessary permits and water rights, complying with all laws and regulations, and meeting legal requirements applicable to the installation, operation, and maintenance of this practice and associated structures.

Cultural Resources and Wildlife Habitat. *Impact to cultural resources, wetlands and Federal and state protected species shall be evaluated and avoided or minimized to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH), National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).*

Design. The system provider shall complete and supply to the land owner/operator a detailed design of the facility/process clearly outlining the objectives and anticipated outcomes of implementation.

The design documentation shall include a process diagram containing, at a minimum, the following information:

1. Volumetric flow rates including influent, effluent, and recycle streams.
2. Waste load projections including volume, mass, and characteristics of the waste important to the waste treatment facility or process.
3. Unit process volumes and hydraulic retention times where appropriate.
4. Air emissions projections from the system.
5. Nutrient fate projections within the system.
6. Process monitoring and control system requirements as described below in the Monitoring section of the criteria.

Independent, verifiable data demonstrating results of the use of the facility or process in other similar situations and locations shall be provided.

Where use of a waste treatment facility or process to improve one resource concern negatively impacts another, impacts and mitigation measures, if required by state or local agencies, are to be documented. The mitigation measures shall become a required component of this practice.

National Engineering Manual, Part 531, Geology, specifies geologic investigation requirements and soil transportation regulations.

Plans and Specifications to document this practice shall be as described below.

Components. Waste treatment facilities and processes may consist of multiple components. Where criteria for individual components are described in existing NRCS practice standards, those practice standards and their specific criteria shall be used for planning, designing, and installation of that component.

Where components of a facility or process are not described in a current NRCS practice standard, the system provider shall furnish a one year warranty on all construction or applied processes. In addition, the manufacturer shall provide a warranty that describes the service life of each component and what the warranty covers.

The waste treatment facility or process shall have a minimum practice life of ten years. Where components have less than a ten year service life, their planned replacement during the life of the practice shall be clearly identified in the Operation and Maintenance Plan.

Expected System Performance. The expected system performance shall be clearly documented prior to system installation. At a minimum, the expected system volumetric flow rate, expected macro-nutrient reductions or change in form,

expected pathogen reductions, gaseous ammonia and hydrogen sulfide emissions reductions (or increases) shall be documented.

Operating Costs. Where components of a facility or process are not described in a current NRCS Conservation Practice Standard, the system provider shall furnish an annual estimate of operating costs for the system. Operating costs not based on actual systems data shall be clearly identified as estimates.

Monitoring. Equipment needed to properly monitor and control the waste treatment facility or process shall be installed as part of the system. Process control parameters to be monitored shall include those parameters identified in the design documentation. Parameters considered critical to proper system operation shall be identified in the Operation and Maintenance Plan. Run status of critical equipment and unit processes shall be monitored.

Byproducts. Implementation of a waste treatment process or operation of a waste treatment facility shall not result in discharge of byproducts harmful to the environment.

All byproducts shall be handled and stored in such a manner as to prevent nuisances to neighbors or to the public at large.

Byproducts land applied to supply plant nutrients shall meet the criteria in NRCS Conservation Practice Standard 633, Waste Utilization and NRCS Conservation Practice Standard 590, Nutrient Management.

Any unmarketable or unused byproducts shall be handled and disposed of in accordance with all applicable federal, state, and local laws and regulations. A plan for dealing with such byproducts shall be prepared and approved by NRCS prior to utilization of the process or installation of the waste treatment facility, and shall include a listing of any permits or permissions required for the execution of the plan.

Byproducts shall be recycled to the extent possible without causing a hazard to the environment.

Safety. Design of the process or facility shall include safety features to minimize hazards. Guards and shields shall be provided for moving parts of the equipment used in the treatment process. Waste treatment facilities shall be fenced and warning signs shall be posted where needed to prevent children and others from entering a hazardous area.

All treatment processes shall be carried out in accordance with all safety regulations. Protective clothing shall be utilized when handling potentially harmful chemicals that may be used in the process. Proper ventilation shall be provided.

Investigations, Surveys and Design Criteria. *Waste treatment facilities or systems include practice components required for the complete management of waste. Documentation requirements will be as outlined below, in additional to the documentation requirements of the practice components used in the system.*

Make a preliminary site assessment or reconnaissance to determine the complexity of the problem, availability of land for utilizing the waste and water, and to select the type of waste treatment component(s) which will best meet the needs of the owner to operate the system.

1. *Review of soil borings or geological site investigation, depending on existing site conditions or scope and complexity, to determine site feasibility. Documentation shall include the following, at a minimum:*
   a. *Ground surface elevation of each hole or site, where applicable, and depth to ground water and seasonal high water table;*
   b. *Description of each soil material (silty sand, lean clay, etc.), classification of each material (SM, CL, etc.) by the unified soil classification system;*
   c. *Estimate of soil permeability of underlying materials (permeable, low permeability, etc.) and soil limitations, if any.*

2. *Determine if the waste management and treatment system is to be designed for phosphorous or nitrogen (limiting nutrient).*
3. *Inventory of system- method of operation, number of livestock, waste disposal methods, type of equipment, future expansion plans, crop rotations on planned areas, component locations, structure requirements, quantities and costs.*
4. *Verify appropriate state or local laws for permitting and approval requirements and notify landowner of his/her responsibilities.*
5. *Verification or certification of used materials (if any).*

To adequately plan and layout this practice, a detailed topographic survey is required, that adequately details:

1. *Adequate topographic survey and information at the proposed location of the waste storage facility in order to determine excavation and/or earthfill requirements, the drainage area around barns, high intensity areas (HIA), and pastures contributing runoff to the proposed facility. Obtain topographic data with the land disposal area to determine waste distribution system layout, pumping requirements and costs; to determine*
2. *Location of underground or overhead utilities or markers;*
3. *A permanent benchmark(s) shall be set and described. Preferably, the elevations and coordinates should be based on a local (assumed) or coordinate system (State or grid) and clearly stated on the plan. Datum may be in the form of Northing and Easting coordinates, or Longitude and Latitude.*

Where applicable, USGS 7.5-minute topographic Quadrangles may be used, provided hydraulic analysis verifies minimum criteria are meet at all locations.

The design of a practice is the application of Field Office Technical Guide practice standards, NEH Part 651, AWMFH, using experience and judgment in the development of a solution to the problem or the objective. All computations and decisions made during the design of a practice are to be checked by another qualified individual and appropriate notations made. Design computations, calculations or analysis shall meet the following criteria:

1. *Size the waste management and treatment system and/or facilities using the appropriate engineering practice standard and the NEH Part 651, AWMFH.*
2. *Hydrologic determinations – documentation may include printouts from EFM2 or TR-55 programs or software/spreadsheets used for AWMS design.*
3. *Hydraulic calculations or analysis, as required to determine volumetric flow rates including influent, effluent, recycle streams and unit process volumes and hydraulic retention times where appropriate.*
4. *Manure production/volume calculations (waste load projections including volume, mass, and characteristics of the waste important to the waste treatment facility or process).*
5. *Air emissions and nutrient projections from the system.*
6. *Components shall be designed in accordance with applicable conservation practice standards (i.e., pipelines shall meet the requirements of conservation practice 430, Irrigation Pipeline, etc.).*
7. *Construction material estimates (material volume computations), includes estimates of earthwork, pipe, concrete, rock, vegetative components, geotextile and erosion control fabrics, or other appurtenances.*

***Installation and Basis of Acceptance**. For construction that does not meet State, OSHA, or Tribal criteria or requirements where deficient construction materials were used, NRCS may consider a waiver request for approval of construction after it has received a signed and sealed construction and/or material exemption from a licensed engineer. Required exemption shall be for installation of materials that do not meet minimum quality criteria as found in applicable Standards, Specifications, ASTM's, AWWA standards, etc.*

Contractors performing work under this practice shall abide by all federal, state or

Tribal laws or criteria, and must be licensed by the state board of technical registers where the work is being implemented.

CONSIDERATIONS

Location. The waste treatment facility should be located as near the source of manure or other waste as practicable and as far from neighboring dwellings or public areas as possible. Proper location should also consider slope, distance of manure and other waste transmission, vehicle access, wind direction, proximity of streams and flood plains, and visibility.

In determining the location of the facility, consider elevation and distance from various components to take advantage of gravity flow where possible.

Manure Characteristics. Waste treatment may require specific total solids and nutrient contents of the waste stream. Pretreatment options such as dilution or settling could be used to adjust the solids content before entering the waste treatment facility or process.

Visual Screening. The visual impact of the waste treatment facility or process should be evaluated within the overall landscape context. Screening with vegetative plantings, landforms, or other measures may be implemented to alleviate a negative impact or enhance the view.

PLANS AND SPECIFICATIONS

Use Arizona standard drawings to the extent possible. These may be supplemented by additional drawings or specification notes on the drawings to provide full installation instructions.

Construction plans shall include all components needed for the safe operation of the proposed improvements such as railing, fencing, or warning signs as appropriate. The plans shall address operations near existing utilities, trench excavations and any other items related to construction of the structure that may pose a safety risk to those involved.

Plans shall include engineering drawings*, specifications, material requirements, quantities, construction requirements and/or methods, equipment requirements,* and supporting documentation as well as other plans required to manage the system *or describe the work to be done*; e.g. a nutrient management plan for proper land application of byproducts*, and shall include all components needed for the safe operation of the proposed improvements such as railing, fencing, or warning signs as appropriate. The plans shall address operations near existing utilities, trench excavations and any other items related to construction of the structure that may pose a safety risk to those involved.*

Development of plans and specifications for waste treatment facilities *will be guided by the National Engineering Handbook, Part 650, the Engineering Field Handbook, Chapter 5, shall be in accordance with the National Engineering Manual, Parts 541 and 542, shall be prepared for specific field site or facility, and* shall be prepared in accordance with the criteria of this standard and good engineering practice. As a minimum, the plans and specifications shall provide the following:

- *Project location map, including section, township and range, North arrow, cooperator/owner acknowledgement and certification signature blocks, engineering job class (cover sheet);*
- *References that the owner/cooperator are responsible for all permits, rights-of-way, easements and the contact, coordination and location determination of any existing utilities or clearances (buried utility disclaimer);*
- *If applicable, a map showing the location of the practice(s) or system in reference to a known or established benchmark or reference point with the location, description and elevation clearly shown. Topographical features and/or controls shall be shown, showing tie in with existing or other planned practices;*
- *Field surveys and notes, soil investigations or geologic soil boring locations and soil classifications, earthwork or material estimates/quantities (foundation or subgrade preparation and requirements);*

- *Overall system or plan view (i.e., l*ayout and installation details of livestock facilities, waste collection points, waste transfer components, waste treatment and storage facilities; location of all inflow and discharge pipelines, pipeline materials, diameter and slope; *cross sections, as needed, to show all pertinent details such as side slopes, berms, bottom widths, thickness and elevation; special foundation or subgrade preparation requirements and details, including tolerances or smoothness of the finished grade; quality control testing;* fencing and signage as appropriate for safety purposes; *vegetative, requirements, if required; construction/installation criteria, State and Federal [OSHA] safety requirements, etc.), type, quality and quantity as necessary;*
- Details of support systems for all components *and appurtenances* of the treatment facility *(i.e., reinforced concrete sectional or detail views; location, type, size of construction joints, expansion-contraction joints or special joints for fabricated structures; etc.) as required, for proper system functionality;*
- *Construction notes or specifications to clarify a component and furnish directions or site specific requirements for obstruction removal;*
- *Use Arizona Construction and Material Specifications for each item of work and material, as applicable and available. Additional specifications may need to be written to provide full material and installation instructions. Fill in blanks and add or delete items from the specifications to make them fit the job as needed.*

All designs completed by non-NRCS personal shall meet minimum State licensing board requirements and NRCS requirements and criteria as outlined in the General Manual, the National Engineering Manual (including Arizona Supplements), and the National Engineering Handbook.

ONCE ALL PARTIES HAVE ACCEPTED AND SIGNED THE PLANS AND SPECIFICATIONS, NO CHANGES SHALL BE MADE TO THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF NRCS.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan, *specific to each site,* shall be developed and reviewed with the *land*owner/operator *or individual responsible for operation and maintenance of the facility or structures* prior to construction of a waste treatment facility or implementation of a waste treatment process. The O&M plan shall be *commensurate with the size and complexity of the project or system and shall be* consistent with the proper operation of all system components *and purposes of the practice, its intended life, safety requirements and the criteria for its design. It shall document needed actions, including reference to periodic inspections and the prompt repair or replacement of damaged components, and should provide specific instructions for operating and maintaining facilities to ensure they function properly* and shall contain 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 procedures, normal operation, safety issues, and normal maintenance items. This includes procedures for the planned replacement of components with less than a ten year service life.
- Alternative operation procedures in the event of equipment failure.
- Troubleshooting guide.
- Monitoring and reporting plan designed to demonstrate system performance on an ongoing basis.
- *Maintain all pumps, agitators, piping, valves, and other electrical and mechanical equipment in good operation condition following the manufacturer's recommendations.*

- *Fences and/or warning signs shall be maintained to prevent unauthorized human or livestock entry.*
- *Appurtenances such as trash racks, outlet structures, and valves shall be kept free of trash, debris, foreign materials or blockage and replaced when needed to prevent clogging of outlet and overflow pipes*
- *Eradicate or otherwise remove all rodents or burrowing animals that have or may potentially damage any part of the delivery or application facilities. Immediately repair any damage caused by their activity.*
- *Repair spalls, cracks, and weathered areas in concrete surfaces, and repair or replace rusted or damaged metal and paint.*
- *Maintain vigorous growth of desirable vegetative coverings. This may include re-seeding, fertilization, and controlled application of herbicides when necessary. Periodic mowing or grazing may be needed to control height.*
- *Apply insecticides for insect control as per manufacturer's recommendations and precautions.*
- *The practice should be inspected periodically and especially after storm events to determine whether it is functioning properly or if repairs are needed.*
- *Immediately repair any damage resulting from vandalism, vehicles, or livestock.*

REFERENCES

- *ASAE, 1984. D384 – Manure Production and Characteristics. ASAE. St. Joseph, MI.*
- *Midwest Plan Service. 1985. Livestock Waste Facilities Handbook and Livestock Waste Management Systems. MWPS, Department of Agricultural and Bio-systems Engineering, Iowa State University, Ames, IA.*
- *Quality Assurance and Quality Control for Waste Containment Facilities, EPA/1600/R-93/182, September 1993.*
- *NRCS, "Agricultural Waste Management Field Handbook", National Engineering Handbook, Part 651.*
- *National Engineering Handbook - Part 650, Engineering Field Handbook, Chapter 1 – Engineering Surveys; Chapter 3 – Hydraulics; Chapter 4 – Elementary Soils Engineering; Chapter 5 – Preparation of Engineering Plans; Chapter 6 – Structures; Chapter 10 – Agricultural Waste, and Chapter 17 – Construction & Construction Materials*
- *National Engineering Manual, Part 531 Geology 531.31, USDA, Natural Resources Conservation Service*
- *USDA-NRCS, TR-62 Engineering Layout, Notes, Staking and Calculations;*
- *General Manual, Title 420-Part 401, Title 450-Part 401, Title 190-Parts 410.22 and 410.26*
- *National Environmental Compliance Handbook*
- *National Planning Procedures Handbook*
- *USDA NRCS, Engineering Design Standards – Far West States*
- *National Cultural Resources Handbook*