

DEPARTMENT OF
ECOLOGY
State of Washington

Note that Anaerobic Digester rules have been updated in WAC 173-350-250, <http://apps.leg.wa.gov/wac/default.aspx?cite=173-350-250>.

Guidelines

Operating an Anaerobic Digester Exempted From Solid Waste Handling Permit

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Guidelines

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Waste 2 Resources Program
Washington State Department of Ecology
Olympia, Washington

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Other Anaerobic Digester Permits or Regulations

These guidelines identify the conditions where an anaerobic digester would be exempt from obtaining a solid waste handling permit. Anaerobic digester owners and operators must operate in compliance with other applicable regulations. The Governor's Office of Regulatory Assistance (<http://www.ora.wa.gov/>) may provide help in understanding additional permitting requirements and government regulations.

Information for some environmental requirements are listed below:

Air Quality

- **New or modified sources of air pollution in the State of Washington must obtain an air permit prior to beginning construction and operation** (Chapter 70.94 RCW). These air permits (Notice of Construction or Orders of Approval) include criteria pollutants such as particulates but also include toxic air pollutants such as ammonia and nitrogen dioxide.
- Information about applying for an air permit in the state of Washington can be obtained at <http://www.ecy.wa.gov/air.html>. This website provides a link to local air authorities.

Water Quality

- **Water quality permits are required for discharges to surface water and ground water** (RCW 90.48.160). Operators, including digesters and participating dairies, must manage their operations to ensure that they do not discharge.
- **Water Quality Permits are required prior to any discharge.** If an operator chooses to operate without applying for a discharge permit, it is the operator's responsibility to ensure that no discharges occur. Any discharges without a permit may be subject to enforcement actions.
- **A lagoon with a double liner, including a collection layer between the liners and a system to return any leakage to the lagoon, would be considered a non-discharging design that could be constructed without a water quality permit.** Generally lagoons with alternative liners need a State Waste Discharge Permit. State Waste Discharge Permits¹ are typically required for food processing facilities, mines, wastewater treatment facilities, wastewater reuse projects, large on-site sewage systems, and other industrial or commercial facilities which store their wastes in lagoons.
- **Nutrient Management Plans (NMPs) can be effective tools, if they address the full range of issues.** In addition to an up to date NMP, the operator keeps records verifying that the NMP is followed. NMPs are required for dairies and permitted concentrated animal feeding operations (CAFOs), and are voluntary for other operations. NMP and records can show that discharges are not occurring.

¹ Wastewater Discharge Permits in Washington State, January 2004, <http://www.ecy.wa.gov/pubs/wqr019.pdf>

Contact city or county agencies for the following issues:

- Submit a State Environmental Policy Act review/checklist to a state or local agency
<http://www.ecy.wa.gov/programs/sea/sepa/e-review.html>.
- Building
- Preliminary/final plat
- Grading
- Water system
- Shoreline
- Right of way
- Utility
- Site plan review
- Septic system
- Floodplain development
- Variance (zoning, shoreline, etc)
- Outdoor burning

The environmental permit handbook can be found at the Office of Regulatory Assistance website: <http://apps.ecy.wa.gov/permithandbook/handbook.asp>.

1 – Introduction

The 2009 Washington State Legislature passed Substitute Senate Bill (SSB) 5797 (see Appendix A). The bill provides some anaerobic digesters (ADs) an exemption from obtaining a solid waste handling permit. ADs located on or near a dairy that co-digest organic wastes with manure may qualify for this permit exemption (see Section 2). The bill requires that permit exempted ADs must meet certain requirements.

Substitute Senate Bill 5797
text provided in Appendix A

This exemption will be a separate section in the state’s solid waste management statute, Chapter 70.95 Revised Code of Washington (RCW). SSB 5797 requires adherence to these guidelines for the solid waste handling permit exemption to apply.

The departments of Ecology, Agriculture (WSDA), and Health (WDOH) developed these guidelines with input from stakeholders. Ecology has the lead in implementing these guidelines. Owners or operators should work with Ecology to determine the applicability of these guidelines to their AD operation. Ecology, WSDA, WDOH, and AD stakeholders will work together to put these guidelines into practice. Ecology will collaborate with other agencies and stakeholders to publish updates as needed.

ADs that do not meet the conditions set out in SSB 5797 cannot rely on these guidelines for compliance. Solid waste handling standards are located in Chapter 173-350 Washington Administrative Code (WAC). These ADs are still required to comply with other federal, state, and local requirements (refer to the summary on page iii).

ADs must comply with all applicable federal, state, and local regulations.

Interest from numerous local, state, and federal agencies, private companies, philanthropic foundations, and the dairy industry have supported development of sustainable AD systems. This support has totaled about \$5 million in research on anaerobic digestion technology. These efforts demonstrate sustainable digestion and co-digestion outcomes that include energy and fuels production. Nutrient and fiber recovery platforms have been developed and are in field testing. Processes for recovering valuable resources will be available to AD designers as the methods continue to be tested and demonstrated.

2 – Applicability

These guidelines apply to ADs meeting all the following conditions:

- The owner or operator provides Ecology or the jurisdictional health department (JHD)² at least 30 days notice of the intent to operate and meet the terms of SSB 5797 and these guidelines (Section 5.8).
- AD accepts manure from licensed dairies (Section 5.4.1). ‘Manure’ includes waste from the livestock as well as runoff from the facility. It may also include wash water from the milking parlor and bedding material.
- Digestate liquids and solids returned to a dairy (Section 5.7.1) must be managed under a dairy nutrient management plan (DNMP) prepared in compliance with Chapter 90.64 RCW

² Jurisdictional health departments are responsible for solid waste handling permits, their authority includes ensuring compliance with permit exempt conditions. Therefore JHDs receive AD notifications and may conduct AD inspections.

that has been updated to include the elements that properly address management and use of digestate (Section 5.3).

- AD feedstock includes AT LEAST 50 percent by volume of livestock manure and NO MORE THAN 30 percent by volume of pre-consumer organic waste-derived material (Section 5.4.3). Non-manure agricultural waste from the dairy is acceptable AD feedstock (5.4.2)
- The organic waste-derived material does not include post-consumer organic wastes, municipal or residential solid waste, or biosolids (Section 5.4.4).
- Imported, pre-consumer, organic waste-derived material that includes animal parts is previously source separated at a licensed food processing facility. This material must not include bovine specified risk material or sheep processing waste (Section 5.4.3).
- Manure, agricultural waste, organic waste-derived material, and digestate (liquids and solids) are handled in a manner that protects surface water and groundwater and controls nuisance odors and vectors (Section 5.5).
- Digestate not managed under an updated DNMP (Sections 5.7.1 and 5.3) must be used in one of the following ways:
 - Digestate solids distributed offsite must pass compost quality standards (WAC 173-350-220) (Section 5.7.3).
 - Digestate solids can be delivered to a permitted or legally exempt compost facility for composting (Section 5.7.2).
 - Digestate solids or liquids can be managed in an alternate manner approved by Ecology (Section 5.7.4).
- The AD owner or operator submits an annual report to Ecology or the JHD (Section 5.10).
- The AD owner or operator of a permit-exempt AD allows inspections by Ecology or the JHD (Section 5.11).

Permit Exempt AD
ADs that co-digest at least **50% manure** with no more than **30% organic waste-derived material** may qualify for an exemption from a solid waste handling permit.

These guidelines do not apply to ADs operating on non-dairy farm operations, even if managed under a nutrient management plan that includes all elements included in a DNMP. ADs working with non-dairy farm operations may be required to obtain a solid waste handling permit. Consult the JHD for assistance (see Appendix C).

3 – Anaerobic Digestion Overview

Anaerobic digestion produces a gas composed of mostly methane and carbon dioxide (links to air regulations at <http://www.ecy.wa.gov/air.html>). The methane can be used to create an energy product (heat, electricity, or natural gas). In addition to providing a renewable energy source, anaerobic digestion of farm wastes benefits the environment. Anaerobic digestion, if done properly, can lower greenhouse gas emissions, reduce odors, and reduce pathogens in the manure. Figure 1 shows a sample schematic for an AD that operates under the solid waste handling permit exemption where the AD digestate is separated into liquid and solid components.

An *anaerobic digester* is a vessel that processes organic material into gas and digestate using microorganisms in a decomposition process within a closed, oxygen-free container (SSB 5797).

Digestate is the solid and liquid materials produced through the AD process.

Adding organic waste-derived material to a livestock manure-based AD can make the digestion process more efficient and increase the amount of methane generated. Anaerobic digestion will convert much of the organic nitrogen into ammonia yielding an effluent where the nitrogen is 60-80% ammonia³. Ammonia released as a gas occurs where AD effluent is stored in an uncovered lagoon or field applied where it is not incorporated into the soil⁴.

4 – Oversight Responsibilities

Three AD operation examples are shown in Figure 2 to illustrate where oversight of the operation would be performed by WSDA or Ecology and the JHD. Management and oversight of atmospheric releases (Chapter 70.94 RCW) are not included on this graphic.

1. AD on and operated by a dairy using only on-farm agricultural waste and manure and managing digestate under a DNMP: WSDA provides oversight of the dairy and AD under the Dairy Nutrient Management Act (Chapter 90.64 RCW).
2. AD on or off the dairy, AD feedstock includes more than 50% livestock manure and less than 30% imported organic waste-derived material where the digestate is returned to the dairy or distributed off-site: WSDA provides oversight of digestate handling and use on the dairy (Chapter 90.64 RCW). Ecology and JHD provide oversight of the AD, storage and handling of organic waste-derived material, and storage and handling of digestate distributed to a non-dairy operation under the solid waste handling permit exemption (SSB 5797).
3. AD operating anywhere where feedstock is more than 30% organic waste-derived material: JHD oversight of the AD under a solid waste handling permit (Chapter 70.95 RCW), Ecology provides technical assistance. Any digestate delivered to a licensed dairy: WSDA provides oversight of the dairy operation.

³ Moser, M. *Anaerobic Digesters Control Odors, Reduce Pathogens, Improve Nutrient Manageability, Can be Cost Competitive with Lagoons, and Provide Energy Too!* http://www.epa.gov/agstar/resources/man_man.html

⁴ Topper, Graves, and Richard. *The Fate of Nutrients and Pathogens during Anaerobic Digestion of Dairy Manure.* 2006. <http://www.biogas.psu.edu/pdfs/G71.pdf>

FIGURE 1— PERMIT EXEMPT ANAEROBIC DIGESTER SCHEMATIC

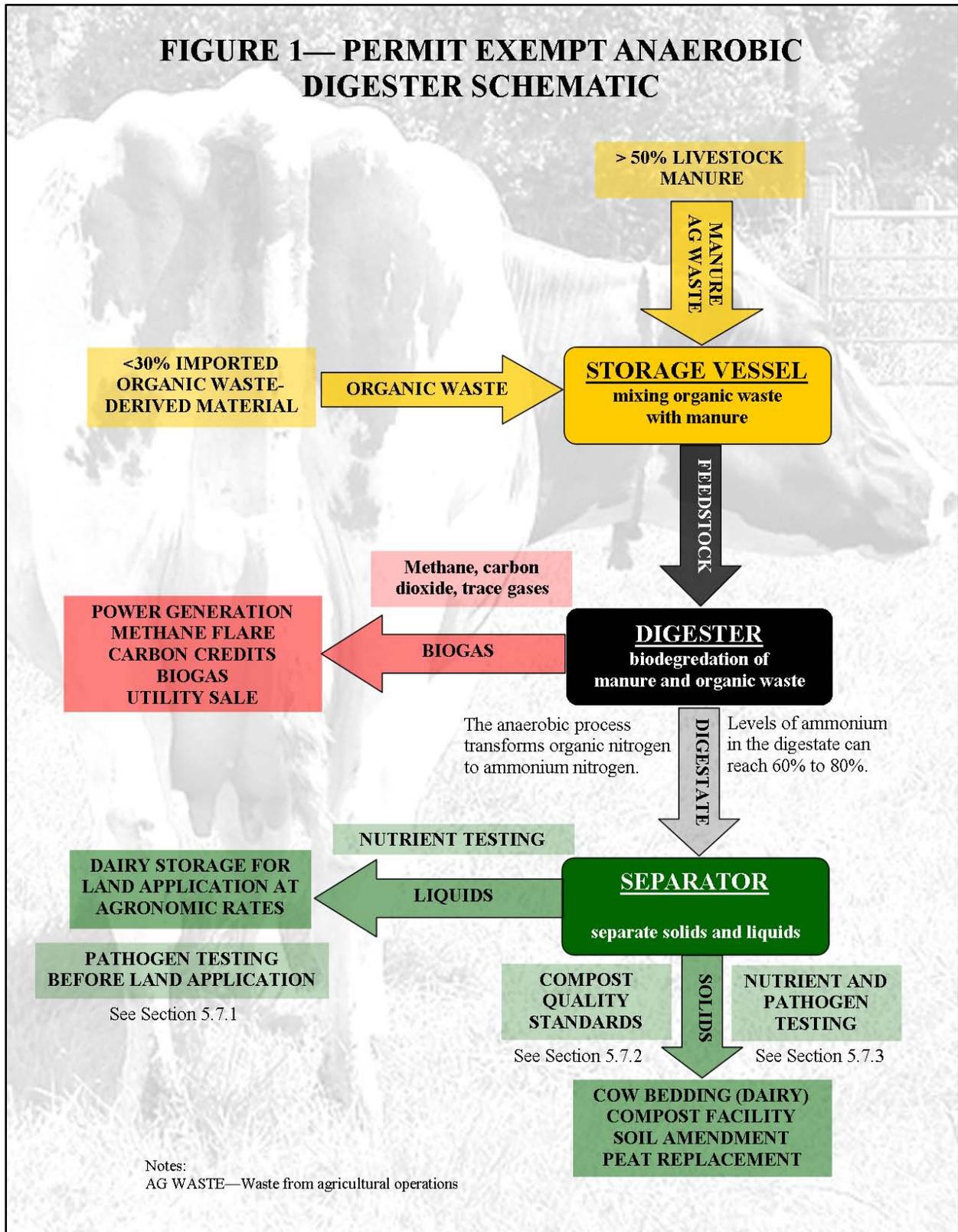
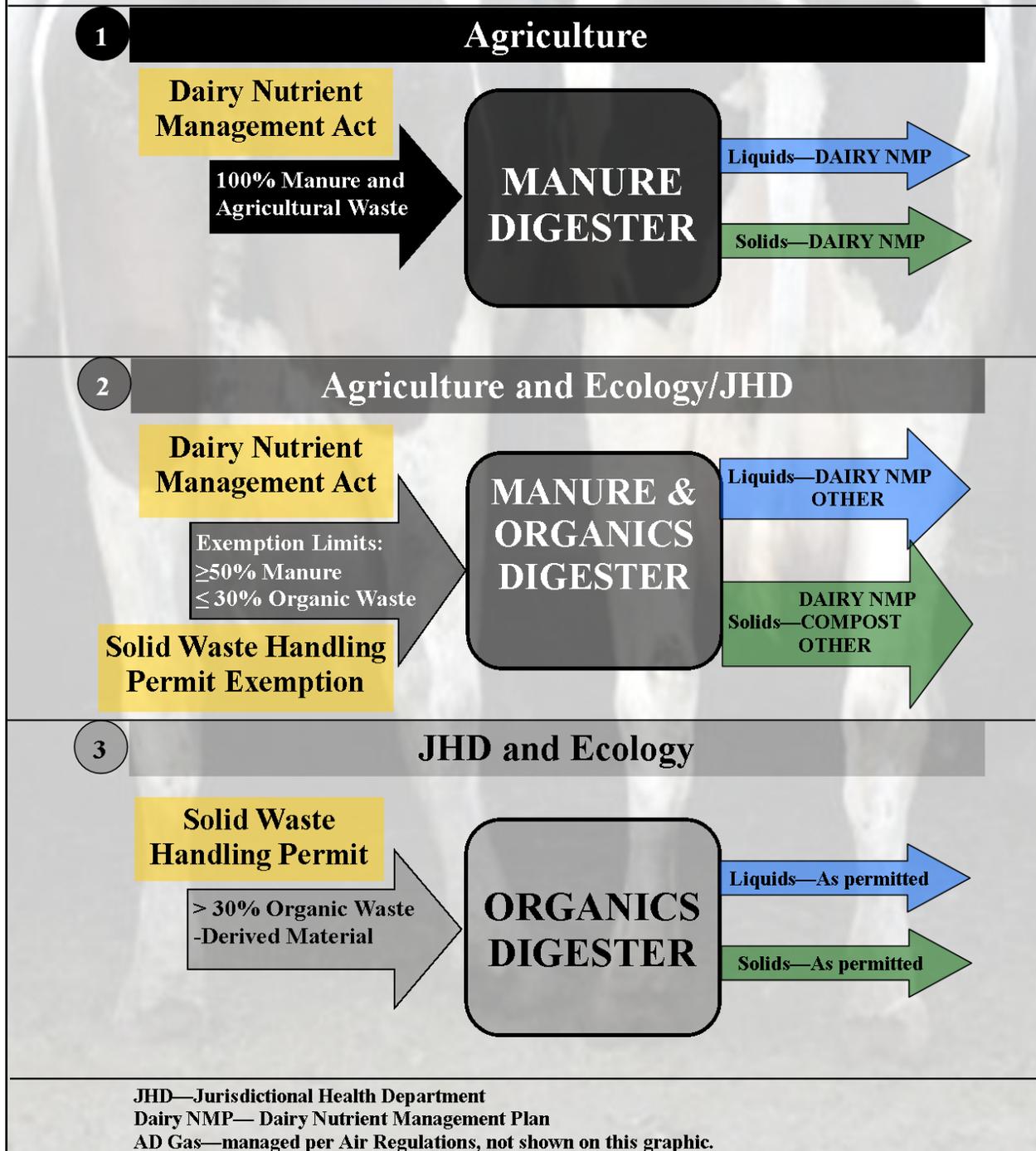


FIGURE 2—ANAEROBIC DIGESTER SCENARIOS

Three examples of digester operations, agencies providing oversight, and digestate use. Digester gas not included in these scenarios.



5 – Permit-Exempt Conditions for an Anaerobic Digester Facility

The following sections describe more details about the requirements of the AD solid waste handling permit exemption. Other permits or requirements still apply to the AD operation (see Page iii). The Governor’s Office of Regulatory Assistance⁵ may provide help in understanding additional permitting requirements and government regulations.

5.1 Design Requirements

Design of the AD must meet the Natural Resources Conservation Service (NRCS) *Conservation Practice Standard Anaerobic Digester, Controlled Temperature No 366*⁶ (Appendix B) from the

Design and Operate the AD as required by NRCS Standard 366 or equivalent.

Washington Field Office Technical Guide or equivalent. The AD “shall be designed to facilitate anaerobic digestion of animal manure...design documentation shall specify the type of digester and include a process diagram.”⁷ The information to be included in the design documentation should:

- Specify the type of AD.
- Describe types of organic waste-derived material the AD will process.
- Describe how organic waste-derived materials will be stored and transferred at the AD.
- Describe the design and size of the collection/mix tank used to accumulate manure and organic waste-derived materials, settle foreign material, and pre-treat influent waste to the appropriate total solids concentration (Section 5.5).
- Describe how the solid and liquid digestate will be stored and transferred within and off the site and the storage capacity compared to the potential daily output.
- Include a drawing of the AD, showing its basic components, including but not limited to:
 - AD volume.
 - Retention time.
 - Influent and effluent flow rates.
 - Total solids content of influent and effluent.

Ecology must review and approve or deny proposals for the use of alternative designs or standards for organic waste-derived material and digestate storage, handling, and use that are not compatible with the criteria in NRCS standard 366. Alternative proposals must be submitted to Ecology and must include a description of how the alternative design would protect environmental quality and public health to the same level as the requirements in the exemption. The approval process will include review by the JHD and WSDA. An Ecology decision will be formally documented.

⁵ <http://www.ora.wa.gov/>

⁶ <http://efotg.nrcs.usda.gov/references/public/WA/366.pdf>

⁷ <http://efotg.nrcs.usda.gov/references/public/WA/366.pdf>

5.2 Operation Plan

Operation of the AD must meet NRCS Standard 366 or equivalent. An AD “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.”⁸ The operation plan must be available for review during Ecology or JHD inspections of the AD. The information to be included in the operation plan should include the following:

- Quantities of manure and organic waste-derived material (in cubic yards or gallons) to be digested in the AD. Provide details on material flow that show the AD and storage areas are sufficient to manage volumes of organic waste-derived material and digestate expected.
- Description of startup procedures, normal operation, safety issues, routine maintenance, and troubleshooting guide.
- Monitoring plan with frequency of measuring and recording AD inflow, operating temperatures, and other information as appropriate.
- Description of procedures to protect surface water and groundwater from AD operations, including storage and transfer of organic waste-derived materials and digestate.
- Description of procedures to control dust, nuisance odors, and other contaminants to prevent migration of dust, odor, and air contaminants beyond property boundaries.
- Description of procedures to prevent the attraction of vectors.
- Description of types and sources of organic waste-derived material.
- Description of planned end uses of the solid and liquid digestate.
- Description of analytical testing that meets compost standards for digestate solids, including frequency of testing (Section 5.7.3).
- Description of analytical testing of solid and liquid digestate to be returned to dairies, include frequency of testing (Section 5.7.1).
- Description of procedures to monitor and control return flow of liquid digestate to individual dairies or other authorized uses.
- Alternative operating procedures, including storage and transfer of solid and liquid digestate, in the event of equipment failure or sudden loss of participating dairy or export user.
- Records to be maintained by the AD owner or operator, including
 - Records of receipt of imported organic waste-derived materials, including type, quantity (cubic yards or gallons), name of source.
 - Records of incoming manure (cubic yards or gallons) and agricultural waste as well as names of participating operations.
 - Records of digestate returned to each dairy, description of solid or liquid, analytical testing results, quantity, name/address of receiving dairy, date delivered.
 - Records of solid digestate not returned to a dairy, including quantity, compost quality test results if applicable, amounts delivered to compost or other facility.
 - Operating records of AD, including maintenance records.

⁸ <http://efotg.nrcs.usda.gov/references/public/WA/366.pdf>

5.3 Dairy Nutrient Management Plan

When the AD is located on and is part of a dairy feedstock and digestate storage and handling are considered part of the dairy's waste management system and must be covered in the DNMP (Chapter 90.64 RCW). Six of the required elements for a DNMP directly cover aspects of the waste storage and management system and apply to any on-dairy AD.

DNMP must be updated **before** the dairy operates an on-dairy AD or receives any AD digestate.

The following six DNMP requirements must be updated to account for the addition of an AD at the dairy. The DNMP must be updated before the dairy receives any AD digestate.

- Develop a waste management system operation plan.
- Identify and describe major factors influencing the quantity of manure and wastewater (for example, herd size, volume of imported organic waste-derived material, climatic data, existing runoff controls).
- Evaluate existing manure and wastewater collection system and establish a schedule to complete any needed improvements.
- Describe storage facilities and needs for solid and liquid manure, and include the calculations and worksheets used to determine storage.
- Describe transfer facilities and systems.
- Describe any treatment of the manure or wastewater.

Four nutrient management requirements in the DNMP⁹ could be affected by a dairy participating in an AD. These DNMP requirements (underlined) are listed below with explanation of how they may be impacted by AD digestate returned to the dairy.

- Major factors influencing the quantity of manure and wastewater are identified and described. Examples of these factors include the impact of imported organic waste-derived material on the AD digestate nutrient content, use of the AD solid digestate returned to the dairy, and contract arrangements between the AD and dairy related to flow volumes.
- If manure must be utilized elsewhere, include off-site manure management agreements in the plan. In order to comply with the solid waste handling permit exemption, a participating dairy is only allowed to export digestate to another licensed dairy whose DNMP has been updated to address the management and use of the AD digestate.
- Nutrient testing procedures for soils and manure (digestate) are described and required. Dairies participating with an AD co-digesting manure and organic waste-derived material will need to perform more tests of the digestate returned to the dairy. Increased testing may include: testing for nutrients and pathogens to address impact of imported organic waste-derived material on the AD digestate, testing to track nutrient levels in manure sent to the AD, testing to verify AD test results, and testing nutrient levels just prior to application activity due to potential for greater changes during storage (Section 5.7.1).
- A recordkeeping system is established that covers soil and manure (digestate) tests, application of the solid and liquid components of the manure (digestate), cropping, and other significant factors and practices. Dairies participating with an AD co-digesting

DNMP Impacts

- Document AD digestate transfer in contract arrangements
- Export digestate **only** to other dairies with updated DNMP
- More testing of AD digestate
- Additional recordkeeping

⁹ <http://agr.wa.gov/FoodAnimal/Livestock-Nutrient/DairyNutrientMgmtPlans.aspx>

manure and organic waste-derived material need to keep additional records including: tracking volume information on the manure sent to the AD and digestate received back, information regarding AD operations and the use of organic waste-derived material that may have impact on the dairy's operation, test data provided by the AD for returned digestate, and dairy test data of digestate and at application times.

Air quality and pathogen considerations must be addressed in the updated DNMP¹⁰. Air quality in and around structures, waste storage areas, and treatment sites may be impaired by excessive dust, gaseous emissions, and odors. Poor air quality may affect the health of workers, animals, and persons living in the surrounding areas. Ammonia emissions from animal operations may be deposited to surface waters, increasing the nutrient load. Proper siting of structures and waste storage facilities can enhance dispersion and dilution of odorous gases. Conservation buffers placed with regard to prevailing wind patterns can intercept movement of some airborne pollutants. Enclosing the waste storage or treatment facility can reduce gaseous emissions from areas with residential development.

Pathogenic organisms in the AD digestate come from the manure and possibly from organic waste-derived materials containing animal parts. Exposure to some pathogens can cause illness to humans and animals, especially for immune-deficient populations. Many of the same conservation practices used to prevent nutrient movement from animal operations, such as leaching, runoff, and erosion control are likely to minimize the movement of pathogens.

5.4 Allowed and Prohibited AD Feedstock

The following subsections describe feedstock limitations to ensure compliance with the solid waste handling permit exemption. Feedstock includes manure, agricultural waste, and organic waste-derived material that goes into the AD for co-digesting.

Acceptable AD Feedstock

- Manure (>50%)
- Dairy related agricultural waste
- Organic waste (<30%): pre-consumer, source separated, from a licensed food processor

5.4.1 – Manure

ADs that qualify for the solid waste handling permit exemption must process a minimum of 50 percent livestock manure by volume. 'Manure' includes waste from the livestock as well as runoff from the facility. It may also include wash water from the milking parlor and bedding material. The AD must contain more than 50% livestock manure at all times.

5.4.2 – Dairy-related agricultural wastes

The AD can accept agricultural wastes resulting from the raising or growing of plants and animals including, but not limited to, crop residue, manure and animal bedding.

5.4.3 – Organic waste-derived material

The exemption allows co-digestion of no more than 30 percent imported organic waste-derived material. Acceptable organic waste-derived materials include:

- Organic waste-derived material from preconsumer sources

¹⁰ http://www.nrcs.usda.gov/technical/afo/cnmp_guide_600.54.html
http://efotg.nrcs.usda.gov/references/public/WA/590_std_040609.pdf

- Organic waste-derived material likely to contain animal parts must be source separated at a facility licensed to process food by the US Department of Agriculture (USDA), Food and Drug Administration (FDA), WSDA, or other appropriate regulatory agency.
- Organic waste-derived material that likely contains bovine processing waste must be derived from animals approved by the USDA food safety and inspection service and not contain any specified risk material (defined in Section 5.4.4).

5.4.4 – Prohibited materials

The following list identifies materials not allowed as feedstock for the permit-exempt AD.

- Sheep carcasses or sheep processing waste.
- Bovine waste that includes specified risk material.
- Municipal or residential solid waste.
- Post-consumer organic waste-derived materials, for example food waste discarded from consumer plates at restaurants or cafeterias.
- Biosolids, including septage, or sewage sludge.

Specified risk material, as defined by the USDA (9 US Code of Federal Regulations [CFR] 310.22), includes the following materials from cattle:

- The brain, skull, eyes, trigeminal ganglia, spinal cord, vertebral column (excluding the vertebrae of the tail, the transverse processes of the thoracic and lumbar vertebrae, and the wings of the sacrum), and dorsal root ganglia of cattle 30 months of age and older;
- The tonsils of all cattle; and
- The distal ileum of all cattle.

5.5 Storage and Handling Requirements

The pits, tanks, or structures at the AD receiving manure, organic waste-derived material, and digestate must be certified to meet the NRCS *Conservation Practice Standard Waste Storage Facility No 313, Washington State*¹¹ (Appendix B) from the Washington Field Office Technical Guide or equivalent. Confirmation that the storage structure meets these standards or are otherwise effective can be performed by a representative of the NRCS or a qualified professional engineer. Confirmation must accompany the required notification to Ecology before startup of the AD operation. Equivalent construction standards for evaluating pits, tanks, or structures are referenced in the NRCS Standard 313 (links provided in Section 8).

Storage and Handling of Manure, Organic Waste, and Digestate

- Meet NRCS 313 (NRCS WA, 2004) or equivalent for storage structure
- Put organic waste in AD within 36 hours
- Control dust, odor, and vectors
- Protect groundwater and surface water

Handling of manure, organic waste-derived material, and digestate at the AD must comply with the following requirements:

- Organic waste-derived material received at the AD must be put into the AD within 36 hours of receipt.
- Storage and handling of organic waste-derived material, manure, and digestate must be performed in a manner that

¹¹ <http://efotg.nrcs.usda.gov/references/public/WA/WA313.pdf>

- Controls dust, nuisance odors, and other contaminants to prevent migration of air contaminants beyond property boundaries. If odor issues are identified the organic waste-derived material may need to be stored using a controlled odor system until it is put into the AD.
- Prevents the attraction of vectors (vector attraction is the characteristic that attracts rodents, flies, mosquitoes, or other organisms that can spread disease).
- Protects groundwater and surface water.

5.6 Interruption of AD Operations

AD operators must report to Ecology when normal operations are interrupted or shut down due to spills, upsets, fire, explosion or any other event resulting in an inability to meet the conditions of these guidelines. An AD that is no longer operating in compliance with the conditions of this exemption should notify Ecology. Notification must occur within 48 hours of an incident or non-compliance with exemption conditions. Notification can be by phone, fax, or email and must include:

Notify Ecology of AD Interruptions Within 48 Hours
See Appendix C for Ecology contact information

- Description of the reason for the system interruption.
- Impacts on storage, handling and disposition of organic waste derived material or digestate solids or liquids.
- Description of actions taken to control and minimize the impacts of disruption.
- Description of resolution of the interruption or shut down.
- Schedule for when operations will resume.

5.7 AD Digestate Use

The permit exemption limits digestate use to the following:

5.7.1 – Return Digestate to the Dairy

For an AD to be covered under the permit exemption, any dairy that receives digestate solids or liquids from the AD must manage the digestate according to a DNMP. The dairy must update its DNMP in order to address proper handling and to maintain the proper balance of nutrients within its operation (see Section 5.3). The dairy handling and storage systems will be impacted by the nutrient-rich digestate.

Participating dairies should work with their Conservation District or NRCS planners, or qualified private professionals to develop or update their DNMP. The dairy is responsible for implementing the DNMP in order to ensure proper handling and use of the digestate. When properly managed according to the updated DNMP, the digestate is not considered a solid waste. Improper management of digestate by a dairy or not covering the proper elements in their DNMP could put the solid waste handling permit exemption for the AD at risk.

Digestate Use Options

Solids

- Return to the dairy
- Send to a compost facility
- Solids that pass compost quality tests can be distributed offsite
- Other use approved by Ecology

Liquid

- Return to the dairy
- Other use approved by Ecology

The DNMP must document and account for the volume of nutrients leaving (manure) and coming back to (solid or liquid digestate) the dairy. This is particularly important when the AD is digesting organic waste-derived material in addition to the dairy manure. The organic waste-derived material can greatly increase the level of nutrients when compared to the levels in manure alone. Since solids from the digester may not return to the dairy, or are returned and used for bedding material, these variables also need to be addressed by the DNMP. Agreements between the dairy and operator of the AD should include how to track and report volumes sent and received and quantities or levels of nutrients sent and received.

Table 5.1 provides a list of analytical methods for nutrients and selected pathogens for digestate returned to the dairy. Specific digestate testing parameters, methods, and frequency will be identified in the updated DNMP. Digestate analytical tests required by the DNMP take the place of the list in Table 5.1. These test results are required in order for the participating dairies to ensure proper use and nutrient balance under the DNMP and for protection of human health and the environment.

Additional digestate testing may be required if future research or experience indicates it is necessary.

Table 5.1 Analytical Methods for Nutrients and Selected Pathogens

Parameter	Analytical Method
Total Kjeldahl Nitrogen (TKN)	SM Method 4500, N _{org} B, SM Method 4500, N _{org} C
Nitrate-N (NO ₃ -N)	SM Method 4500-NO ₃ E, F, or H
Ammonia –N (NH ₄ -N)	SM Method 4500-NH ₃ B + C, D, E, or G
Organic Nitrogen	Value calculated as TKN minus NH ₃ -N
Total Phosphorus	SM Method 4500-P B + E or F
<i>Fecal Coliform</i>	SM 9221 C or E, SM 9222 D, Appendix F EPA/625/R-92/013, EPA 1680, EPA 1681
<i>Salmonella</i> bacteria	SM 9260 D, Appendix G EPA/625/R-92/013, EPA 1682

NRCS National Planning Procedures Handbook and NRCS Standard 590¹² require assessing for risks associated with manure handling and nutrient applications. Ecology and WSDA will confer to determine if pathogen testing is required at some point prior to field application if:

- AD feedstock includes animal parts and
- Digestate will be used on fields used to grow crops meant for human or animal consumption.

The updated DNMP will identify digestate pathogen testing requirements, methods, and frequency. Contract arrangement between the dairy receiving the digestate and the AD owner or operator must specify the required testing and which party will conduct the tests.

5.7.2 – Send Solids to a Compost Facility

A compost facility operating in accordance with Chapter 173-350 WAC, *Solid waste handling standards*, can accept solid digestate for further treatment without prior testing. Solid digestate sent to a compost facility may classify as either Type 2 Feedstock or Type 3 Feedstock (as defined for compost in WAC 173-350-100, see Section 6) based on the following:

- Type 2 - digestate generated from manure and vegetative organic waste-derived material.

¹² http://www.nrcs.usda.gov/technical/afo/cnmp_guide_index.html
http://efotg.nrcs.usda.gov/references/public/WA/590_std_040609.pdf

- Type 3 - digestate generated from manure and organic waste-derived material that includes animal parts.

It is the responsibility of the generator to verify that the receiving compost facility is properly authorized to accept the digestate by contacting the JHD for confirmation. The AD operator must keep records of the solid digestate sent to a compost facility.

5.7.3 – Send Solids to Other Offsite Location

To distribute digestate solids to anywhere other than discussed in Subsections 5.7.1 and 5.7.2, the digestate must be tested for and pass compost quality standards for metals, biological stability, pathogens and other parameters (Table 5.2). Frequency of digestate testing is based on the volume of organic waste-derived material put into the AD (Table 5.3). The recipient of the solid digestate must be provided with compost quality test results and details of the feedstock. If the AD operation has consistent input (manure and organic waste-derived material) or has established a baseline of consistent data, testing for metals could be reduced in frequency. This change in testing requirements would require consultation with and approval by Ecology. The selected analytical laboratory must understand methods for testing for pathogens in digestate. A list of labs accredited by Ecology can be found at:

<http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html>.

Table 5.2 Compost Quality Standards Analyses and Limits

Metals Analysis	Limit
Arsenic	≤ 20 mg/kg dry weight
Cadmium	≤ 10 mg/kg dry weight
Copper	≤ 750 mg/kg dry weight
Lead	≤ 150 mg/kg dry weight
Mercury	≤ 8 mg/kg dry weight
Molybdenum	≤ 9 mg/kg dry weight
Nickel	≤ 210 mg/kg dry weight
Selenium	≤ 18 mg/kg dry weight
Zinc	≤ 1400 mg/kg dry weight
Other Parameters	Limit or Test Protocol
Biological stability	US Composting Council Test Method
Manufactured inerts	< 1 percent
Sharps	0 (zero)
pH	5 – 10 standard units
<i>Fecal coliform</i> ^a	< 1,000 Most Probable Number per gram of total solids (dry weight)
<i>Salmonella</i> ^a	< 3 Most Probable Number per 4 grams of total solids (dry weight)

^a Test for *Fecal Coliform* or *Salmonella*
Compost standards: WAC 173-350-220

Table 5.3 Compost Quality Standards Testing Frequency

Organic Waste-Derived Material	Digestate Testing Frequency
< 5000 cubic yards per year	Once per quarter (four times per year)
> 5000 cubic yards per year	Every 5,000 cubic yards or every other month whichever is more frequent

Compost standards: WAC 173-350-220

Digestate solids that have not been composted cannot be called “compost” even if they meet compost quality standards for certain criteria. Compost is defined as an aerobic process, so digestate from an anaerobic process is, by definition, not compost.

5.7.4 - Other Digestate Proposals

There is great interest and strong potential for harnessing value-added products from anaerobic digestion. Ecology will work closely with AD owners/operators and technology providers and other agencies on approving specific alternate digestate processing not specified in SSB 5797. Ecology will develop a process for approval of value-added products for use in off-site venues or markets. This supports sustainable resource recovery consistent with Ecology’s waste to resources goals and the intent of SSB 5797.

The AD operator must contact Ecology to propose other uses or management of the digestate solids or liquids. Ecology will collaborate with the JHD, WSDA, WDOH, and other appropriate agencies for review and approval of proposals. The approval process will ensure compliance with the conditions of the solid waste handling permit exemption. AD owners or operators are encouraged to involve Ecology early if they are considering alternative digestate management proposals.

Examples of possible other proposals for digestate management or use that could be consistent with the solid waste handling permit exemption:

- The liquid digestate will be registered as a fertilizer in compliance with WSDA requirements: <http://agr.wa.gov/PestFert/fertilizers/ProductRegistration.aspx>
- Management of the liquid digestate will comply with conditions specified in an existing state waste discharge permit (RCW 90.48.160).

5.8 Notification

The owner or operator of an AD intending to operate in a manner meeting the conditions listed in the Applicability section of these guidelines must notify Ecology and the JHD no less than 30 days prior to operation. ADs already operating as permit exempt prior to the publication of these guidelines must notify Ecology by October 30, 2009. Contact information for Ecology and JHDs are provided in Appendix C. Startup notification form is available at the following Ecology website link <http://www.ecy.wa.gov/biblio/ecy070356.html>.

Notify Ecology and JHD in writing no less than **30 days prior to operation startup** of the AD.

Appendix C lists Ecology, JHD, and WSDA contacts

When **digestate does not pass compost quality standards** inform your regional Ecology contact within 48 hours.

Thirty days prior to startup of the AD, notification to Ecology (by phone, fax, or email) must include:

- An operation plan or other equivalent document that will allow Ecology to determine if the AD qualifies for the permit exemption.
- Confirmation by a qualified professional that storage structures meet the NRCS 313 standard or equivalent (Section 5.5).
- The status of the DNMP updates for the participating dairies.
- Description of final use or destination of digestate.

When digestate tests fail compost quality standards, Ecology must be notified and such solids must not be distributed. Notification must occur within 48 hours of receipt of test results.

Notification (by phone, fax, or email) must include:

- Explanation of the impacts on storage, handling and disposition of digestate solids.
- Description of the steps to be taken to handle the digestate solids.

5.9 Oversight of AD Operations

Ecology and the JHD have oversight authority of the AD operating under a solid waste handling permit exemption. This oversight is similar to that for permitted solid waste handling facilities.

Oversight activities may include:

- Review and comment on AD construction proposals and designs.
- Inspections of AD operations relating to incoming organic waste-derived material, storage and handling of organic waste-derived material and digestate, and disposition of solid and liquid digestate.
- Review of processing and testing records.
- Receipt and review of annual reports from the AD operator.
- Consultation with WSDA for receiving dairies regarding implementation of DNMP elements related to AD digestate storage, use, and proper agronomic land application.

5.10 Annual Reporting

The owner or operator of the AD must prepare and submit an annual report to Ecology and the JHD by April 1 on forms supplied by Ecology. The annual report shall detail the AD's activities during the previous calendar year. Annual reporting form is available at the following Ecology website link <http://www.ecy.wa.gov/biblio/ecy070355.html>.

Annual Report to Ecology

- Due April 1
- Ecology provided forms

Submit Annual Report to Ecology Headquarters office at:

PO Box 47600
Olympia, WA 98504-7600

5.11 Compliance Inspections

An owner or operator of a permit-exempt AD must allow inspections by Ecology and the JHD. The inspection will ensure that the AD and associated materials handling complies with the conditions of the solid waste handling permit exemption. Inspections will focus on site conditions, the handling and storage of imported organic waste-derived materials and digestate, and facility records (recordkeeping detailed in Section 5.2).

The AD permit exemption depends on a participating dairy properly managing digestate under their DNMP. Consequently, as part of their inspection, Ecology will confer with WSDA on the status of the DNMP and digestate management.

5.12 Enforcement

Ecology has enforcement authority over solid waste handling permit exemptions (RCW 70.95.315). Ecology will monitor solid waste handling permit exempted AD operations to ensure compliance with solid waste laws, regulations, and permit exemption requirements. These monitoring efforts may include inspections, response to complaints, and review of annual reports and other submittals. Monitoring may provide a basis for informal responses to non-compliance or for formal enforcement action.

Informal responses to issues of noncompliance include phone calls, inspection reports, other documentations of deficiencies, notices of corrections, technical assistance, or compliance meetings. The intent of these informal responses is to provide the AD owner or operator specific instructions on how to correct the noncompliance issue within a reasonable timeframe.

Failure of the AD owner or operator to take corrective action or to prevent recurring violations may result in a formal enforcement action. Formal enforcement actions include orders and civil penalties (RCW 70.95.315). The AD owner or operator may appeal formal enforcement actions to the Pollution Control Hearings Board. An AD not in compliance with the terms and conditions of the permit exempt status may be required to obtain a solid waste handling permit from the JHD (RCW 70.95.305).

5.12.1 - Orders

Orders may be used to formalize specific unmet requirements. Examples include timelines and specific actions an owner or operator must take to come into compliance with applicable regulations. Orders may be unilateral or agreed. Agreed orders are negotiated and usually stipulate that they are not appealable.

5.12.2 - Civil Penalties

Civil penalties are authorized for violations of the requirements to maintain the exemption. Civil penalties may be assessed per violation per day. The maximum allowable penalty per violation per day is \$1,000 (RCW 70.95.315). Impacts to the environment or impacts to human health as well as past performance issues will weigh heavily in determining penalty assessments.

5.12.3 - Requirement to Obtain a Solid Waste Handling Permit

If an AD does not meet conditions to maintain its exempt status and does not respond adequately to enforcement actions, Ecology will direct the AD to the JHD to obtain a solid waste handling permit. When applying for a permit, the AD must meet all requirements of a permitted solid waste handling facility; this includes design and operating standards (Chapter 173-350 WAC). If the AD comes into and stays in compliance for the duration of the permit, the permit exemption may be restored, at the discretion of the JHD and Ecology.

6 – Glossary

Anaerobic digester (AD). A vessel that processes organic material into gas and digestate using microorganisms in a decomposition process within a closed, oxygen-free container.

Animal parts. For the purposes of these guidelines, “animal parts” is the waste material from food processing facilities that slaughter or process animals for human consumption. These facilities are licensed to process food by the USDA, FDA, WSDA, or other appropriate regulatory agency.

Agricultural waste. Wastes on farms resulting from the raising or growing of plants and animals including, but not limited to, crop residue, manure, waste feed, animal bedding, and carcasses of on-site dead animals weighing each or collectively in excess of fifteen pounds. For ADs covered by this guidance, agricultural waste does not include sheep carcasses or carcasses containing specified risk material.

Dairy Nutrient Management Plan (DNMP). A plan meeting the requirements established under RCW 90.64.026. To operate a digester or to receive and use digestate, a dairy’s plan must address the proper handling, storage, and use of manure, organic waste-derived material, and digestate.

Digestate. Solid and liquid substances that remain following anaerobic digestion of material in an anaerobic digester.

Imported. Materials not originating from a participating dairy or the site where the anaerobic digester is being operated.

Jurisdictional health department (JHD). City, county, city-county, or district public health department (WAC 173-350-100).

Manure. For the purpose of these guidelines, “manure” includes waste from dairy cows or other livestock as well as runoff from the dairy, which may include wash water from the milking parlor and bedding material.

Most probable number (MPN). Statistical expression for estimating the number of microorganisms in a culture.

Natural Resources Conservation Service (NRCS). Conservation practice standards – best management practices including structural specifications that provide guidance for applying conservation technology on the land and set the acceptable level for application of the technology. The practice standards are found in the *Washington NRCS Field Office Technical Guide* [http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WA] DNMPs are required under RCW 90.64.026 to be developed using NRCS standards. The design and installation of an anaerobic digester covered by the permit exemption is required to meet NRCS standards for both the digester (Standard 366) and waste storage (Standard 313) unless Ecology approves an alternative.

Organic waste-derived material. Defined in RCW 15.54.270 to include grass clippings, leaves, weeds, bark, plantings, prunings, and other vegetative wastes, uncontaminated wood waste from logging and milling operations, food wastes, food processing wastes, and materials derived from these wastes through composting. Organic waste-derived material does not include products that include biosolids (RCW 15.54.270). Organic waste-derived material under the definition in SSB

5797 does not include material collected through municipal and residential solid waste collection programs.

Post-consumer. After material has been in the consumer's hands (for example, restaurant food scraps). Material or product used by the consumer for its original purpose and then discarded.

Pre-consumer. Before material has been in the consumer's hands (for example, potato scraps from potato chip factory).

Specified risk material. The following materials from cattle: the brain, skull, eyes, trigeminal ganglia, spinal cord, vertebral column (excluding the vertebrae of the tail, the transverse processes of the thoracic and lumbar vertebrae, and the wings of the sacrum), and dorsal root ganglia of cattle 30 months of age and older; the tonsils of all cattle; and the distal ileum of all cattle.

Source separation. Separation of different kinds of solid waste at the place where the waste originates.

Type 1 feedstock. Means source-separated yard and garden wastes, wood wastes, agricultural crop residues, wax-coated cardboard, preconsumer vegetative food wastes, other similar source-separated materials that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances, human pathogens, and physical contaminants (WAC 173-350-100).

Type 2 feedstock. Means manure and bedding from herbivorous animals that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances and physical contaminants when compared to a type 1 feedstock (WAC 173-350-100).

Type 3 feedstock. Means meat and postconsumer source-separated food wastes or other similar source-separated materials that the jurisdictional health department determines to have a comparable low level of risk in hazardous substances and physical contaminants, but are likely to have high levels of human pathogens (WAC 173-350-100).

7 – Acronyms

AD – anaerobic digester
CAFO – concentrated animal feeding operation
CFR – Code of Federal Regulations
DNMP – dairy nutrient management plan
Ecology – Washington State Department of Ecology
FDA - US Food and Drug Administration
FOTG – field office technical guide
JHD – jurisdictional health department
MPN – Most probable number
NMP - nutrient management plans
NRCS – Natural Resource Conservation Service
RCW – Revised Code of Washington
SSB – Substitute Senate bill
USDA - US Department of Agriculture
WAC – Washington Administrative Code
WDOH – Washington State Department of Health
WSDA – Washington State Department of Agriculture

8 – References

Ecology, *Wastewater Discharge Permits in Washington State*, January 2004, Ecology publication WQ-R-019, <http://www.ecy.wa.gov/pubs/wqr019.pdf>

EPA 1680 - USEPA. *Method 1680: Fecal Coliforms in Sewage Sludge (Biosolids) by Multiple-Tube Fermentation Using Lauryl-Tryptose Broth (LTB) and EC Medium*. U.S. Environmental Protection Agency, Office of Water, Washington, DC EPA-821-R-06-012.

EPA 1681 - USEPA. *Method 1681: Fecal Coliforms in Sewage Sludge (Biosolids) by Multiple-Tube Fermentation using A-1 Medium*. U.S. Environmental Protection Agency, Office of Water, Washington, DC EPA-821-R-06-013.

EPA/625/R-92/013 - "*Environmental Regulations and Technology, Control of Pathogens and Vector Attraction in Sewage Sludge (Including Domestic Septage) Under 40 CFR Part 503*," U.S. Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Center for Environmental Research Information, Cincinnati, OH 45268.

Governor's Office of Regulatory Assistance. <http://www.ora.wa.gov/>

Governor's Office of Regulatory Assistance. Environmental Permit Handbook. <http://www.ora.wa.gov/resources/handbook.asp>

Moser, M. *Anaerobic Digesters Control Odors, Reduce Pathogens, Improve Nutrient Manageability, Can be Cost Competitive with Lagoons, and Provide Energy Too!* Resource Conservation Management. http://www.epa.gov/agstar/resources/man_man.html

National Planning Procedures Handbook, Subpart B, Part 600.54, Draft Comprehensive Nutrient Management Planning Technical Guidance, http://www.nrcs.usda.gov/technical/afo/cnmp_guide_index.html

NRCS Conservation Practice Standard, *Waste Storage Facility No 313, Washington State*, December 2004; <http://efotg.nrcs.usda.gov/references/public/WA/WA313.pdf>

NRCS Conservation Practice Standard No. 366 – *Anaerobic Digester, Controlled Temperature*, September 2003. <http://efotg.nrcs.usda.gov/references/public/WA/366.pdf>

NRCS Conservation Practice Standard , WA No. 590 – *Nutrient Management*, March 2009. http://efotg.nrcs.usda.gov/references/public/WA/590_std_040609.pdf

NRCS 313 Structure Standards – website links

- American Concrete Institute ACI318, <http://www.concrete.org/general/home.asp>
- American Institute of Steel Construction, Manual of Steel Construction <http://www.aisc.org/>

SM - "*Standard Methods for the Examination of Water and Wastewater*," American Public Health Association, 1015 15th Street NW, Washington, DC 20005.

Topper, Graves, and Richard. *The Fate of Nutrients and Pathogens during Anaerobic Digestion of Dairy Manure*. Penn State University. July 2006. <http://www.biogas.psu.edu/pdfs/G71.pdf>

Appendix A – Substitute Senate Bill 5797

CERTIFICATION OF ENROLLMENT

SUBSTITUTE SENATE BILL 5797

Chapter 178, Laws of 2009

61st Legislature
2009 Regular Session

SOLID WASTE HANDLING PERMITS--REQUIREMENTS--EXEMPTIONS

EFFECTIVE DATE: 07/26/09

Passed by the Senate March 2, 2009
YEAS 46 NAYS 1

BRAD OWEN

President of the Senate

Passed by the House April 9, 2009
YEAS 97 NAYS 0

FRANK CHOPP

Speaker of the House of Representatives

Approved April 22, 2009, 11:49 a.m.

CHRISTINE GREGOIRE

Governor of the State of Washington

CERTIFICATE

I, Thomas Hoemann, Secretary of the Senate of the State of Washington, do hereby certify that the attached is **SUBSTITUTE SENATE BILL 5797** as passed by the Senate and the House of Representatives on the dates hereon set forth.

THOMAS HOEMANN

Secretary

FILED

April 23, 2009

**Secretary of State
State of Washington**

SUBSTITUTE SENATE BILL 5797

Passed Legislature - 2009 Regular Session

State of Washington 61st Legislature 2009 Regular Session

By Senate Agriculture & Rural Economic Development (originally sponsored by Senators Haugen, Ranker, Brandland, and Hatfield)

READ FIRST TIME 02/16/09.

1 AN ACT Relating to exemptions from solid waste handling permit
2 requirements; amending RCW 43.21B.300, 43.21B.310, 70.95.170, and
3 70.95.315; and adding a new section to chapter 70.95 RCW.

4 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF WASHINGTON:

5 NEW SECTION. **Sec. 1.** A new section is added to chapter 70.95 RCW
6 to read as follows:

7 (1) An anaerobic digester that complies with the conditions
8 specified in this section is exempt from the permitting requirements of
9 this chapter. To qualify for the exemption, an anaerobic digester must
10 meet the following conditions:

11 (a) The owner or operator must provide the department or the
12 jurisdictional health department with at least thirty days' notice of
13 intent to operate under the conditions specified in this section and
14 comply with any guidelines issued under subsection (2) of this section;

15 (b) The anaerobic digester must process at least fifty percent
16 livestock manure by volume;

17 (c) The anaerobic digester may process no more than thirty percent
18 imported organic waste-derived material by volume, and must comply with
19 subsection (3) of this section;

1 (d) The anaerobic digester must comply with design and operating
2 standards in the natural resources conservation service's conservation
3 practice standard code 366 in effect as of the effective date of this
4 section;

5 (e) Digestate must:

6 (i) Be managed in accordance with a dairy nutrient management plan
7 under chapter 90.64 RCW that includes elements addressing management
8 and use of digestate;

9 (ii) Meet compost quality standards concerning pathogens,
10 stability, nutrient testing, and metals before it is distributed for
11 off-site use, or be sent to an off-site permitted compost facility for
12 further treatment to meet compost quality standards; or

13 (iii) Be processed or managed in an alternate manner approved by
14 the department;

15 (f) The owner or operator must allow inspection by the department
16 or jurisdictional health department at reasonable times to verify
17 compliance with the conditions specified in this section; and

18 (g) The owner or operator must submit an annual report to the
19 department or the jurisdictional health department concerning use of
20 nonmanure material in the anaerobic digester and any required
21 compliance testing.

22 (2) By August 1, 2009, the department and the department of
23 agriculture, in consultation with the department of health, shall make
24 available to anaerobic digester owners and operators clearly written
25 guidelines for the anaerobic codigestion of livestock manure and
26 organic waste-derived material. The guidelines must explain the steps
27 necessary for an owner or operator to meet the conditions specified in
28 this section for an exemption from the permitting requirements of this
29 chapter.

30 (3) Any imported organic waste-derived material must:

31 (a) Be preconsumer in nature;

32 (b) Be fed into the anaerobic digester within thirty-six hours of
33 receipt at the anaerobic digester;

34 (c) If it is likely to contain animal byproducts, be previously
35 source-separated at a facility licensed to process food by the United
36 States department of agriculture, the United States food and drug
37 administration, the Washington state department of agriculture, or
38 other applicable regulatory agency;

1 (d) If it contains bovine processing waste, be derived from animals
2 approved by the United States department of agriculture food safety and
3 inspection service and not contain any specified risk material;

4 (e) If it contains sheep carcasses or sheep processing waste, not
5 be fed into the anaerobic digester;

6 (f) Be stored and handled in a manner that protects surface water
7 and groundwater and complies with best management practices;

8 (g) Be received or stored in structures that:

9 (i) Comply with the natural resources conservation service's
10 conservation practice standard code 313 in effect as of the effective
11 date of this section;

12 (ii) Are certified to be effective by a representative of the
13 natural resources conservation service; or

14 (iii) Meet applicable construction industry standards adopted by
15 the American concrete institute or the American institute of steel
16 construction and in effect as of the effective date of this section;
17 and

18 (h) Be managed to prevent migration of nuisance odors beyond
19 property boundaries and minimize attraction of flies, rodents, and
20 other vectors.

21 (4) Digestate that is managed in accordance with a dairy nutrient
22 management plan under chapter 90.64 RCW that includes elements
23 addressing management and use of digestate shall no longer be
24 considered a solid waste. Use of digestate from an anaerobic digester
25 that complies with the conditions specified in this section is exempt
26 from the permitting requirements of this chapter.

27 (5) An anaerobic digester that does not comply with the conditions
28 specified in this section may be subject to the permitting requirements
29 of this chapter. In addition, violations of the conditions specified
30 in this section are subject to provisions in RCW 70.95.315.

31 (6) The definitions in this subsection apply throughout this
32 section unless the context clearly requires otherwise:

33 (a) "Anaerobic digester" means a vessel that processes organic
34 material into biogas and digestate using microorganisms in a
35 decomposition process within a closed, oxygen-free container.

36 (b) "Best management practices" means managerial practices that
37 prevent or reduce water pollution.

1 (c) "Digestate" means both solid and liquid substances that remain
2 following anaerobic digestion of organic material in an anaerobic
3 digester.

4 (d) "Imported" means originating off of the farm or other site
5 where the anaerobic digester is being operated.

6 (e) "Organic waste-derived material" has the same meaning as
7 defined in RCW 15.54.270 and any other organic wastes approved by the
8 department, except for organic waste-derived material collected through
9 municipal commercial and residential solid waste collection programs.

10 **Sec. 2.** RCW 43.21B.300 and 2007 c 147 s 9 are each amended to read
11 as follows:

12 (1) Any civil penalty provided in RCW 18.104.155, 70.94.431,
13 70.95.315, 70.105.080, 70.107.050, 88.46.090, 90.03.600, 90.48.144,
14 90.56.310, and 90.56.330 and chapter 90.76 RCW shall be imposed by a
15 notice in writing, either by certified mail with return receipt
16 requested or by personal service, to the person incurring the penalty
17 from the department or the local air authority, describing the
18 violation with reasonable particularity. Within thirty days after the
19 notice is received, the person incurring the penalty may apply in
20 writing to the department or the authority for the remission or
21 mitigation of the penalty. Upon receipt of the application, the
22 department or authority may remit or mitigate the penalty upon whatever
23 terms the department or the authority in its discretion deems proper.
24 The department or the authority may ascertain the facts regarding all
25 such applications in such reasonable manner and under such rules as it
26 may deem proper and shall remit or mitigate the penalty only upon a
27 demonstration of extraordinary circumstances such as the presence of
28 information or factors not considered in setting the original penalty.

29 (2) Any penalty imposed under this section may be appealed to the
30 pollution control hearings board in accordance with this chapter if the
31 appeal is filed with the hearings board and served on the department or
32 authority thirty days after the date of receipt by the person penalized
33 of the notice imposing the penalty or thirty days after the date of
34 receipt of the notice of disposition of the application for relief from
35 penalty.

36 (3) A penalty shall become due and payable on the later of:

37 (a) Thirty days after receipt of the notice imposing the penalty;

1 (b) Thirty days after receipt of the notice of disposition on
2 application for relief from penalty, if such an application is made; or

3 (c) Thirty days after receipt of the notice of decision of the
4 hearings board if the penalty is appealed.

5 (4) If the amount of any penalty is not paid to the department
6 within thirty days after it becomes due and payable, the attorney
7 general, upon request of the department, shall bring an action in the
8 name of the state of Washington in the superior court of Thurston
9 county, or of any county in which the violator does business, to
10 recover the penalty. If the amount of the penalty is not paid to the
11 authority within thirty days after it becomes due and payable, the
12 authority may bring an action to recover the penalty in the superior
13 court of the county of the authority's main office or of any county in
14 which the violator does business. In these actions, the procedures and
15 rules of evidence shall be the same as in an ordinary civil action.

16 (5) All penalties recovered shall be paid into the state treasury
17 and credited to the general fund except those penalties imposed
18 pursuant to RCW 18.104.155, which shall be credited to the reclamation
19 account as provided in RCW 18.104.155(7), RCW 70.94.431, the
20 disposition of which shall be governed by that provision, RCW
21 70.105.080, which shall be credited to the hazardous waste control and
22 elimination account created by RCW 70.105.180, RCW 90.56.330, which
23 shall be credited to the coastal protection fund created by RCW
24 90.48.390, and RCW 90.76.080, which shall be credited to the
25 underground storage tank account created by RCW 90.76.100.

26 **Sec. 3.** RCW 43.21B.310 and 2004 c 204 s 5 are each amended to read
27 as follows:

28 (1) Except as provided in RCW 90.03.210(2), any order issued by the
29 department or local air authority pursuant to RCW 43.27A.190,
30 70.94.211, 70.94.332, 70.95.315, 70.105.095, (~~(43.27A.190)~~) 86.16.020,
31 88.46.070, or 90.48.120(2) or any provision enacted after July 26,
32 1987, or any permit, certificate, or license issued by the department
33 may be appealed to the pollution control hearings board if the appeal
34 is filed with the board and served on the department or authority
35 within thirty days after the date of receipt of the order. Except as
36 provided under chapter 70.105D RCW and RCW 90.03.210(2), this is the
37 exclusive means of appeal of such an order.

1 (2) The department or the authority in its discretion may stay the
2 effectiveness of an order during the pendency of such an appeal.

3 (3) At any time during the pendency of an appeal of such an order
4 to the board, the appellant may apply pursuant to RCW 43.21B.320 to the
5 hearings board for a stay of the order or for the removal thereof.

6 (4) Any appeal must contain the following in accordance with the
7 rules of the hearings board:

8 (a) The appellant's name and address;

9 (b) The date and docket number of the order, permit, or license
10 appealed;

11 (c) A description of the substance of the order, permit, or license
12 that is the subject of the appeal;

13 (d) A clear, separate, and concise statement of every error alleged
14 to have been committed;

15 (e) A clear and concise statement of facts upon which the requester
16 relies to sustain his or her statements of error; and

17 (f) A statement setting forth the relief sought.

18 (5) Upon failure to comply with any final order of the department,
19 the attorney general, on request of the department, may bring an action
20 in the superior court of the county where the violation occurred or the
21 potential violation is about to occur to obtain such relief as
22 necessary, including injunctive relief, to insure compliance with the
23 order. The air authorities may bring similar actions to enforce their
24 orders.

25 (6) An appealable decision or order shall be identified as such and
26 shall contain a conspicuous notice to the recipient that it may be
27 appealed only by filing an appeal with the hearings board and serving
28 it on the department within thirty days of the date of receipt.

29 **Sec. 4.** RCW 70.95.170 and 1998 c 156 s 3 are each amended to read
30 as follows:

31 Except as provided otherwise in RCW 70.95.300, 70.95.305 (~~(e)~~),
32 70.95.306, 70.95.310, or section 1 of this act, after approval of the
33 comprehensive solid waste plan by the department no solid waste
34 handling facility or facilities shall be maintained, established, or
35 modified until the county, city, or other person operating such site
36 has obtained a permit pursuant to RCW 70.95.180 or 70.95.190.

1 **Sec. 5.** RCW 70.95.315 and 2005 c 510 s 7 are each amended to read
2 as follows:

3 (1) The department may assess a civil penalty in an amount not to
4 exceed one thousand dollars per day per violation to any person exempt
5 from solid waste permitting in accordance with RCW 70.95.300,
6 70.95.305, (~~or~~) 70.95.306, or section 1 of this act who fails to
7 comply with the terms and conditions of the exemption. Each such
8 violation shall be a separate and distinct offense, and in the case of
9 a continuing violation, each day's continuance shall be a separate and
10 distinct violation. The penalty provided in this section shall be
11 imposed pursuant to RCW 43.21B.300.

12 (2) If a person violates a provision of any of the sections
13 referenced in subsection (1) of this section, the department may issue
14 an appropriate order to ensure compliance with the conditions of the
15 exemption. The order may be appealed pursuant to RCW 43.21B.310.

Passed by the Senate March 2, 2009.

Passed by the House April 9, 2009.

Approved by the Governor April 22, 2009.

Filed in Office of Secretary of State April 23, 2009.

Appendix B – NRCS Standards 313, 366, and 590

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WASTE STORAGE FACILITY

(No.)

CODE 313

DEFINITION

A waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure.

PURPOSE

To temporarily store wastes such as manure, wastewater, and contaminated runoff as a storage function component of an agricultural waste management system.

CONDITIONS WHERE PRACTICE APPLIES

- Where the storage facility is a component of a planned agricultural waste management system
- Where temporary storage is needed for organic wastes generated by agricultural production or processing
- Where the storage facility can be constructed, operated and maintained without polluting air or water resources
- Where site conditions are suitable for construction of the facility
- To facilities utilizing embankments with an effective height of 35 feet or less where damage resulting from failure would be limited to damage of farm buildings, agricultural land, or township and country roads.
- To fabricated structures including tanks, stacking facilities, and pond appurtenances.

CRITERIA

General Criteria Applicable to All Waste Storage Facilities.

Laws and Regulations. Waste storage facilities must be planned, designed, and constructed to meet all federal, state, and local laws and regulations. All state and local permits that are applicable for the specific site must be met.

Location. To minimize the potential for contamination of streams, waste storage facilities 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 25-year flood event, or larger if required by laws, rules, and regulations. Waste storage facilities shall be located so the potential impacts from breach of embankment, accidental release, and liner failure are minimized; and separation distances are such that prevailing winds and landscape elements such as building arrangement, landforms, and vegetation minimize odors and protect aesthetic values.

Storage Period. The storage period is the maximum length of time anticipated between emptying events. The minimum storage period shall be based on the timing required for environmentally safe waste utilization considering the climate, crops, soil, equipment, and local, state, and federal regulations.

Design Storage Volume. The design storage volume equal to the required storage volume shall consist of the total of the following as appropriate:

- (a) Manure, wastewater, and other wastes accumulated during the storage period
- (b) Normal precipitation less evaporation on the surface area (at the design storage volume level) of the facility during the storage period
- (c) Normal runoff from the facility's drainage area during the storage period
- (d) 25-year, 24-hour precipitation on the surface (at the required design storage volume level) of the facility
- (e) 25-year, 24-hour runoff from the facility's drainage area
- (f) Residual solids after liquids have been removed. A minimum of 6 inches shall be provided for tanks
- (g) Additional storage as may be required to meet management goals or regulatory requirements

Inlet. Inlets shall be of any permanent type designed to resist corrosion, plugging, freeze damage and ultraviolet ray deterioration while incorporating erosion protection as necessary.

Emptying Component. Some type of component shall be provided for emptying storage facilities. It may be a facility such as a gate, pipe, dock, wet well, pumping platform, retaining wall, or ramp. Features to protect against erosion, tampering, and accidental release shall be incorporated as necessary.

Accumulated Solids Removal. Provision shall be made for periodic removal of accumulated solids to preserve storage capacity. The anticipated method for doing this must be considered in planning, particularly in determining the configuration of ponds and type of seal, if any.

Safety. Design shall include appropriate safety features to minimize the hazards of the facility. Ramps used to empty liquids shall have a slope of 4 horizontal to 1 vertical or flatter. Those used to empty slurry, semi-solid, or solid waste shall have a slope of 10 horizontal to 1 vertical or flatter unless special traction surfaces are provided. Warning signs, fences, ladders, ropes, bars, rails, and other devices shall be provided, as appropriate, to ensure the safety of humans and livestock. Ventilation and warning signs must be

provided for covered waste holding structures, as necessary, to prevent explosion, poisoning, or asphyxiation. Pipelines shall be provided with a water-sealed trap and vent, or similar device, if there is a potential, based on design configuration, for gases to enter buildings or other confined spaces. Ponds and uncovered fabricated structures for liquid or slurry waste with walls less than 5 feet above ground surface shall be fenced and warning signs posted to prevent children and others from using them for other than their intended purpose.

Erosion Protection. Embankments and disturbed areas surrounding the facility shall be treated to control erosion.

Liners. Liners shall meet or exceed the criteria in Pond Sealing or Lining (PS 521).

Additional Criteria for Waste Storage Ponds

Location. A separation distance of 100 feet for storage ponds and waste confinement areas from existing water wells shall be maintained. A different separation distance will require a site specific evaluation of the aquifer. In no case shall a pond be closer to a well than allowed by state and local regulations.

Permits and Regulations. For all waste storage ponds that impound 10 acre-feet or more of wastewater, WAC Chapter 173-175 Dam Safety Regulation, require review and approval of the construction plans and specifications by the Washington Dam Safety Office (Department of Ecology). The plans and specifications are reviewed for conformance with requirements for downstream hazard and dam height classifications; outlet, spillway and energy dissipater configurations; and application of site specific slope stability and design precipitation criteria. These criteria and configurations are listed in "Dam Safety Guidelines: Part IV: Dam Design and Construction, Washington State Department of Ecology, 1993, Document #92-55D.

The impoundment volume is used to determine if a structure exceeds the 10 acre-foot storage threshold. The impoundment volume is the volume of wastewater stored behind the dam from the elevation measured from the lowest

point of the outside limit of the impoundment barrier to the maximum attainable water surface elevation of the reservoir pool that could occur during extreme operating conditions.

For multiple cell waste storage ponds the following shall be considered in the determination of the impoundment volume:

1. Include the volume that would be released from one cell if an embankment were to fail, plus the volume that would drain from adjacent cells through connecting pipe conduits or any other type of spillways that would connect adjacent cells.
2. If the top of the embankments for adjacent cells are not at the same elevation, the breach volume shall include the total volume that would be released from the higher cell plus the total volume that would be released from the lower cell if the common embankment between the cells and the exterior embankment of the lower cell were to both fail.

Soil and foundation.

The pond shall be located in soils with an acceptable permeability that meets all applicable regulation, or the pond shall be lined. Information and guidance on controlling seepage from waste impoundments can be found in the Agricultural Waste Management Field Handbook (AWMFH), Appendix 10D.

Soil permeability rate of the ponds wetted surface shall not exceed 1×10^{-6} cm/s. The effects of manure sealing will provide approximately one order of magnitude of additional protection resulting in a liner permeability of 1×10^{-7} cm/s. If the foundation permeability rate exceeds 1×10^{-6} cm/s, a compacted clay, amended soil liner or synthetic liner is required. Refer to NRCS Conservation Practice Standard 521A-D.

Criteria for Evaluating the Potential of Waste Storage Pond Earthfill Liner Material.

The following appropriate tests must be conducted for compacted earthfill liners, by qualified soils testing laboratory or NRCS soil mechanics laboratory. A number of soil samples may need to be tested if one sample

is not representative of the material that is to be used for a Compacted Earthfill liner.

1. ASTM D 420, "Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes Section 8 "Sampling".
2. ASTM D 2487, "Classification of Soils for Engineering Purposes" shall be followed to classify all samples provided for testing.
3. ASTM D 5084, "Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter" shall be conducted on soils or soil admixtures documenting the permeability rate of each sample tested with respect to the moisture/density of the sample.
4. ASTM D 698, "Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 5.5-lb Rammer and 12-in Drop" shall be followed.

The data results from the tests listed above shall be used to establish the compaction parameters for construction. NRCS-WA Construction Specification CS-18, Compacted Earthfill Liner, can be used where the specified degree of compaction is to be checked and controlled by standard compaction tests.

Additional Soil and Foundation Criteria

Groundwater and/or seasonal high ground water table. The depth to the seasonal high water table shall be determined. Washington Engineering Technical Note #7 provides guidance on identifying soil features for establishing the seasonal high ground water table depth.

The pond shall have a bottom elevation that is a minimum of 2 feet above the seasonal high water table unless features of special design are incorporated that address buoyant forces, pond seepage rate and non-encroachment of the water table by contaminants. The water table may be lowered by use of passive perimeter drains, if feasible, to meet this requirement.

Foundation and Subsurface Investigations.

See reference section for guidance criteria for the subsurface investigations of waste storage ponds.

Maximum Operating Level. The maximum operating level for waste storage ponds shall be the pond level that provides for the required volume less the volume contribution of precipitation and runoff from the 25-year, 24-hour storm event plus the volume allowance for residual solids after liquids have been removed. A permanent marker or recorder shall be installed at this maximum operating level to indicate when drawdown should begin. The marker or recorder shall be referenced and explained in the O&M plan.

Outlet. No outlet shall automatically release storage from the required design volume. Manually operated outlets shall be of permanent type designed to resist corrosion and plugging.

Spillway. Waste storage ponds with an impoundment volume requiring a Dam Safety permit shall have spillway facilities. The spillway may be open channel or pipe conduit that meets the following requirements:

1. For waste storage ponds with a gravity inlet, the spillway shall accommodate design storm events on the area that will contribute runoff to the pond in combination with the design storm even on the pond surface. The design storm even shall be determined according to the Washington State Department of Ecology (DOE) Dam Safety Guidelines. Potential roof runoff shall not be excluded. Roof runoff management facilities are not considered to be effective for the design storm event.
2. For ponds with a pumped inlet, the spillway shall accommodate the pumped inflow in combination with the design storm event on the pond surface. The design storm event shall be determined according to the DOE Dam Safety Guidelines.
3. Multiple cell waste storage ponds shall have a spillway for each cell. These spillways may be through common interior embankments, but at least one cell must have a spillway through an exterior embankment. All spillways shall be designed for erosion control.

Embankments. The minimum elevation of the top of the settled embankment shall be 1 foot above the waste storage pond's required volume. This height shall be increased by the amount needed to ensure that the top elevation will be maintained after settlement. This increase shall be not less than 5 percent. The minimum top widths are shown in Table 1. The combined side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical, and neither slope shall be steeper than 2 horizontal to 1 vertical unless provisions are made to provide stability.

Table 1 – Minimum Top Widths

Total embankment Height, ft.	Top Width, ft.
15 or less	8
15 – 20	10
20 – 25	12
25 – 30	14
30 – 35	15

Waste storage ponds with an impoundment volume requiring a Dam Safety permit shall meet the following additional requirements:

1. Normal and minimum freeboard shall be provided according to the DOE Dam Safety Guidelines.
2. For multiple cell ponds, the common embankments between cells shall not have a top elevation lower than the external embankments and the combined side slopes of the common embankment shall meet the 5 horizontal to 1 vertical requirement.
3. Compaction of GW, GP, GM, GC, SW, SP, SM, SC, CL, ML, CH, and MH soil material shall be in accordance with Washington NRCS Construction Specifications CS-15, Earth Fill Class S or Washington NRCS Construction Specification CS-14, Earth Fill Class A.

Excavations. Unless supported by a soil investigation, excavated side slopes shall be no steeper than 2 horizontal to 1 vertical.

Additional Criteria for Fabricated Structures

Foundation. The foundations of fabricated waste storage structures shall be proportioned

to safely support all superimposed loads without excessive movement or settlement.

Where a non-uniform foundation cannot be avoided or applied loads may create highly variable foundation loads, settlement should be calculated from site-specific soil test data. Index tests of site soil may allow correlation with similar soils for which test data is available. If no test data is available, presumptive bearing strength values for assessing actual bearing pressures may be obtained from Table 2 or another nationally recognized building code. In using presumptive bearing values, adequate detailing and articulation shall be provided to avoid distressing movements in the structure.

Foundations consisting of bedrock with joints, fractures, or solution channels shall be treated or a separation distance provided consisting of a minimum of 1 foot of impermeable soil between the floor slab and the bedrock or an alternative that will achieve equal protection.

Table 2 - Presumptive Allowable Bearing Stress Values¹

Foundation Description	Allowable Stress
Crystalline Bedrock	12000 psf
Sedimentary Rock	6000 psf
Sandy Gravel or Gravel	5000 psf
Sand, Silty Sand, Clayey Sand, Silty Gravel, Clayey Gravel	3000 psf
Clay, Sandy Clay, Silty Clay, Clayey Silt	2000 psf

¹ Basic Building Code, 12th Edition, 1993, Building Officials and Code Administrators, Inc. (BOCA)

Foundation and Subsurface Investigations.

See reference section for guidance criteria for the subsurface investigations of fabricated structures

Liquid Tightness. Applications such as tanks, that require liquid tightness shall be designed and constructed in accordance with standard engineering and industry practice

appropriate for the construction materials used to achieve this objective.

Structural Loadings. Waste storage structures shall be designed to withstand all anticipated loads including internal and external loads, hydrostatic uplift pressure, concentrated surface and impact loads, water pressure due to seasonal high water table, and frost or ice pressure and load combinations in compliance with this standard and applicable local building codes.

The lateral earth pressures should be calculated from soil strength values determined from the results of appropriate soil tests. Lateral earth pressures can be calculated using the procedures in TR-74. If soil strength tests are not available, the presumptive lateral earth pressure values indicated in Table 3 shall be used.

Lateral earth pressures based upon equivalent fluid assumptions shall be assigned according to the following conditions:

- **Rigid frame or restrained wall.** Use the values shown in Table 3 under the column "Frame tanks," which gives pressures comparable to the at-rest condition.
- **Flexible or yielding wall.** Use the values shown in Table 3 under the column "Free-standing walls," which gives pressures comparable to the active condition. Walls in this category are designed on the basis of gravity for stability or are designed as a cantilever having a base wall thickness to height of backfill ratio not more than 0.085.

Internal lateral pressure used for design shall be 65 lb/ft² where the stored waste is not protected from precipitation. A value of 60 lb/ft² may be used where the stored waste is protected from precipitation and will not become saturated. Lesser values may be used if supported by measurement of actual pressures of the waste to be stored. If heavy equipment will be operated near the wall, an additional two feet of soil surcharge shall be considered in the wall analysis.

Tank covers shall be designed to withstand both dead and live loads. The live load values for covers contained in ASAE EP378.3, Floor and Suspended Loads on Agricultural

Structures Due to Use, and in ASAE EP 393.2, Manure Storages, shall be the minimum used. The actual axle load for tank wagons having

more than a 2,000 gallon capacity shall be used.

TABLE 3 - LATERAL EARTH PRESSURE VALUES¹

Soil		Equivalent fluid pressure (lb/ft ² /ft of depth)			
		Above seasonal high water table ²		Below seasonal high water table ³	
Description ⁴	Unified Classification ⁴	Free-standing walls	Frame tanks	Free-standing walls	Frame tanks
Clean gravel, sand or sand-gravel mixtures (maximum 5% fines) ⁵	GP, GW, SP, SW	30	50	80	90
Gravel, sand, silt and clay mixtures (less than 50% fines) Coarse sands with silt and and/or clay (less than 50% fines)	All gravel sand dual symbol classifications and GM, GC, SC, SM, SC-SM	35	60	80	100
Low-plasticity silts and clays with some sand and/or gravel (50% or more fines) Fine sands with silt and/or clay (less than 50% fines)	CL, ML, CL-ML SC, SM, SC-SM	45	75	90	105
Low to medium plasticity silts and clays with little sand and/or gravel (50% or more fines)	CL, ML, CL-ML	65	85	95	110
High plasticity silts and clays (liquid limit more than 50) ⁶	CH, MH	-	-	-	-

¹ For lightly-compacted soils (85% to 90% maximum standard density.) Includes compaction by use of typical farm equipment.

² Also below seasonal high water table if adequate drainage is provided.

³ Includes hydrostatic pressure.

⁴ All definitions and procedures in accordance with ASTM D 2488 and D 653.

⁵ Generally, only washed materials are in this category

⁶ Not recommended. Requires special design if used.

If the facility is to have a roof, snow and wind loads shall be as specified in ASCE 7-02, Minimum Design Loads for Buildings and Other Structures. If the facility is to serve as part of a foundation or support for a building, the total load shall be considered in the structural design.

Tanks may be designed with or without covers. Covers, beams, or braces that are integral to

structural performance must be indicated on the construction drawings. The openings in covered tanks shall be designed to accommodate equipment for loading, agitating, and emptying. These openings shall be equipped with grills or secure covers for safety, and for odor and vector control.

All structures shall be underlain by free draining material or shall have a footing

located below the anticipated frost depth. Fabricated structures shall be designed according to the criteria in the following references as appropriate:

- Steel: "Manual of Steel Construction", American Institute of Steel Construction.
- Timber: "National Design Specifications for Wood Construction", American Forest and Paper Association.
- Concrete: "Building Code Requirements for Reinforced Concrete, ACI 318", American Concrete Institute.
- Masonry: "Building Code Requirements for Masonry Structures, ACI 530", American Concrete Institute.

Slabs on Grade. Slab design shall consider the required performance and the critical applied loads along with both the subgrade material and material resistance of the concrete slab. Where applied point loads are minimal and liquid-tightness is not required, such as barnyard and feedlot slabs subject only to precipitation, and the subgrade is uniform and dense, the minimum slab thickness shall be 4 inches with a maximum joint spacing of 10 feet. Joint spacing can be increased if steel reinforcing is added based on subgrade drag theory.

For applications where liquid-tightness is required such as floor slabs of storage tanks, the minimum thickness for uniform foundations shall be 5 inches and shall contain distributed reinforcing steel. The required area of such reinforcing steel shall be based on subgrade drag theory as discussed in industry guidelines such as American Concrete Institute, ACI 360, "Design of Slabs-on-Grade".

When heavy equipment loads are to be resisted and/or where a non-uniform foundation cannot be avoided, an appropriate design procedure incorporating a subgrade resistance parameter(s) such as ACI 360 shall be used.

CONSIDERATIONS

Waste storage facilities should be located as close to the source of waste and polluted runoff as practicable. Other considerations for locating the waste storage facility include

vehicle access, wind direction, neighboring dwellings, proximity of streams and floodplains, and visibility.

An increased separation distance from ground water wells will provide additional wellhead protection.

Non-polluted runoff should be excluded from the structure to the fullest extent possible except where its storage is advantageous to the operation of the agricultural waste management system.

Freeboard for waste storage tanks should be considered.

Solid/liquid separation of runoff or wastewater entering pond facilities should be considered to minimize the frequency of accumulated solids removal and to facilitate pumping and application of the stored waste.

Due consideration should be given to environmental concerns, economics, the overall waste management system plan, and safety and health factors.

Considerations for Minimizing the Potential for and Impacts of Sudden Breach of Embankment or Accidental Release from the Required Volume.

Features, safeguards, and/or management measures to minimize the risk of failure or accidental release, or to minimize or mitigate impact of this type of failure should be considered when any of the categories listed in Table 4 might be significantly affected.

The following should be considered either singly or in combination to minimize the potential of or the consequences of sudden breach of embankments when one or more of the potential impact categories listed in Table 4 may be significantly affected:

1. An auxiliary (emergency) spillway
2. Additional freeboard
3. Storage for wet year rather than normal year precipitation
4. Reinforced embankment -- such as, additional top width, flattened and/or armored downstream side slopes
5. Secondary containment

Table 4 - Potential Impact Categories from Breach of Embankment or Accidental Release

1. Surface water bodies -- perennial streams, lakes, wetlands, and estuaries
2. Critical habitat for threatened and endangered species.
3. Riparian areas
4. Farmstead, or other areas of habitation
5. Off-farm property
6. Historical and/or archaeological sites or structures that meet the eligibility criteria for listing in the National Register of Historical Places.

The following options should be considered to minimize the potential for accidental release from the required volume through gravity outlets when one or more of the potential impact categories listed in Table 4 may be significantly affected:

1. Outlet gate locks or locked gate housing
2. Secondary containment
3. Alarm system
4. Another means of emptying the required volume

Considerations for Minimizing the Potential of Waste Storage Pond Liner Failure.

Sites with categories listed in Table 5 should be avoided unless no reasonable alternative exists. Under those circumstances, consideration should be given to providing an additional measure of safety from pond seepage when any of the potential impact categories listed in Table 5 may be significantly affected.

Table 5 - Potential Impact Categories for Liner Failure

1. Any underlying aquifer is at a shallow depth and not confined
2. The vadose zone is rock
3. The aquifer is a domestic water supply or ecologically vital water supply
4. The site is located in an area of solutionized bedrock such as limestone or gypsum.

Should any of the potential impact categories listed in Table 5 be affected, consideration should be given to the following:

1. A clay liner designed in accordance with procedures of AWMFH Appendix 10D with a thickness and coefficient of permeability so that specific discharge is less than 1×10^{-6} cm/sec
2. A flexible membrane liner over a clay liner
3. A geosynthetic clay liner (GCL) flexible membrane liner
4. A concrete liner designed in accordance with slabs on grade criteria for fabricated structures requiring water tightness

Considerations for Improving Air Quality

To reduce emissions of greenhouse gases, ammonia, volatile organic compounds, and odor, other practices such as Anaerobic Digester – Ambient Temperature (365), Anaerobic Digester – Controlled Temperature (366), Waste Facility Cover (367), and Composting Facility (317) can be added to the waste management system.

Adjusting pH below 7 may reduce ammonia emissions from the waste storage facility but may increase odor when waste is surface applied (see Waste Utilization, 633).

Some fabric and organic covers have been shown to be effective in reducing odors.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for

applying the practice to achieve its intended use.

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 shall contain the operational requirements for emptying the storage facility. This shall include the requirement that waste shall be removed from storage and utilized at locations, times, rates, and volume in accordance with the overall waste management system plan.

In addition, for ponds, the plan shall include an explanation of the permanent marker or recorder installed to indicate the maximum operating level.

The plan shall include a strategy for removal and disposition of waste with the least environmental damage during the normal storage period to the extent necessary to insure the pond's safe operation. This strategy is for the removal of the contribution of unusual storm events that may cause the pond to fill to capacity prematurely with subsequent design inflow and usual precipitation prior to the end of the normal storage period.

Development of an emergency action plan should be considered for waste storage facilities where there is a potential for significant impact from breach or accidental release. The plan shall include site-specific provisions for emergency actions that will minimize these impacts.

REFERENCES

Subsurface investigations guidance for waste storage ponds:

"Guidance for Geological Site Explorations of Waste Storage Ponds" in Washington Engineering Technical Note #5.

This reference is available for Washington State in Section 1 of the NRCS electronic Field Office Technical Guide available on the web at the following site:

<http://www.nrcs.usda.gov/technical/efotg/>

Subsurface investigations for waste storage ponds and fabricated structures:

[Agricultural Waste Management Field Handbook](#), Chapter 7, Geological and Ground Water Considerations, section 651.0704 Site investigations for planning and design.

This reference is available on-line from the NRCS Conservation Engineering Division and listed under the Environmental Engineering section available on the web at the following site:

<http://www.info.usda.gov/CED/>

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

ANAEROBIC DIGESTER – CONTROLLED TEMPERATURE

(No.)

CODE 366

DEFINITION

A managed temperature waste treatment facility.

PURPOSE

To biologically treat waste as a component of a waste management system to:

- produce biogas and capture for energy
- improve air quality
- reduce greenhouse gas emissions
- reduce pathogens
- improve nutrient management

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Biogas production and capture are components of a planned animal waste management system.
- Existing facilities can be modified to the requirements of this standard or for new construction.
- Manure can be collected fresh and delivered to the digester with a total solids (TS) concentration up to 14 percent.
- The operator has the interest and training to monitor and maintain processes or contracts with a consultant to provide these services.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. Waste treatment facilities must be planned, designed, and constructed to meet all Federal, State, and local regulations.

Manure Characteristics. This practice is applicable to manure that is collected fresh, generally less than 7 days old. Manure shall be essentially free of soil, sand, stones, or fibrous bedding material (including clumps of straw), or otherwise processed to remove or reduce such material.

Total Solids Concentration. The total solids of manure influent to the digester shall be as required by the digester type and process design. Except for any supplemental feedstocks and non-manure wastewater as described in following sections, water or wastewater, other than that needed for dilution to achieve the design total solids concentration, shall be excluded from the digester.

Treatment of Supplemental Feedstocks.

Food waste and wastewater from food processing operations may be added as supplemental feedstocks to a digester when the following conditions are satisfied:

1. The digester is designed to treat such wastes, as documented in the Plans and Specifications.
2. The digester Operation and Maintenance Plan includes the handling and treatment of such wastes.
3. The farm's nutrient management plan accounts for the nutrient impact of such wastes.

4. The treatment of such wastes meets with all State and local regulations.

Treatment of Non-manure Wastewater.

Wastewater from farm operations, such as milking parlor wastewater, barn floor wash water, and runoff from silage bunkers, may be added to a digester when the following conditions are satisfied:

1. The digester design has accounted for the use and treatment of such wastewater and included appropriate handling of such wastewater in the operation and maintenance plan.
2. The farm's nutrient management plan accounts for the nutrient impact of such wastewater.

Safety. If the digester will create a safety hazard, it shall be fenced and warning signs posted to prevent children and others from using it for purposes other than intended.

The effect of earthquake loads on the digester and biogas system shall be considered and appropriate protective measures incorporated into the design.

Biogas is flammable and highly toxic. The design of the digester and gas components must consider the hazards associated with normal operation and maintenance and provide adequate safety measures.

Digester Design. Digesters shall be designed to facilitate anaerobic digestion of animal manure and meet the minimum design and operational requirements below for the type of digester specified. The design documentation shall specify the type of digester and include a process diagram with the following minimum information:

1. Flow rates, influent, and effluent
2. Design total and volatile solids content of influent and effluent
3. Digester volume
4. Retention time
5. Heating system, control, and monitoring
6. Methane yield
7. 12-month energy budget when applicable
8. Process control and monitoring

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Digester Types

Plug Flow Digester

- For ruminant manure the total solids concentration of influent shall be 11 to 14 percent. For other manure sources the total solids concentration shall be 8 to 14 percent.
- Digester retention time shall be ≥ 20 days.
- Operational temperature shall be mesophilic (35 °C to 40 °C).
- The length to width ratio of digester flow path shall be between 3.5:1 and 5:1.
- The ratio of flow path width to fluid depth shall be less than 2.5:1.
- The shape of the floor and walls shall be uniform to minimize mixing.

Complete Mix Digester

- Total solids concentration of manure influent shall be from 2.5 to 10percent.
- Digester retention time shall be ≥ 17 days.
- Operational temperature shall be mesophilic (35 °C to 40 °C).
- Appropriate mixing devices shall be provided to assure a complete mix process.

Fixed Film Digester

- Total solids concentration of influent shall be ≤ 5 percent. For total solids concentration ≥ 2.5 percent, the influent particle size shall be ≤ 0.25 inch.
- Digester retention time shall range from 1 to 6 days, depending on waste biodegradability.
- Operational temperature shall range from 15 °C (59 °F) to 40 °C (103 °F).
- Microbial support material with ≥ 3 inch openings

Alternative Digester Design Criteria

Design of digesters not meeting the listed design and operational criteria or for a type

other than listed in this standard shall be based on the documented design and performance of such existing animal waste digester and certified as such by a registered professional engineer licensed in the state of the proposed installation.

Digester Vessel Characteristics. The digester vessel (tank) shall be a corrosion-protected material or concrete structure, above or below ground, with allowances for entry and exit of manure, heat pipes, and/or other appurtenances. The tank shall be equipped with a suitable cover designed for accumulation and collection of biogas. The tank and internal components shall be designed to facilitate periodic removal of accumulated solids.

Digester vessels shall meet the structural criteria for "Fabricated Structures" in Practice Standard (313), Waste Storage Facility, and the requirements of state and local seismic codes as applicable.

The following additional criteria apply:

1. Design Operating Volume. The digester shall be sized to retain the volume of manure and water at the design total solids concentration for the digester design retention time (days).
2. Configuration. The configuration of the digester tank is specific to the type of digester design and may be square, rectangular, circular, or as necessary to most effectively meet specific criteria listed under Digester Design. Tank dividers or flow separators can be utilized to increase efficiency.
3. Location of Inlet and Outlet. The inlet and outlet devices shall be located to facilitate process flow.
4. Inlet. Inlets shall be of any permanent type designed to resist corrosion, plugging, freeze damage, and prevent gas loss.
5. Outlet. The digester shall be equipped with an outflow device, such as an underflow weir, that will maintain the operating level, maintain a gas seal under the cover, prevent gas loss, and release effluent directly to separation, storage, or other treatment facility.

6. Cover. The digester cover shall be designed for all internal and external loads and shall capture and convey the biogas to a designed gas outlet. The cover system shall be designed to exclude the entrance of air under all operating conditions. Where the cover is exposed to the weather, the design shall account for environmental conditions for its service life. Precipitation runoff shall be collected and discharged to suitable grassed or otherwise stabilized areas.

Covers shall meet the requirements of Practice Standard (367), Waste Facility Cover.

Operating Temperature.

Digesters shall be maintained at internal temperatures appropriate to the digester type and design. The design shall include heat loss calculations to determine insulation, heat exchanger capacity, and energy requirements as appropriate for maintaining the digester operating temperature within acceptable limits.

Mesophilic Digesters - The digester shall be maintained between 35 °C and 40 °C (95 °F-103 °F) with an optimum of 37.5 °C (100 °F) and daily fluctuation of digester temperature limited to less than 0.55 °C (1 °F).

Operating Level. The operating level of digesters shall be designed with appropriate freeboard and overflow or automatic shutdown devices to prevent accidental spillage of effluent or discharge into the gas collection system.

Gas Collection, Transfer, and Control System. The biogas collection, transfer, and control system shall be designed to convey captured gas from within the digester to gas utilization equipment or devices (flare, boiler, engine, etc.).

1. Gas collection and transfer - Pipe and/or appurtenances shall meet the following:
 - The gas collection system within the digester shall be designed to facilitate exclusion of floating debris.
 - Pipe and components within the digester shall be securely anchored to prevent displacement from normal forces including loads from accumulated scum.

- Pipe shall be designed for wet biogas. In colder climates, the pipe may need to be insulated to prevent frost buildup.
- Pipes shall be constructed to enable all sections to be safely isolated and cleaned as part of routine maintenance.
- Transfer pipe can be buried or installed above ground and must include provisions for drainage of condensate.

2. Gas Control

- Equipment and components shall be conveniently located and sheltered from the elements.
- Equipment and components shall have a service life of not less than 2 years and shall be readily accessible for replacement or repair.
- The size of equipment and connecting pipe shall be based on head loss, cost of energy, cost of components, and manufacturers' recommendations.
- Gas pipe installed within buildings shall be of type approved for combustible gas.
- Where electrical service is required at the control facility, the installation and all electrical wire, fixtures, and equipment shall meet the National Electrical Code and local and state requirements.

Gas Utilization. Gas utilization equipment shall be designed and installed in accordance with standard engineering practice and the manufacturer's recommendations. As a minimum, the installation will include a flare to burn off collected gas and a means of maintaining the digester within acceptable operating temperature limits.

- The flare shall be equipped with automatic ignition and powered by battery/solar or direct connection to electrical service. The flare shall have a minimum capacity equal to the anticipated maximum biogas production.
- Gas-fired boilers, fuel cells, turbines, and internal combustion engines, when a component of the system, shall be designed for burning biogas directly, in a mix with other fuel, or shall include

equipment for removing H₂S and other contaminants from the biogas.

Monitoring. Equipment needed to properly monitor the digester and gas production shall be installed as part of the system. As a minimum the following equipment is required:

- Temperature sensors and readout device to measure internal temperature of digester
- Temperature sensors and readout device to measure inflow and outflow temperature of digester heat exchanger
- Gas meter suitable for measuring biogas

Safety. Biogas is a flammable gas. The gas collection, control, and utilization system shall be designed in accordance with standard engineering practice for handling a flammable gas and to prevent undue safety hazards. As a minimum:

- "Warning Flammable Gas" and "No Smoking" signs shall be posted.
- Flares shall be grounded or otherwise protected to minimize the chance of lightning strikes.
- A flame trap device shall be provided in the gas line between the digester and sources of ignition or as recommended by the flame arrester manufacturer.
- The location of underground gas lines shall be marked with signs to prevent accidental disturbance or rupture. Mark exposed pipe to indicate whether gas line or other.

Waste Storage Facility. When a waste storage facility is a component of the waste system, it shall meet the requirements of Practice Standard, 313, Waste Storage Facility. The volume of the digester shall not be considered in determining the storage requirement of the waste storage facility except that the sludge volume can be reduced by the anticipated percent destruction of total solids.

CONSIDERATIONS

Location. The digester should be located as near the source of manure as practicable and

as far from neighboring dwellings or public areas (minimum distance of 91 m (300 ft)) as possible. Proper location should also consider slope, distance of manure transmission, vehicle access, wind direction, proximity of streams and flood plains, and visibility. The digester should be located near a suitable site for energy utilization equipment. Short distances for the transmission of biogas through buried pipe are preferable. In determining the location of the waste storage facility, consider elevation and distance from the digester to take advantage of gravity flow.

Manure Characteristics. Aged manure can be fed to the digester if properly reconstituted to the digester design total solids content. The biogas yield from aged manure (generally less than 6 months old) is dependent on the biodegradation that has taken place during the storage period. If frozen, little biodegradation will have occurred, whereas manure in a warm, moist state could be significantly degraded.

Collection/Mix Tank. A collection/mix tank may be included to accumulate manure, settle foreign material, and pre-treat influent waste to the appropriate total solids concentration. A volume equal to 2 days of manure collection is recommended.

Digester Design. A digester operating fluid depth of 8 feet or greater is generally considered more economical for tank design.

Gas Collection Cover. In areas of extreme wind or excessive snow, appropriate structures may be necessary to protect inflatable and floating digester covers from damage.

Cover Design. A variety of digester cover designs can be considered to meet the needs of the farm. A secured, flexible membrane cover can be designed for significant storage of biogas whereas a rigid cover generally has limited storage.

Gas Utilization. The most beneficial use of the biogas energy must be investigated and selected. Depending on the design and climate, digesters may require up to 50 percent of the biogas heat value to maintain the design temperature in the winter. Digesters can be heated by hot water from boilers burning biogas or by heat recovery

from engines burning biogas for power generation.

Effluent Tank. An effluent tank to hold digester effluent for solids separation treatment may be considered due to the potential value of digested separated solids for bedding or soil amendment.

Visual Screening. Analyze the visual impact of the digester within the overall landscape context or viewshed. Screening with vegetative plantings, landforms, or other measures may be implemented to alleviate a negative impact or enhance the view.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and sound engineering practice, and shall describe the requirements for applying this practice to achieve its intended use.

As a minimum, the plans and specifications shall provide the following:

1. Layout and location of livestock facilities, waste collection points, waste transfer pipe, digester, biogas utilization facilities, and digester effluent storage.
2. Grading plan showing excavation, fill, and drainage, as appropriate.
3. Materials and structural details of the digester, including all premixing tanks, inlets, outlets, pipes, pumps, valves, and appurtenances as appropriate to the complete system.
4. Details of gas collection, control, and utilization system including type of materials for pipe, valves, regulators, pressure gages, electrical power and interface as appropriate, flowmeters, flare, utilization equipment, and associated appurtenances.
5. A process flow diagram.

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 shall contain operation and maintenance requirements including but not limited to:

- Proper loading rate of the digester and total solids content of the influent.
- Proper operating procedures for the digester.
- Estimates of biogas production, methane content, and potential energy recovery.
- Description of the planned startup procedures, normal operation, safety issues, and normal maintenance items.
- Alternative operation procedures in the event of equipment failure.
- Instructions for safe use or flaring of biogas.
- Digester and other component maintenance.
- Troubleshooting guide.
- Monitoring plan with frequency of measuring and recording digester inflow, operating temperatures, biogas yield, and/or other information as appropriate.

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

NUTRIENT MANAGEMENT

(Ac.)

CODE 590

DEFINITION

Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments.

PURPOSE

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural nonpoint source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen emissions (ammonia and NO_x compounds) and the formation of atmospheric particulates.
- To maintain or improve the physical, chemical and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied.

CRITERIA

General Criteria Applicable to All Purposes

A nutrient budget for nitrogen, phosphorus, and potassium shall be developed that considers all potential sources of nutrients including, but not limited to animal manure and organic by-products, waste water, commercial fertilizer, crop residues, legume credits, and irrigation water.

Realistic yield goals shall be established based on soil productivity information, historical yield data, climatic conditions, level of management and/or local research on similar soil, cropping systems, and soil and manure/organic by-products tests.

For new crops or varieties, industry yield recommendations may be used until documented yield information is available.

Plans for nutrient management shall specify the source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing movement of nutrients and other potential contaminants to surface and/or ground waters.

Areas contained within established minimum application setbacks (e.g., sinkholes, wells, gullies, ditches, surface inlets or rapidly permeable soil areas) shall not receive direct application of nutrients.

The amount of nutrients lost to erosion, runoff, irrigation and drainage, shall be addressed, as needed.

Soil and Tissue Sampling and Laboratory Analyses (Testing). Nutrient planning shall be based on current soil and tissue (where used as a supplement) test results developed in accordance with Land Grant University guidance, or industry practice if recognized by the Land Grant University. Current soil tests are those that are no older than five years.

Soil and tissue samples shall be collected and prepared according to the Land Grant University guidance or standard industry practice. Soil and tissue test analyses shall be performed by laboratories that are accepted in one or more of the following:

- Laboratories successfully meeting the requirements and performance standards of the North American Proficiency Testing Program (NAPT) under the auspices of the Soil Science Society of America, or
- State recognized program that considers laboratory performance and proficiency to assure accuracy of soil test results.

Soil and tissue testing shall include analyses for any nutrients for which specific information is needed to develop the nutrient plan. Request analyses pertinent to monitoring or amending the annual nutrient budget, e.g. pH, electrical conductivity (EC), soil organic matter, nitrogen, phosphorus and potassium.

Nutrient Application Rates. Soil amendments shall be applied, as needed, to adjust soil pH to an adequate level for crop nutrient availability and utilization.

Recommended nutrient application rates shall be based on Land Grant University recommendations (and/or industry practice when recognized by the university) that consider current soil test results, realistic yield goals and management capabilities. If the Land Grant University does not provide specific recommendations, application shall be based on realistic yield goals and associated plant nutrient uptake rates.

The planned rates of nutrient application, as documented in the nutrient budget, shall be determined based on the following guidance:

- Nitrogen Application - Planned nitrogen application rates shall match the recommended rates as closely as possible, except when manure or organic by-products are a source of nutrients. When manure or organic by-products are a source of nutrients, see "Additional Criteria" below.
- Phosphorus Application - Planned phosphorus application rates shall match the recommended rates as closely as possible, except when manure or organic by-products are sources of nutrients. When manure or organic by-products are a source of nutrients, see "Additional Criteria" below.

- Potassium Application - Potassium shall not be applied in situations in which excess (greater than soil test potassium recommendation) causes unacceptable nutrient imbalances in crops or forages. When forage quality is an issue associated with excess potassium application, state standards shall be used to set forage quality guidelines.
- Other Plant Nutrients - The planned rates of application of other nutrients shall be consistent with Land Grant University guidance or industry practice if recognized by the Land Grant University in the state.
- Starter Fertilizers - When starter fertilizers are used, they shall be included in the overall nutrient budget, and applied in accordance with Land Grant University recommendations, or industry practice if recognized by the Land Grant University within the state.

Nutrient Application Timing. Timing and method of nutrient application (particularly nitrogen) shall correspond as closely as possible with plant nutrient uptake characteristics, while considering cropping system limitations, weather and climatic conditions, risk assessment tools (e.g., leaching index, P index) and field accessibility.

Nutrient Application Methods. Application methods to reduce the risk of nutrient transport to surface and ground water, or into the atmosphere shall be employed.

To minimize nutrient losses:

- Apply nutrient materials uniformly to application area(s).
- Nutrients shall not be applied to frozen, snow-covered or saturated soil if the potential risk for runoff exists.
- Nutrients shall be applied considering the plant growth habits, irrigation practices, and other conditions so as to maximize availability to the plant and minimize the risk of runoff, leaching, and volatilization losses.
- Nutrient applications associated with irrigation systems shall be applied in a

manner that prevents or minimizes

Conservation Management Unit (CMU) Risk Assessment. In areas with identified or designated nutrient related water quality impairment, a CMU specific risk assessment of the potential for nutrient transport from the area shall be completed.

States that utilize a threshold prescreening procedure to trigger CMU risk assessment shall follow approved procedures as recommended by the respective state or Land Grant University.

Use an appropriate nutrient risk assessment tool for the nutrient in question (e.g., leaching index, phosphorus index) or other state recognized assessment tool.

Additional Criteria Applicable to Manure and Organic By-Products or Biosolids Applied as a Plant Nutrient Source

When animal manures or organic by-products are applied, a risk assessment of the potential for nutrient transport from the CMU shall be completed to adjust the amount, placement, form and timing of application of nutrient sources, as recommended by the respective state or Land Grant University.

Nutrient values of manure and organic by-products (excluding sewage sludge or biosolids) shall be determined prior to land application. Samples will be taken and analyzed with each hauling/emptying cycle for a storage/treatment facility. Manure sampling frequency may vary based on the operation's manure handling strategy and spreading schedule. If there is no prior sampling history, the manure shall be analyzed at least annually for a minimum of three consecutive years. A cumulative record shall be developed and maintained until a consistent (maintaining a certain nutrient concentration with minimal variation) level of nutrient values is realized. The average of results contained in the operation's cumulative manure analyses history shall be used as a basis for nutrient allocation to fields. Samples shall be collected and prepared according to Land Grant University guidance or industry practice.

In planning for new operations, acceptable "book values" recognized by the NRCS and/or

resource impairment.

the Land Grant University may be used if they accurately estimate nutrient output from the proposed operation (e.g., NRCS Agricultural Waste Management Field Handbook).

Biosolids (sewage sludge) shall be applied in accordance with USEPA regulations. (40 CFR Parts 403 (Pretreatment) and 503 (Biosolids) and other state and/or local regulations regarding the use of biosolids as a nutrient source.

Manure and Organic By-Product Nutrient Application Rates. Manure and organic by-product nutrient application rates shall be based on nutrient analyses procedures recommended by the respective state or Land Grant University. As indicated above, "book values" may be used in planning for new operations. At a minimum, manure analyses shall identify nutrient and specific ion concentrations, percent moisture, and percent organic matter. Salt concentration shall be monitored so that manure applications do not cause plant damage or negatively impact soil quality.

The application rate (in/hr) of liquid materials applied shall not exceed the soil intake/infiltration rate and shall be adjusted to minimize ponding and to avoid runoff. The total application shall not exceed the field capacity of the soil and shall be adjusted, as needed, to minimize loss to subsurface tile drains.

The planned rates of nitrogen and phosphorus application recorded in the plan shall be determined based on the following guidance:

Nitrogen Application Rates

- When manure or organic by-products are used, the nitrogen availability of the planned application rates shall match plant uptake characteristics as closely as possible, taking into consideration the timing of nutrient application(s) in order to minimize leaching and atmospheric losses.
- Management activities and technologies shall be used that effectively utilize mineralized nitrogen and that minimize nitrogen losses

through denitrification and ammonia volatilization.

- Manure or organic by-products may be applied on legumes at rates equal to the estimated removal of nitrogen in harvested plant biomass.
- When the nutrient management plan component is being implemented on a phosphorus basis, manure or organic by-products shall be applied at rates consistent with a phosphorus limited application rate. In such situations, an additional nitrogen application, from non-organic sources, may be required to supply, but not exceed, the recommended amounts of nitrogen in any given year.

Phosphorus Application Rates

- When manure or organic by-products are used, the planned rates of phosphorus application shall be consistent with any one of the following options:
 - ◇ Phosphorus Index (PI) Rating. Nitrogen-based manure application on Low or Medium Risk Sites; phosphorus-based or no manure application on High and Very High Risk Sites.**
 - ◇ Soil Phosphorus Threshold Values. Nitrogen-based manure application on sites on which the soil test phosphorus levels are below the threshold values; Phosphorus-based or no manure application on sites on which soil phosphorus levels equal or exceed threshold values.**
 - ◇ Soil Test. Nitrogen-based manure application on sites for which the soil test recommendation calls for phosphorus application; phosphorus-based or no manure application on sites for which the soil test recommendation calls for no phosphorus application. ‡

** Acceptable phosphorus-based manure application rates shall be determined as a function

of soil test recommendation or estimated phosphorus removal in harvested plant biomass.

Guidance for developing these acceptable rates is found in the NRCS General Manual, Title 190, Part 402 (Ecological Sciences, Nutrient Management, Policy), and the National Agronomy Manual, Section 503 (to be developed).

- The application of phosphorus applied as manure may be made at a rate equal to the recommended phosphorus application or estimated phosphorus removal in harvested plant biomass for the crop rotation or multiple years in the crop sequence. When such applications are made, the application rate shall:
 - ◇ Not exceed the recommended nitrogen application rate during the year of application, or
 - ◇ Not exceed the estimated nitrogen removal in harvested plant biomass during the year of application when there is no recommended nitrogen application.
 - ◇ Not be made on sites considered vulnerable to off-site phosphorus transport unless appropriate conservation practices, best management practices or management activities are used to reduce the vulnerability.

Heavy Metal Monitoring. When sewage sludge (biosolids) is applied, the accumulation of potential pollutants (including arsenic, cadmium, copper, lead, mercury, selenium, and zinc) in the soil shall be monitored in accordance with the US Code, Reference 40 CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

In areas with an identified or designated nutrient management related air quality concern, any component(s) of nutrient

management (i.e., amount, source, placement, form, timing of application) identified by risk assessment tools as a potential source of atmospheric pollutants shall be adjusted, as necessary, to minimize the loss(es).

When tillage can be performed, surface applications of manure and fertilizer nitrogen formulations that are subject to volatilization on the soil surface (e.g., urea) shall be incorporated into the soil within 24 hours after application.

When manure or organic by-products are applied to grassland, hayland, pasture or minimum-till areas the rate, form and timing of application(s) shall be managed to minimize volatilization losses.

When liquid forms of manure are applied with irrigation equipment, operators will select weather conditions during application that will minimize volatilization losses.

Operators will handle and apply poultry litter or other dry types of animal manures when the potential for wind-driven loss is low and there is less potential for transport of particulates into the atmosphere.

Weather and climatic conditions during manure or organic by-product application(s) shall be recorded and maintained in accordance with the operation and maintenance section of this standard.

Additional Criteria to Improve the Physical, Chemical and Biological Condition of the Soil

Nutrients shall be applied and managed in a manner that maintains or improves the physical, chemical and biological condition of the soil.

Minimize the use of nutrient sources with high salt content unless provisions are made to leach salts below the crop root zone.

To the extent practicable nutrients shall not be applied when the potential for soil compaction and rutting is high.

CONSIDERATIONS

The use of management activities and technologies listed in this section may improve

both the production and environmental performance of nutrient management systems.

The addition of these management activities, when applicable, increases the management intensity of the system and is recommended in a nutrient management system.

Action should be taken to protect National Register listed and other eligible cultural resources.

The nutrient budget should be reviewed annually to determine if any changes are needed for the next planned crop.

For sites on which there are special environmental concerns, other sampling techniques may be appropriate. These include soil profile sampling for nitrogen, Pre-Sidedress Nitrogen Test (PSNT), Pre-Plant Soil Nitrate Test (PPSN) or soil surface sampling for phosphorus accumulation or pH changes.

Additional practices to enhance the producer's ability to manage manure effectively include modification of the animal's diet to reduce the manure nutrient content, or utilizing manure amendments that stabilize or tie-up nutrients.

Soil test information should be no older than one year when developing new plans, particularly if animal manures are to be used as a nutrient source.

Excessive levels of some nutrients can cause induced deficiencies of other nutrients.

If increases in soil phosphorus levels are expected, consider a more frequent (annual) soil testing interval.

To manage the conversion of nitrogen in manure or fertilizer, use products or materials (e.g. nitrification inhibitors, urease inhibitors and slow or controlled release fertilizers) that more closely match nutrient release and availability for plant uptake. These materials may improve the nitrogen use efficiency (NUE) of the nutrient management system by reducing losses of nitrogen into water and/or air.

Considerations to Minimize Agricultural Nonpoint Source Pollution of Surface and Ground Water.

Erosion control and runoff reduction practices can improve soil nutrient and water storage, infiltration, aeration, tilth, diversity of soil organisms and protect or improve water and air quality (Consider installation of one or more NRCS FOTG, Section IV – Conservation Practice Standards).

Cover crops can effectively utilize and/or recycle residual nitrogen.

Apply nutrient materials uniformly to the application area. Application methods and timing that reduce the risk of nutrients being transported to ground and surface waters, or into the atmosphere include:

- Split applications of nitrogen to provide nutrients at the times of maximum crop utilization,
- Use stalk-test to minimize risk of over applying nitrogen in excess of crop needs.
- Avoid winter nutrient application for spring seeded crops,
- Band applications of phosphorus near the seed row,
- Incorporate surface applied manures or organic by-products as soon as possible after application to minimize nutrient losses,
- Delay field application of animal manures or organic by-products if precipitation capable of producing runoff and erosion is forecast within 24 hours of the time of the planned application.

Considerations to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere.

Odors associated with the land application of manures and organic by-products can be offensive to the occupants of nearby homes. Avoid applying these materials upwind of occupied structures when residents are likely to be home (evenings, weekends and holidays).

When applying manure with irrigation equipment, modifying the equipment can reduce the potential for volatilization of nitrogen from the time the manure leaves the application equipment until it reaches the surface of the soil (e.g., reduced pressure,

drop down tubes for center pivots). N volatilization from manure in a surface irrigation system will be reduced when applied under a crop canopy.

When planning nutrient applications and tillage operations, encourage soil carbon buildup while discouraging greenhouse gas emissions (e.g., nitrous oxide N₂O, carbon dioxide CO₂).

Nutrient applications associated with irrigation systems should be applied in accordance with the requirements of Irrigation Water Management (Code 449).

CAFO operations seeking permits under USEPA regulations (40 CFR Parts 122 and 412) should consult with their respective state permitting authority for additional criteria.

PLANS AND SPECIFICATIONS

Plans and specifications for nutrient management shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s), using nutrients to achieve production goals and to prevent or minimize resource impairment.

Nutrient management plans shall include a statement that the plan was developed based on requirements of the current standard and any applicable Federal, state, or local regulations, policies, or programs, which may include the implementation of other practices and/or management activities. Changes in any of these requirements may necessitate a revision of the plan.

The following components shall be included in the nutrient management plan:

- aerial site photograph(s) or site map(s), and a soil survey map of the site,
- location of designated sensitive areas or resources and the associated, nutrient management restriction,
- current and/or planned plant production sequence or crop rotation,
- results of soil, water, manure and/or organic by-product sample analyses,
- results of plant tissue analyses, when used for nutrient management,

- realistic yield goals for the crops,
- complete nutrient budget for nitrogen, phosphorus, and potassium for the crop rotation or sequence,
- listing and quantification of all nutrient sources,
- CMU specific recommended nutrient application rates, timing, form, and method of application and incorporation, and
- guidance for implementation, operation, maintenance, and recordkeeping.

If increases in soil phosphorus levels are expected, the nutrient management plan shall document:

- the soil phosphorus levels at which it may be desirable to convert to phosphorus based planning,
- results of appropriate risk assessment tools to document the relationship between soil phosphorus levels and potential for phosphorus transport from the field,
- the potential for soil phosphorus drawdown from the production and harvesting of crops, and
- management activities or techniques used to reduce the potential for phosphorus loss.

OPERATION AND MAINTENANCE

The owner/client is responsible for safe operation and maintenance of this practice including all equipment. Operation and maintenance addresses the following:

- periodic plan review to determine if adjustments or modifications to the plan are needed. As a minimum, plans will be reviewed and revised with each soil test cycle.
- significant changes in animal numbers and/or feed management will necessitate additional manure sampling and analyses to establish a revised average nutrient content.
- protection of fertilizer and organic by-product storage facilities from weather and accidental leakage or spillage.

- calibration of application equipment to ensure uniform distribution of material at planned rates.
- documentation of the actual rate at which nutrients were applied. When the actual rates used differ from the recommended and planned rates, records will indicate the reasons for the differences.
- Maintaining records to document plan implementation. As applicable, records include:
 - Soil, plant tissue, water, manure, and organic by-product analyses resulting in recommendations for nutrient application,
 - quantities, analyses and sources of nutrients applied,
 - dates and method(s) of nutrient applications,
 - weather conditions and soil moisture at the time of application; lapsed time to manure incorporation, rainfall or irrigation event.
 - crops planted, planting and harvest dates, yields, and crop residues removed,
 - dates of plan review, name of reviewer, and recommended changes resulting from the review.

Records should be maintained for five years; or for a period longer than five years if required by other Federal, state or local ordinances, or program or contract requirements.

Workers should be protected from and avoid unnecessary contact with plant nutrient sources. Extra caution must be taken when handling ammoniacal nutrient sources, or when dealing with organic wastes stored in unventilated enclosures.

Material generated from cleaning nutrient application equipment should be utilized in an environmentally safe manner. Excess material should be collected and stored or field applied in an appropriate manner.

Nutrient containers should be recycled in compliance with state and local guidelines or regulations.

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Sims, J.T. (ed.) 2005. Phosphorus: Agriculture and the Environment. Agron. Monogr. 46. ASA, CSSA, and SSSA, Madison, WI.

Stevenson, F.J. (ed.) 1982. Nitrogen in Agricultural Soils. Agron. Series 22. ASA, CSSA, and SSSA, Madison, WI.

Appendix C – Ecology, JHD, and WSDA Contact Information

Department of Ecology Contacts – www.ecy.wa.gov

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Map of Ecology Regions



Jurisdictional Health Department - <http://www.doh.wa.gov/LHJMap/LHJMAP.htm>

Adams County Health Department

425 E. Main, STE 700 (509) 659 3322 brents@co.adams.wa.us
Othello, WA 99344

Asotin County Health District

431 Elm Street (509) 758 3344 achd@co.asotin.wa.us
Clarkston, WA 99403

Benton-Franklin Health District

800 W Canal Drive (509) 526 2985 info@bfhd.wa.gov
Kennewick, WA 99336-3564

Bremerton-Kitsap County Health District

345 6th Street, Ste 300 (360) 337 5235 browej@health.co.kitsap.wa.us
Bremerton, WA 98337

Chelan-Douglas Health District

200 Valley Mall Parkway (509) 886 6450 marc.marquis@cdhd.wa.gov
East Wenatchee, WA 98802

Clallam County Health and Human Services, Environmental Health

223 E 4Th St 14 (360) 417 2415 Web_envhltht@co.clallam.wa.us
Port Angeles, WA 98362

Clark County Public Health, Environmental Health

1601 East 4th Plain Blvd (360) 397 8122 Public.health@clark.wa.gov
Vancouver, WA 98663

Columbia County Health Department

1010 S 3rd (509) 524 2653 bjenkins@co.walla-walla.wa.us
Dayton, WA 99328

Cowlitz County

1952 9th Avenue (360) 414 5599 bischoffc@co.cowlitz.wa.us
Longview, WA 98632

Garfield County Health District

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Pomeroy, WA 99347

Grant County Health District

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First and C Street NW

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Grays Harbor County Health Dept, Env Health

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Montesano, WA 98563

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Coupeville, WA 98239-5000

Jefferson County Public Health, Environmental Health

615 Sheridan Street (360) 385 9400 info@jeffersoncountypublichealth.org
Port Townsend, WA 98368

Public Health Seattle & King County

999 3rd Ave Ste 700 (206) 296 0100 ngozi.oleru@kingcounty.gov
Seattle, WA 98104-4039

Kittitas County Health Dept

507 N Nanum Street (509) 962 7506 environmentalhealth@co.kittitas.wa.us
Ellensburg, WA 98926-2898

Klickitat County Health Dept

228 West Main Street, MS- (509) 773 2366 Health@co.klickitat.wa.us
CH-14
Goldendale, WA 98620

Lewis County Health Dept, Env Health Division

2025 Kresky Avenue (360) 740 1238 TGBarret@co.lewis.wa.us
Chehalis, WA 98532-2626

Lincoln County Health Department

90 Nicholls (509) 725 9213 ext 24 edzedzy@co.lincoln.wa.us
Davenport, WA 99122-0105

Mason County Env Health

PO Box 1666 (360) 427 9670 ext 358 dlr@co.mason.wa.us
411 N. 5th Street
Shelton, WA 98584

Okanogan County Public Health, Environmental Health

1234 South 2nd Avenue (509) 422 7140 dhilton@co.okanogan.wa.us
Okanogan, WA 98840

Pacific County Public Health

7013 Sandridge Rd. (360) 642-9349 health@co.pacific.wa.us

Jurisdictional Health Department - <http://www.doh.wa.gov/LHJMap/LHJMAP.htm>

Long Beach, WA 98631

Tacoma-Pierce County Health Dept

3629 South D Street (253) 798 6500 info@tpchd.org
Tacoma, WA 98418-6813

San Juan Health Dept

PO Box 607 (360) 378 4474 markt@co.san-juan.wa.us
145 Rhone Street
Friday Harbor, WA 98250-0607

Skagit County Health Department

700 South Second Rm, 301 (360) 336 9380 ext 5459 health@co.skagit.wa.us
Mount Vernon, WA 98273-1071

Skamania County Health Dept

PO Box 162 (509) 427 5138 bscherling@swwhd.wa.gov
8683 SW Rock Creek Drive
Stevenson, WA 9864

Snohomish County Health Dist

3020 Rucker Avenue Ste 204 (425) 339 5250 swtquestions@shd.snohomish.wa.gov
Everett, WA 98201-3971

Spokane Regional Health District, Environmental Health Div

1101 W College Ave Rm 200 (509) 324 1590 dswink@spokanecounty.org
Spokane, WA 99201-2095

Thurston County Environmental Health

2000 Lakeridge (360) 786 5456 starraya@co.thurston.wa.us
Olympia, WA 98502

Northeast Tri County Health District (Stevens, Ferry, Pend Oreille)

PO Box 270 (509) 684 2262 jmatsuyama@netchd.org
567 East 3rd
Colville, WA 99114

Wahkiakum County, Health & Human Services

PO Box 696 (360) 795 6207 ehs@co.wahkiakum.wa.us
64 Main Street
Cathlamet, WA 98612

Walla Walla City/Co. Health Dept.

PO Box 1753 (509) 524 2653 bjenkins@co.walla-walla.wa.us
310 West Poplar Suite 102

Jurisdictional Health Department - <http://www.doh.wa.gov/LHJMap/LHJMAP.htm>

Walla Walla, WA 99362-0346

Whatcom County Health Dept, Environmental Health

509 Girard Street (360) 676 6724 ext 50808 health@whatcomcounty.us
Bellingham, WA 98227-0935

Whitman County Health Dept

310 N Main Street (509) 397 6280 Michael.Baker@WhitmanCounty.net
Colfax, WA 99111-1848

Yakima County Health Dist, Env Health

104 N First Street (509) 575 4040 gordon.kelly@co.yakima.wa.us
Yakima, WA 98901

Department of Agriculture Contacts - <http://agr.wa.gov/FoodAnimal/Livestock-Nutrient>

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Seattle, WA (360) 202-3257 cmckinnon@agr.wa.gov

Jason Pentzer: Whatcom Co.
Lynden, WA (360) 961-7412 jpentzer@agr.wa.gov

Ginny Prest: Clark, Cowlitz, Grays Harbor, Lewis, Mason, Pacific, Pierce, Thurston, and Wahkiakum counties
Olympia, WA (360) 902-1928 vprest@agr.wa.gov

Eric Bair: all Eastern Washington counties
Ephrata, WA (509) 969-7140 ebair@agr.wa.gov

Washington State Dairy Map (red dot = dairy)

