Compost Facility Resource Handbook

Guidance for Washington State

November 1998
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Washington State Department of Ecology
Solid Waste & Financial Assistance Program

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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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Compost Facility Resource Handbook Users:

Over the past decade, the composting industry in Washington State has emerged as an important component in our organic residual management system. As more materials are recycled into usable end products, we find ourselves grappling with a regulatory framework that includes multiple agencies and jurisdictions responsible for protecting our soil, air, water and public health.

In an effort to assist the developing industry, Ecology's Solid Waste & Financial Assistance Program has prepared this handbook to provide a common reference on how compost facilities are regulated in Washington State. It describes the regulatory framework, outlines basic design criteria that will meet solid waste and water quality requirements, and suggests planning and operation concepts for well-run facilities.

At this writing, the Solid Waste & Financial Assistance Program is beginning the process of revising the state's regulations in Chapter 173-304 WAC, *Minimum Functional Standards for Solid Waste Handling*. We are planning to include a new section for compost facility standards. Much of the groundwork for the new section is contained in this handbook.

We view this handbook as a valuable tool that outlines the existing regulatory structure for compost facilities, and highlights those areas in need of change.

We hope you find this handbook informative and useful.

Sincerely,

Cullen D. Stephenson

Cullen D. Stephenson, Program Manager
Solid Waste & Financial Assistance Program

The Compost Facility Resource Handbook was developed to help facility planners, operators, regulators and consumers easily identify environmental laws, regulations, permit requirements, and best management practices for compost facilities.

This handbook includes the most pertinent and generally required information. It does not include all laws, regulations, permit requirements and practices. It is intended as a guidance book and not a strict interpretation of state laws or a replacement for current regulations. This handbook should not be used as a substitute for legal advice.

Contact your local Ecology Regional Office if you need specific guidance or interpretation of a law, regulation or permit requirement.

For copies of this handbook, please contact:

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This handbook is also available in electronic format on our home page at
http://www.wa.gov/ecology/swfa/swhome.html.

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About This Handbook

Purpose

The purpose of the Compost Facility Resource Handbook is to provide a common reference on how compost facilities[1] are regulated in Washington State.

Goals

The Department of Ecology's goals for developing this handbook are to:

- Clarify the regulation of compost facilities under Chapter 173-304 WAC, Minimum Functional Standards for Solid Waste Handling;
- Integrate to the extent possible the regulatory requirements of solid waste, water quality, and air quality rules as they apply to compost facilities;
- Promote baseline compost facility designs to protect human health and the environment; and
- Recommend management practices based on experiences in Washington State, referencing existing documents as appropriate.

[1]Backyard composting is not regulated as a compost facility in Washington State. On-farm composting may or may not be regulated as a compost facility depending on feedstocks composted and use of the end product. Please refer to Chapters 2 and 3 for important explanations.

How To Use This Handbook

This handbook addresses three aspects of guidance about compost facilities:

- Requirements found in the regulations
- Explanations of how the regulations are applied to compost facilities
- Recommendations

Each of these aspects is represented by one of the symbols described below.

These symbols were created to help improve clarity of the document. It is important to rely on the text descriptions for any questions about specific requirements.

Symbols are attached to individual paragraphs in the text. (Symbols are not attached to any figures or tables in the document.)

Paragraphs without symbols should be considered general information.

 **Regulatory requirement**

Describes what you must do according to current regulations. Actual regulatory language appears in italics with the appropriate citation.

 **Clarification of the regulations**

Explains how the regulations are applied to compost facilities. Clarifies specific requirements.

 **Recommendations**

Suggests operation and management procedures and concepts that are not specifically required by regulation. Emphasizes what you should do for a well-run facility.

The best way to use this handbook is to formulate your question about compost facilities and then browse the Table of Contents to find the appropriate topics.

Starting a New Compost Facility

If you want information about starting a new compost facility, go to Appendix 1-Checklist for Planning New Facilities. Each of the steps will refer you to the appropriate chapters in the handbook. You will want to become familiar with the regulatory framework in Chapter 2, and pay particular attention to planning and siting issues in Chapter 4.

Who should use the Compost Facility Resource Handbook?

The Department of Ecology compiled this handbook for:

- Jurisdictional health departments
- Compost producers
- State and local governments
- Consultants and engineers
- Interested citizens

Brief Description of Each Chapter

Chapter 1	Overview of the Compost Facility Resource Handbook Describes what topics the handbook covers and includes a brief history of solid waste regulation in Washington State.
Chapter 2	Understanding the Regulatory Framework Describes solid waste, water quality and air quality regulations as they apply to compost facilities.
Chapter 3	Important Questions and Answers Answers important questions about how compost facilities are regulated. Focus is on solid waste regulations, but includes water quality and air quality regulations where appropriate.
Chapter 4	Planning and Siting Compost Facilities: The "Good Neighbor" Strategy Identifies potential problems; outlines a strategy to plan and site a compost facility with impact to neighbors in mind.
Chapter 5	Compost Facility Designs Covers elements of site layout and basic design criteria to meet regulations.
Chapter 6	Recommended Management Practices Uses models developed by The Composting Council to describe best practices for various stages of the composting process.

Chapter 1
Overview of the Compost Facility Resource Handbook

Introduction

Welcome to the Compost Facility Resource Handbook!

Every day compost facilities across Washington State transform tons of organic waste materials into usable soil amendments. Operators and managers of these facilities face many challenges; from handling storm water and leachate to mitigating odors and working with neighbors.

To support the compost industry in facing these challenges, the Department of Ecology has designed this handbook to provide "one stop shopping" for information on how compost facilities are regulated in Washington. Use of this handbook eases the process of obtaining and complying with permits for compost facilities by compiling solid waste, water quality and air quality requirements in one document.

This handbook does not reflect any new regulations; rather, it clarifies regulations that already exist at the state level. However, local agencies may be clarifying ordinances for their own jurisdictions concurrent with this document.

Another purpose of this handbook is to provide criteria for baseline compost facility designs and management practices. This information includes mandatory requirements for protecting air and water quality, as well as suggestions for meeting those requirements. In this respect, we have relied heavily on local experience to suggest designs and management practices that have been successful in Washington State.

This handbook is a guidance document. It should be used to help make decisions about what features are needed at individual compost facilities. Several items have been included that are not regulated under the composting sections of the Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC. For example, information on commercial vermicomposting is included to aid health departments in making decisions about those operations that process solid wastes using worms.

The handbook is divided into seven chapters. There is some overlap in information between chapters since the design and operation of a compost facility is integrally related to public acceptance and protecting the environment. The handbook also includes a glossary and six appendices. The glossary and references are taken largely from the existing body of information available at the national level. In some instances, definitions have been changed to reflect unique aspects of the composting industry here in Washington.

What feedstocks are addressed in the handbook?

The composting industry has the potential to compost a broad range of the organic wastes we generate. Ecology developed this handbook focusing on commonly recognized feedstocks as listed below. Please note the list does not reflect specific elements of the current regulatory structure (e.g. biosolids compost is regulated under a new state rule).

- Yard waste
- Municipal solid waste
- Animal manures and bedding
- Paper wastes, including wax-coated paper and old corrugated cardboard
- Biosolids (including septage)
- Food waste - residential and commercial
- Fish and animal morts (dead animal carcasses)
- Specialty wastes (e.g. food processing waste)
- Paper mill waste, industrial sludges
- Sawdust, wood chips, other wood wastes used as bulking agents

Other feedstocks may also be appropriate for composting. Ecology recommends that composters and health departments evaluate other feedstocks not mentioned above to determine whether or not a proposed feedstock will benefit a particular compost operation. The following elements should be considered:

- Biodegradability
- Potential for physical contaminants
- Potential for human pathogens
- Potential for hazardous contaminants
- Preprocessing requirements
- Compatibility with other feedstocks (Will characteristics like nutrient value and particle size enhance the mix?)

What composting technologies are addressed in the handbook?

Organic materials can be composted by several different technologies. In general, this handbook focuses on the following technologies:

- Windrows
- Aerated windrows
- Aerated static piles

Ecology is focusing on these technologies because:

- They are the most common technologies in Washington State;
- Most of the regulatory questions we receive about composting relate to these technologies; and
- Our recommendations for management practices are based on experiences from existing facilities in the state.

Other technologies, such as in-vessel systems, may be more appropriate in certain situations. However, we are limiting our discussion of these facility types in the handbook to general information and references.

What practices are *not* addressed in the handbook?

Several processes/practices related to composting are beyond the scope of this handbook and are not addressed as integral components of the compost industry. However, these practices may be regulated under the Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC or other regulations. See Table 1-1.

Table 1-1. Processes/Practices Not Addressed

Processes/Practices Not Addressed in the Handbook	Process/Practice Not Addressed Because:
Composting of petroleum contaminated soils (PCS)	Petroleum contaminated soils are a special waste; remediation of this kind of material through composting requires management beyond the scope of this handbook.
Topsoil manufacturing (blending and mixing only)	Mixing and blending of topsoil materials (without active composting of ingredients) is not a regulated solid waste activity.
Backyard composting	Single family composting does not require permits under state solid waste, state water quality and state air quality regulations.
Individual farm composting	Composting your own waste for use on your own farm is exempt from solid waste regulations. Please see important clarification of on-farm composting in Chapter 3.
Detailed operations guidance for specific technologies	This handbook provides basic information on compost technologies as they relate to process control. Detailed information can be obtained from references and/or manufacturers of specific systems.
Comparisons between specific technologies and equipment	Comparisons between composting technologies are beyond the scope of this handbook. Considerable planning is involved in deciding which technology is appropriate for your situation. Please see the references in Appendix 3.
Wood waste processing (for markets/end uses other than composting)	Wood waste processing is a different industry than composting, and is beyond the scope of this handbook. See Chapter 3 for clarifying information on the use of wood waste as compost feedstocks.

How does this handbook relate to the Interim Guidelines for Compost Quality?

The Interim Guidelines for Compost Quality were published by the Department of Ecology in April 1994. They were developed to:

- Recommend consistent statewide standards for compost quality; and
- Provide guidance to county jurisdictional health departments and compost processors.

This handbook relates to the Interim Guidelines for Compost Quality in two ways:

(1) Facility types by feedstock

In the Interim Guidelines for Compost Quality, Ecology recommends defining compost facility types by feedstocks to differentiate the testing parameters and testing frequency for each facility. Since monitoring and testing are linked to both compost facility and compost quality issues, this handbook includes the three facility types developed for the Interim Guidelines for Compost Quality. (See Facility Types by Feedstocks below.)

(2) Compost quality criteria

The Interim Guidelines for Compost Quality present two grades of compost quality, Grade A and Grade AA. Ecology recommends that compost meeting either of the two grades be considered a product, not subject to a solid waste land application permit. Grade A compost reflects metals concentration limits found in the 40 CFR Part 503 regulation for biosolids (with exceptions for cadmium and arsenic). Grade AA has metals concentrations at half the Grade A levels (except cadmium and arsenic). The Grade AA compost classification was developed to extend the site life of compost applications. Please refer to Appendix II in the Interim Guidelines for Compost Quality for further explanation.

Since the definition of finished compost product may affect the design and operation of a compost facility, Ecology recommends using these compost quality criteria to help answer questions that may arise on facility design.

Facility Types by Feedstocks

Type 1 feedstocks:

- Wood wastes;
- Source separated yard and garden wastes;
- Agricultural crop residues;
- Manures from herbivorous animals;
- Pre-consumer meat-free food wastes; and
- Other source separated specialty waste or combination of Type 1 wastes that the jurisdictional health department considers to be relatively low in hazardous substances, human pathogens and physical contaminants.

Type 2 feedstocks:

- Biosolids, wastewater treatment solids, and septage;
- Meat and post-consumer source separated food wastes; and
- Other similar source separated specialty wastes that the jurisdictional health department considers to be relatively low in hazardous substances and physical contaminants, but are likely to have high levels of human pathogens.

Type 3 feedstocks:

- Mixed municipal solid wastes;
- Post collection separated or processed solid wastes;
- Industrial solid wastes;
- Industrial biological treatment sludges; and
- Other similar compostable organic wastes that the jurisdictional health department considers to have relatively high levels of hazardous substances, human pathogens and/or physical contaminants.

What is composting?

Composting is defined in Chapter 173-304 WAC, Minimum Functional Standards for Solid Waste Handling as: “the controlled degradation of organic solid waste, yielding a product for use as a soil conditioner.”

In this handbook, composting does **not** include:

- Treatment of sewage sludge or biosolids in digesters at wastewater treatment facilities; and
- Treatment of other liquid organic materials in aerobic or anaerobic digesters.

Background - A Short History of Compost Facility Regulation

The history of compost facility regulation in Washington State begins with the Solid Waste Management Act, Chapter 70.95, Revised Code of Washington (RCW). This act was passed by the legislature in 1969, at a time when the landscape was dotted with open burning dumps. The Solid Waste Management Act directed communities to close these dumps, and gave authority to local health departments to issue permits for solid waste handling. The permits were to be based on standards developed by the Department of Ecology.

In 1972, the Department of Ecology issued the first standards regulating solid waste handling (Chapter 173-301 WAC). These standards focused on the important task of setting up a framework to protect public health and the environment from inadequate solid waste disposal practices.

Since composting was not widely viewed as an alternative to disposal, this first regulation contained only three short sections relating to compost and the composting process. The standards required compost operators to:

(1) Cover odorous materials such as spoiled food and slaughterhouse waste;

(2) Ensure that compost offered to the public does not contain pathogenic organisms or sharp particles, and does not reheat upon standing; and

(3) Dispose of residue from the composting process in a sanitary manner.

The Solid Waste Management Act has been amended over the past 20 years to keep up with changes in the solid waste world. In the 1984 amendments, the legislature adopted waste management priorities for the first time. Citizens, municipalities, and businesses were called upon to follow a hierarchy for the collection, handling and management of solid waste: reduce, recycle, incinerate (energy recovery), and landfill. In addition, the amendments required county governments to develop solid waste management plans. They also gave authority to the Department of Ecology to review plans and solid waste permits.

It was clear that the state needed new standards to deal with these changes in the Solid Waste Management Act. The Department of Ecology responded by publishing Chapter 173-304 WAC, Minimum Functional Standards for Solid Waste Handling (MFS) in 1985. The Minimum Functional Standards were written to:

- Upgrade landfill standards as the main priority;
- Answer all questions about solid waste (that existed at the time);
- Expand coverage to include waste piles, ponds, incinerators, land application units, and recycling on the land; and
- On recycling, “speak softly and carry a small stick.”

The new standards contained two sections that addressed composting based on the feedstocks processed[2]: Section 300, Waste Recycling Facility Standards, and Section 420, Piles Used for Storage and Treatment - Facility Standards.

In 1989, the Solid Waste Management Act was amended again as the "Waste Not Washington Act." These amendments set a 50% recycling goal for Washington and required each county to include recycling in its solid waste management plan.

In 1990, the Department of Ecology held meetings to get feedback from the public on revising Chapter 173-304 WAC[3]. At that time, municipal solid waste landfills were on the way to being controlled. Recycling and composting began to take hold as communities worked to increase recycling rates. Comments from the public encouraged Ecology to look at compost quality and compost facilities separately.

In 1992, the Department of Ecology decided to address compost quality through guidelines, as opposed to regulation. The Department convened an advisory committee, and developed and issued the Interim Guidelines for Compost Quality in 1994.

This handbook is the companion document to the Interim Guidelines for Compost Quality. It provides regulatory guidance and recommends management practices for compost facilities in Washington State.

[2] See Chapter 2 for a discussion of these sections.
[3] Comments can be found in Publication 90-53, Minimum Functional Standards for Solid Waste Handling Rule Revision Project - First Scoping Document.

Chapter 2
Understanding the Regulatory Framework

Introduction

This chapter presents an overview of the regulatory framework for compost facilities in Washington State. Unlike some other states, Washington does not have a separate regulation dedicated to compost facilities and compost. Instead, Washington State has separate regulations with requirements that apply to compost facilities.

The major areas of regulation for compost facilities are:

- Solid waste
- Water quality
- Air quality
- Land use

Each of these major areas of regulation is described in the following sections. The discussion of land use is limited to general descriptions. Land use requirements are based on local conditions that vary from one area of the state to another.

What state regulations apply to compost facilities?

 Table 2-1 presents the major state regulations that apply to compost facilities.

Please note: there may be other state regulations applicable to your facility if your site is located near wetlands, rivers, lakes, or other areas of the shoreline. Contact the Department of Ecology in your region for additional requirements or Ecology's Permit Assistance Center (see Appendix 4 - Contacts).

In addition to the major areas of regulation, there are other state, local, and federal requirements which may apply to a facility depending on its location and construction plans. We've included brief descriptions of these requirements in the section "Other Permits/Approvals You May Need." If you have additional questions about site specific issues, please call the appropriate agency.

Table 2-1. State regulations applicable to compost facilities

State Regulation	Who enforces the regulation?
Chapter 173-304 WAC, Minimum Functional Standards for Solid Waste Handling (MFS)	Jurisdictional health department where the compost facility is located.
Chapter 173-216 WAC, State Waste Discharge Permit Program	Department of Ecology - Water Quality Program (or a delegated Publicly Owned Treatment Works)
Chapter 173-220 WAC, National Pollutant Discharge Elimination System Permit Program	Department of Ecology - Water Quality Program
Chapter 173-240 WAC, Submission of Plans and Reports for Construction of Wastewater Facilities	Department of Ecology - Water Quality Program
Chapter 173-400 WAC, General Regulations for Air Pollution Sources	Local air pollution control authority or Department of Ecology - Air Quality Program (see Table 2-4)
Chapter 173-308 WAC, Biosolids Management	Department of Ecology or local jurisdictional health department (depending on inter-agency agreements)
Chapter 197-11 WAC, State Environmental Policy Act	Lead agency - the agency responsible for State Environmental Policy Act compliance for a particular project.

State Solid Waste Regulation

Background

The Department of Ecology wrote the Minimum Functional Standards for Solid Waste Handling (MFS), Chapter 173-304 WAC in 1985 under the authority of the state's Solid Waste Management Act, Chapter 70.95 RCW.

The Minimum Functional Standards were written to upgrade landfill standards and expand coverage (beyond the previous solid waste regulation) to include waste piles, ponds, incinerators, land application units, and recycling on the land. Local governments have adopted these standards along with any additional requirements needed to address local conditions.

Standards Applicable to Compost Facilities

In Washington State, jurisdictional health departments are responsible for permitting compost facilities under the Minimum Functional Standards. There are two different facility standards under which permits are written:

- Solid Waste Handling Facility Standards, WAC 173-304-400. These standards include a series of sections addressing several different types of solid waste facilities. Standards specific to compost facilities are found in Piles Used for Storage and Treatment - Facility Standards, WAC 173-304-420.
- Waste Recycling Facility Standards, WAC 173-304-300.

The standards applicable to compost facilities do not apply to single family residences or single family farms that compost their own waste on site (WAC 173-304-300(1)(b)(i) and WAC 173-304-400(1)(c)).

Jurisdictional health departments have the authority to decide under which standards, or combination of standards, compost facilities should be regulated. The waste recycling standards were written with minimal requirements to encourage recycling practices. Experience has shown that in most cases these minimal requirements do not protect the environment nor foster a viable compost industry.

Compost facilities processing materials that do not contain garbage or sewage sludge/biosolids **may** follow the less stringent Waste Recycling Facility Standards **only** if the health department determines that:

(1) Water, air or land contamination has not or is not likely to occur under current conditions of storage or in the event of a fire or flood; and

(2) At least half of the waste has been recycled in three years and no material remains on site for more than five years. (WAC 173-304-300(3)(c)(i-ii))

Summary of Requirements in the Minimum Functional Standards

This section provides a summary of the requirements for compost facilities permitted as treatment piles under WAC 173-304-420. See Figure 2-1 for a summary list.

Important note: Since compost facilities must comply with all state and local requirements, this summary includes elements of the regulatory framework that may be more stringent than requirements in the Minimum Functional Standards. The text identifies these elements.

In addition, Chapter 3 contains important questions and answers that clarify the existing solid waste requirements.

Figure 2-1 Summary List of Minimum Functional Standards Applicable to Compost Facilities

Siting
Construction
- Liner
- Run-off Systems
- Run-on Prevention Systems
- Leachate Collection Systems

Operations
Closure
- Closure Plan
- Closure Procedures

Permits
Procedures for Permits
- Application Contents
- Preliminary Engineering Report and Plans
- Permit Renewal

Record Keeping
Reporting
Inspections
- Owner/Operator Inspections
- Compliance Inspections
- Liner Inspections

Comply With All Rules

Siting

There are no specific siting requirements for compost facilities under the Minimum Functional Standards. However, if a waste pile (compost pile) is located in a one hundred year flood plain, the piles must be designed to:

- "Comply with local flood plain management ordinances and Chapter 508-60 WAC, Administration of flood control zones; and
- Avoid washout or restriction of flow." (WAC 173-304-420(2)(b)(i-ii))

There may be siting requirements in specific local land use or health department ordinances. Contact your local jurisdiction in Appendix 4.

Construction

Liner

"Waste piles shall be placed upon a surface such as sealed concrete, asphalt, clay or an artificial liner underlying the pile, to prevent subsurface soil and potential ground water contamination and to allow collection of run-off and leachate. The liner shall be designed of sufficient thickness and strength to withstand stresses imposed by pile handling vehicles and the pile itself." (WAC 173-304-420(3)(a))

Runoff Systems

"Run-off systems shall be installed, designed and maintained to handle a, twenty-five year, twenty-four hour storm event." (WAC 173-304-420(3)(b))

Experience has shown that the twenty-five year, twenty-four hour storm event design criteria is not adequate for compost facilities in the wet climates[4] of Washington State over the course of an entire wet season. Ecology will use the water balance described in Chapter 5 to evaluate facility designs.

Run-on Prevention Systems

"Run-on prevention systems shall be designed and maintained to handle the maximum flow from a twenty-five year storm event;" (WAC 173-304-420(3)(d))

The Baseline General Permit for Stormwater Discharges Associated with Industrial Activities requires a stormwater pollution prevention plan that addresses the issue of run-on. (Please see the section in this chapter on state water quality regulations.)

Leachate Collection Systems

Water quality regulations require leachate collection and treatment systems for all compost facilities. (Please see the section in this chapter on state water quality regulations.)

Waste piles that exceed 10,000 cubic yards must have either a groundwater monitoring system that complies with WAC 173-304-490 or a leachate detection, collection and treatment system. (WAC 173-304-420(3)(c))

Operations

Compost facility owners/operators are required to develop, keep, and abide by a plan of operation approved as part of the permitting process. (WAC 173-304-405(2) General Facility Requirements) The plan must:

- Describe the facility's operation;
- Convey to site operating personnel the concept of operation intended by the designer;
- Be available for inspection at the request of the jurisdictional health officer; and
- Be modified with approval of the health department when operations at the facility change.

[4] Ecology recommends using the arid design threshold of 12" of rain to distinguish "wet climates" from "dry climates." Ecology encourages best professional judgement when evaluating designs for your particular location.

The plan of operation must include the following (from WAC 173-304-405(2) and 600(3)(e)(ii)):

- How solid wastes are to be handled on-site during its active life;
- How inspections and monitoring are conducted and their frequency;
- Actions to take if there is a fire or explosion;
- Actions to take if leaks are detected;
- Corrective action programs to take if groundwater is contaminated;
- Actions to take for other releases (e.g. failure of run-off containment system);
- How equipment such as leachate collection and gas collection equipment are to be maintained;
- A safety plan or procedure;
- Other such details as required by the jurisdictional health department;
- Methods of adding or removing wastes from the pile and equipment used;
- Inspections of the liner for integrity; and
- Safety and emergency plans.

The above requirements do not address many elements of the composting process that are necessary for a well-run operation. Ecology recommends expanding these requirements to include items found in the section entitled Operations Plan in Chapter 4.

Closure

Closure refers to the activities associated with ceasing compost operations. It includes waste removal and decontamination of the site, as well as grading, seeding, landscaping, contouring and/or screening.

Closure Plan

Owners or operators must develop, keep and abide by a closure plan that has been approved by the local health department during the permitting process. A facility may not begin operation until the closure plan for the entire facility has been approved. Specific closure plan requirements are identified in WAC 173-304-407(4) and WAC 173-304-600(3)(e)(iii).The closure plan must include the following:

- Estimate of closure year and cost;
- Methods of removing waste, liners or contaminated materials to a disposal site;
- Closure timing (including time intervals for implementing partial closure and notification procedures; and
- Final inspection by regulatory agencies.

Closure Procedures

Compost facility owners or operators must close their facility according to the performance standards and procedures in WAC 173-304-407 (3) and (5), respectively.

All solid wastes from the compost piles must be removed at closure to another permitted facility[5]. (WAC 173-304-420(2)(c))

Permits

Compost facility owners or operators must obtain a solid waste handling permit from the health department in their jurisdiction. (WAC 173-304-600(2-3))

Procedures for Permits

Applicants must apply with the jurisdictional health department. Application procedures are identified in WAC 173-304-600(3). Please see Appendix 4 for contact information.

Application Contents

The permit application must contain a general facility description, types of waste handled, plan of operation, the form used to record weights or volumes, and inspection schedule and log, documentation to show that any leachate treatment system is being reviewed by Ecology under WAC 173-240 Submission of Plans and Reports for Construction of Wastewater Facilities , and a closure plan. (WAC 173-304-600(3)(a))

Preliminary Engineering Report and Plans

The permit application must contain a preliminary engineering report and plans that include:

(1) How the facility will meet zoning requirements;

(2) How the facility meets the county comprehensive solid waste management plan;

(3) The liner design including an analysis of its ability to withstand stress;

(4) Run-on and run-off system design (leachate and stormwater collection and treatment system design);

(5) The design to avoid washout when located in a 100 year floodplain; and

(6) The maximum elevation and boundaries of the waste pile. (WAC 173-304-600(3)(e)(i)).

[5] Finished compost can be sold.

Permit Annual Renewal

Permits must be renewed and permit fees paid annually to the jurisdictional health department. Facility changes must be noted on the application to be authorized by permit. (WAC 173-304-600(4))

Record keeping

Daily operating records must be maintained on the weights or volumes of waste, number of vehicles entering, the types of waste received, and major deviations from the operating plan. (WAC 173-304-405(3))

Health departments may also require data on pile turning and temperature monitoring.

Reporting

Facilities must submit annual reports to the local health department and to the Department of Ecology by March 1 of each year. The reports must list quantities and types of solid waste handled, and the results of ground water monitoring, if conducted. (WAC 173-304-405(4))

Other reporting requirements may be contained in a leachate disposal permit issued by the Department of Ecology, if required. Please see the section on water quality regulations in this chapter.

Inspections

Owner/Operator Inspections

Owners or operators must inspect the facility to identify any site malfunctions or problems. Findings must be maintained in a log, which must be available to inspectors. (WAC 173-304-405(5))

Inspecting the facility on a daily basis is critical to a well-run facility. Inspections should become an integral part of operations.

Compliance Inspections

Owners or operators must allow local health department inspectors on site at reasonable times to determine compliance with the rules. Inspections by local health departments must be performed annually. (WAC 173-304-600(5))

Other regulatory inspectors must also be allowed on site for inspections according to provisions in the respective permits. Water quality inspectors must be allowed on site to determine compliance with leachate and stormwater permit requirements. Air quality inspectors must be able to inspect the facility for compliance with air quality permits.

Liner Inspections

Health departments may require that the entire base or liner be inspected for wear and integrity. (WAC 173-304-420(3)(e))

Comply With All Rules

Compost facilities must comply with all other state and local requirements, such as zoning requirements, fire prevention, water and air pollution prevention, nuisance and aesthetics. (WAC 173-304-405(7))

State Water Quality Regulations

The Department of Ecology is the primary agency regulating water quality in Washington State. [6] In order to protect surface water and ground water quality, Ecology issues permits for wastewater discharges from municipalities and industries.

There are two types of wastewater from compost facilities that need to be addressed:

- Leachate
- Stormwater

The following sections define these two types of wastewater and describe the permit requirements for each.

What is leachate?

Leachate, or industrial wastewater, is "water or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste or gases therefrom," (Chapter 173-304 WAC). Leachate is generated at compost facilities that compost outside without cover. All runoff from active composting areas, including waste receiving and processing areas is leachate.

Runoff from other facility areas such as roads and finished product storage areas is considered to be stormwater.

[6] Several local governments and tribes have additional requirements for stormwater and/or pollutant discharges to surface water.

Table 2-2. Pollutants of concern in leachate

What pollutants in leachate raise concern?	
Biochemical oxygen demand (BOD)	Biochemical oxygen demand is a measurement of the amount of oxygen that would be depleted from a surface water when leachate (or other oxygen-demanding material) is allowed to run into it. Dissolved oxygen in lakes and streams is critical to supporting a healthy aquatic ecosystem.
Nitrogen	The nitrogen in leachate can be detrimental to surface water depending on its form. Ammonia nitrogen (in high concentrations) is toxic to fish. Ammonia (in low concentrations) and nitrate provide nutrients for excessive growth of algae. In addition, the conversion of ammonium nitrogen to nitrate consumes large quantities of dissolved oxygen. Nitrate in leachate is also a potential pollutant in drinking water supplies. In high enough concentrations, it can cause methemoglobinemia in infants.
Suspended solids	Suspended solids are particles in leachate that are large enough to settle out of solution or be filtered out. Suspended solids can lead to sediment and anaerobic conditions in receiving waters.
Total and fecal coliforms	Coliforms are microorganisms that indicate fecal contamination in water samples.

What permits are required for leachate?

The type of permit required for leachate management and disposal is determined by the disposal method. There are three alternatives for management and/or disposal of leachate generated at a compost facility:

- Discharge of treated leachate to surface water, which requires a National Pollutant Discharge Elimination System (NPDES) permit
- Discharge of treated leachate to groundwater through land disposal or discharge to a municipal sanitary sewer, which requires a State Waste Discharge permit
- Zero discharge (leachate storage)

The alternative that fits your facility depends on the features incorporated into its design. In both the NPDES permit and State Waste Discharge permit cases, you must treat the leachate before it is discharged.[7] In addition, you must comply with the surface and ground water quality standards (Chapter 173-201A WAC and Chapter 173-200 WAC, respectively).

[7] When leachate is discharged to a Publicly Owned Treatment Works, it may not require treatment before being discharged.

National Pollutant Discharge Elimination System (NPDES) permit

If you plan to discharge industrial wastewater (leachate) to any surface water you must obtain a NPDES permit. The leachate must be treated prior to discharge according to All Known, Available, and Reasonable Methods of Prevention and Treatment (AKART). AKART determinations consider all the potential treatment technologies, including zero discharge and pollution prevention best management practices (BMPs), which may be applicable to the facility. AKART determinations include an economic analysis of the cost of zero discharge and any treatment processes. The Department of Ecology will make the AKART determination during the permit issuance process.

As part of the NPDES permit application, you will need to submit an engineering report to the Department of Ecology which describes your leachate treatment options and disposal (Chapter 173-240 WAC).

State Waste Discharge permit

If you discharge leachate to ground water or to a municipal sewage treatment plant, known as a publicly owned treatment works (POTW), you must obtain a State Waste Discharge permit. However, if the discharge is to a delegated POTW (i.e. the State of Washington has delegated authority to regulate pretreatment of incoming waste), you would have to get the permit directly from that POTW. Please contact the Department of Ecology for a list of delegated POTWs.

Land application of treated leachate is an example of a discharge to ground water. If you plan to use this option for leachate management, you will need to submit an engineering report to the Department of Ecology for review and approval. Guidance for this kind of report is available in "Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems," publication #93-36.

Zero discharge (leachate storage)

If you don't want to get either a NPDES or State Waste Discharge permit, you must contain all the leachate from your facility or prevent the production of leachate. Zero discharge can be accomplished by composting under a roof or in an enclosed building, or by storing leachate in a tank or lagoon and reusing it in the composting process. Leachate storage lagoons must be lined. See Chapter 5 for more details.

What is stormwater?

Stormwater is defined as "rainfall and snow melt runoff." Stormwater at a compost facility is runoff from areas at the facility that are not associated with compost processing and curing, such as product storage areas, vehicle maintenance areas, and access roads. Run-off from roofs and employee parking lots is generally exempt from stormwater regulations.

What permits are required for stormwater?

The Department of Ecology issues stormwater permits as part of the stormwater pollution prevention program. The program is based on federal regulations, the Federal Clean Water Act, and the state law governing water pollution control.[8] The stormwater permit program is part of a national effort to reduce or eliminate pollution of stormwater from municipal and industrial point sources.

Compost facilities that discharge stormwater to surface water or to a municipal stormwater system must have a stormwater permit issued under the General Permit to Discharge Stormwater Associated with Industrial Activity. Facilities that infiltrate all of their stormwater are not required to obtain the permit. This permit covers stormwater only. It does not include industrial wastewater (leachate). The main purpose of the permit is to incorporate Stormwater Pollution Prevention Plans into the design of facilities.

Coverage under the stormwater permit depends on the Standard Industrial Classification (SIC) for individual compost facilities. The following SIC codes should be used when a facility applies for the permit:

SIC code 2879, Pesticides and Agricultural Chemicals, Not Elsewhere Classified.

This classification includes facilities that are primarily engaged in manufacturing or formulating soil conditioners. Normal composting operations, which produce a final product that is considered a soil conditioner, will fall under SIC code 2879.

Compost facilities that may be classified under other SIC codes may not be required to obtain the Baseline Stormwater Permit. Please contact the Department of Ecology's stormwater unit at (360) 407-6458 for more assistance.

SIC code 2875, Fertilizers, Mixing only.

Compost facilities that mix fertilizers into the compost and produce a final product, which is considered fertilizer, will be classified as SIC code 2875.

Stormwater Permits for Construction

There is an additional stormwater permit required for constructing a compost facility if the area covers more than 5 acres. It is called the General Baseline Stormwater Permit for Construction and requires best management practices for controlling erosion and surface water contamination at construction sites.

[8] Regulations addressing storm water at the federal level are found in 40 CFR Parts 122, 123, and 124. The state law is Chapter 90.48 RCW, Water Pollution Control.

State Air Quality Regulations

The Department of Ecology issued Chapter 173-400 WAC, General Regulations for Air Pollution Sources, to control and/or prevent the emission of air contaminants statewide. In most regions of the state local air quality authorities enforce this regulation. The local authorities may adopt additional or more stringent standards or requirements (beyond the requirements in Chapter 173-400 WAC) to fit local conditions.

For those areas of the state that do not have a local air quality authority, the Department of Ecology administers the program. See Table 2-4 for contact information and Figure 2-2 for the corresponding map. Recommendations for designing and operating compost facilities to minimize air pollutants appear in Chapters 4,5, and 7.

"Composting operations" are specifically listed as one of the source categories of air emissions in the General Regulations for Air Pollution Sources (WAC 173-400-100). The listing includes "*commercial, industrial, and municipal compost facilities but exempting residential composting activities.*"

As a source category, compost facilities must meet the general standards for maximum emissions. Table 2-3 summarizes the standards as they relate to compost facilities.

Table 2-3. General Standards for Air Emissions (WAC 173-400-040)

General Standards	Description
(1) Visible emissions	Emissions from any source cannot exceed 20 percent opacity for more than three minutes in any one hour.
(2) Fallout	Particulate matter is not allowed to drift over to neighboring property in any amount that will "interfere unreasonably with the use and enjoyment of the property."
(3) Fugitive emissions	You must take reasonable precautions to prevent fugitive dust from becoming airborne and must maintain and operate your facility to minimize emissions.
(4) Odors	If odor from your compost facility "unreasonably interferes" with the "use and enjoyment" of any neighbor's property, then you must "use recognized good practice and procedures to reduce these odors to a reasonable minimum."
(5) Emissions detrimental to persons or property	You cannot allow any emission from your facility that is "detrimental to the health, safety or welfare of any person, or causes damage to property or business."

Who needs to register with the local air authority (or Department of Ecology)?

Owners or operators of all *currently operating* compost facilities, including commercial, industrial and municipal facilities, need to check with the local air quality authority or Department of Ecology to find out whether or not the facility needs to be registered.

If the facility emits limited amounts of air pollutants (or the potential for fugitive or odorous emissions is low), it may not need to be registered. This determination must be made by a representative of your local air quality authority or the Department of Ecology.

Important note: Residential or backyard composting is exempt from the air quality registration requirements, but must operate in a manner that doesn't create nuisance odors or emit pollutants to the air.

Owners or operators of *proposed* compost operations need to submit a Notice of Construction Application with their local air authority or Department of Ecology (in counties where Ecology has authority). Before beginning construction, you must obtain a written Order of Approval.

All new sources in Washington are required to use best available control technology[9] (BACT) for the control of air pollutant emissions and odors. BACT is the most stringent level of control, taking into account energy, economic, and environmental factors, on a case-by-case basis. You and your local air authority or Department of Ecology permit writer should agree on BACT for your proposed source, as specified in the written order of approval, before you spend any money on capital equipment.

[9] Ecology is currently preparing a report to the Legislature that will include a discussion of best available control technology for compost facilities. The report will be available in early December 1998.

Table 2-4. Contact Information - Air Pollution Agencies in Washington State

1 Olympic Air Pollution Control Authority
(Clallam, Grays Harbor, Jefferson, Mason, Pacific, Thurston Counties)
909 Sleater-Kinney Road SE, Suite 1
Lacey WA 98503-1128
Charles E. Peace, Executive Director
Telephone: (360) 438-8768 or 1-800-422-5623
Fax: (360) 491-6308

2 Department of Ecology Northwest Regional Office
(San Juan County)
3190-160th Avenue SE
Bellevue, WA 98008-5452
Telephone: (206) 649-7000
TDD: (206) 649-4259
Fax: (206) 649-7098

3 Northwest Air Pollution Authority
(Island, Skagit, Whatcom Counties)
302 Pine Street #207
Mount Vernon, WA 98273-3852
Terryl L. Nyman, Air Pollution Control Officer
Telephone: (360) 428-1617
1-800-622-4627 (*Island & Whatcom*)
Fax: (360) 428-1620

4 Puget Sound Air Pollution Control Agency
(King, Kitsap, Pierce, Snohomish Counties)
110 Union Street, Suite 500
Seattle, WA 98101-2038
Dennis J. McLerran, Air Pollution Control Officer
Telephone: (206) 343-8800 or 1-800-552-3565
1-800-595-4341 *(Burn Ban Recording)*
Fax: (206) 343-7522

5 Southwest Air Pollution Control Authority
(Clark, Cowlitz, Lewis, Skamania, Wahkiakum Counties)
1308 NE 134th Street, Vancouver, WA 98685-2747
Robert D. Elliott, Executive Director
Telephone: (360) 574-3058 or 1-800-633-0709
Fax: (360) 576-0925

6 Department of Ecology Central Regional Office
(Chelan, Douglas, Kittitas, Klickitat, Okanogan Counties)
15 West Yakima Avenue, Suite #200
Yakima, WA 98902-3401
Telephone: (509) 575-2490
TDD: (509) 454-7673
Fax: (509) 575-2809

7 Yakima County Clean Air Authority
6 South 2nd Street, Room 1016
Yakima, WA 98901
Les Ornelas, Director
Telephone: (509) 574-1410 or 1-800-540-6950
Fax: (509) 574-1411

8 Department of Ecology Eastern Regional Office
(Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Stevens, Walla Walla, Whitman Counties)
4601 N. Monroe Street, Suite 202,
Spokane, WA 99205-1295
Telephone: (509) 456-2926
TDD: (509) 458-2055
Fax: (509) 456-6175

9 Spokane County Air Pollution Control Authority
W 1101 College Ave, Suite 403
Spokane, WA 99201
Eric Skelton, Director
Telephone: (509) 456-4727
Fax: (509) 459-6828

10 Benton County Clean Air Authority
650 George Washington Way, Richland, WA 99352
Dave Lauer, Director
Telephone: (509) 943-3396
(509) 946-4489 *(Burn Ban Recording)*
Fax: (509) 943-0505 *or* 943-2232

Other Sources of Information about Air Pollution in Washington State

Washington State Department of Ecology
Air Quality Program
PO Box 47600, Olympia, WA 98504-7600
Telephone: (360) 407-6800
TDD: (360) 407-6006
Fax: (360) 407-6802

Pulp Mills, Aluminum Smelters
Department of Ecology - Industrial Section
PO Box 47600, Olympia, WA 98504-7600
Telephone: (360) 407-6916
Fax: (360) 407-6902

Department of Ecology Southwest Regional Office
PO Box 47775, Olympia, WA 98504-7775
Telephone: (360) 407-6300
TDD: (360) 407-6006
Fax: (360) 407-6305

Figure 2-2. Map of Air Pollution Control Authorities of Washington

What regulated air pollutants raise concerns at compost facilities?

Compost facilities most likely emit four of the fourteen regulated air pollutants (WAC 173-400-030-67):

- Course particulate matter (dust);
- Fine particulate matter;
- Volatile organic compounds; and
- Odorous compounds.

Of these, odor and course particulate matter are the emissions most likely to raise concerns.

Land Use Requirements

Local land use requirements have a critical impact on siting and operation of compost facilities in Washington State. Since local jurisdictions develop their own zoning ordinances, it is important to find out specific zoning codes for any prospective compost facility site.[10]

Typically, zoning codes define the type of activities and development allowed in a number of zoning categories. Categories reflect the degree of development in an area (e.g. urban vs. rural) and the nature of land use (e.g. industrial, commercial, agricultural etc.). Composting is often defined as an activity that is allowed outright in certain zoning categories (e.g. agricultural zones), and requires additional review through a conditional use permit in other zones.

Some communities in the state have revised their zoning codes to reflect developments in the composting industry. However, requirements for compost facilities written into zoning codes do not necessarily match requirements in a local solid waste permit.

Important note: When planning a compost facility, seek coordination between local planning agencies and health departments to make the permitting process and SEPA review as efficient as possible.

State Environmental Policy Act

The State Environmental Policy Act (SEPA) was first adopted in 1971. Its goal is to ensure that environmental values are considered by state and local government officials when making decisions, and to create a mechanism for public involvement in the decision process. One of the primary purposes of SEPA is to evaluate the environmental impacts of a proposed project and identify methods to reduce the impacts.

The SEPA process starts when someone submits a permit application to an agency or when an agency proposes to take some official action. The applicant completes an environmental checklist (with or without agency assistance) and the agency evaluates the checklist. The agency determines whether an environmental impact statement is required. If an environmental impact statement is not issued, a determination of nonsignificance (DNS) must be issued. In some instances, changes to the original proposal will enable the applicant to move forward with the project if a mitigated DNS is issued.

SEPA requires public notice at certain stages of the process to allow time for the public to comment on proposed projects.

For new compost facilities, the SEPA process usually starts when you apply for a special use permit through the county planning agency, or when you apply for a solid waste handling permit through the jurisdictional health department. Please note that solid waste handling permits always require SEPA review.

[10] Please see Appendix 4. It includes contact information for county planning agencies.

Regulatory requirements for biosolids compost facilities

Owners and operators of biosolids compost facilities must comply with Chapter 173-308 WAC, Washington's *Biosolids Management* rule. The rule is designed to encourage the production of biosolids for beneficial use and be protective of human health and the environment. Like its federal counterpart, 40 CFR Part 503, the biosolids rule is self-implementing. This means that the basic requirements of the rule must be met regardless of the permit status of a facility (see the discussion on permits below).

Before Chapter 173-308 WAC was adopted, all compost facilities, including those which used biosolids as a feedstock, were permitted as solid waste management facilities under state and local solid waste rules and ordinances. The state biosolids rule was adopted in February of 1998 and took biosolids out of the solid waste world (where it was regulated primarily at the local level) and into another regulatory structure administered at the state level by the Department of Ecology. Jurisdictional health departments may still be actively involved in regulating biosolids under the state program if they have received delegation of authority from Ecology. (At this writing, agreements between health departments and Ecology are in the process of being written.) It is important then that owners/operators of compost facilities check with the local health department and/or the Ecology regional office to determine the status of any delegation agreements.

What about permits for biosolids compost facilities?

The biosolids rule requires permits for all "treatments works treating domestic sewage." A treatment works treating domestic sewage can be thought of as any facility that changes the quality of biosolids. Since a compost facility changes the quality of the biosolids, it is considered a "treatment works treating domestic sewage," and a biosolids permit is required.

Because biosolids compost facilities typically accept other feedstocks which are still regulated as solid wastes, in many instances two permits would be required: a state biosolids permit and a local solid waste permit. A health department can regulate biosolids compost facilities under a local permit if Ecology agrees the local permit provides adequate assurance of compliance with the state biosolids program requirements. It is likely that any delegation agreement would affect state and local expectations regarding compost facility permitting and regulation. The Department of Ecology encourages issuing one permit for biosolids compost facilities when possible.

There are certain situations in which a state biosolids permit would be required for a compost facility. This could occur where local permit conditions were inadequate, in cases of noncompliance by the compost facility, and would also likely be required where composting occurs as an extension of the wastewater treatment process and the compost facility is located at the same site. The wastewater treatment plant itself is required to have a permit and the compost operation is considered the last phase of that treatment process.

Other Permits/Approvals You May Need

The Washington State Department of Natural Resources

The Department of Natural Resources (DNR) manages more than five million acres of state owned lands, including forest, grazing, agricultural, and aquatic lands. These lands are managed for beneficiaries, namely, public schools, state universities, prisons, charitable institutions, counties, and capitol buildings. The DNR also regulates logging practices and surface mining, and monitors sensitive, threatened, and endangered plant species.

Two laws under DNR jurisdiction may require permits for the construction of compost facilities under certain circumstances: the Surface Mine Reclamation Act, and the Forest Practices Act.

Surface Mine Reclamation Act

Chapter 78.44 RCW Surface Mining was revised by the legislature in 1995. The purpose of the act is to balance environmental protection with the production and conservation of minerals in Washington State and to provide reclamation of mined lands.

You **will** need a permit from the DNR for surface mining if you:

(1) Excavate 3 acres or more; and

(2) The material mined is hauled off the site.

You **will not** need a permit if you excavate and use the material for constructing and maintaining the compost facility and roads on-site.

Contact Information

Department of Natural Resources
Division of Geology and Earth Resources

Telephone: (360) 902-1450
Fax: (360) 902-1785

Forest Practices Act

The Forest Practices Act (Chapter 76.09 RCW), first adopted by the legislature in 1974, establishes a comprehensive statewide system of laws and regulations governing forest practices.

To find out if you need a Forest Practices permit for construction of your compost facility, please contact:

Contact Information

Department of Natural Resources
Forest Practices Division

Telephone: (360) 902-1400

Department of Ecology

Water Use/Water Rights Permits

The Department of Ecology authorizes water use by municipalities, citizens, and the agricultural community across the state through the Water Resources Program.

You will need a water rights permit for your compost facility if:

(1) You draw more than 5,000 gallons of water per day from an existing well; and

(2) You draw water from any surface water body.

Important note: If a compost facility is located at or near a landfill, operators must remember that no wells may be drilled within 1/4 mile of a landfill (RCW 18.104, Well Drilling). Contact the Department of Ecology before any well drilling activity.

Contact Information

Department of Ecology
Water Resources Program

Telephone: (360) 407-6600
Fax: (360) 407-7162

Department of Fish and Wildlife

Activities related to construction and operation of compost facilities may require one or both of the following approvals from the Department of Fish and Wildlife: Hydraulics Project Approval and Stormwater Approval. There are no fees associated with either one of these approvals, but violations of the Hydraulics Project Approval are misdemeanors under Chapter 75.20 RCW.

Hydraulics Project Approval

This approval is applicable to any person or government agency (state, federal, or local) working within the ordinary high water mark in "waters of the state." Examples of this type of activity include changes to any existing channel, and construction of a culvert for an access road to the facility.

Stormwater Approval

A compost facility incorporating land with more than 5,000 square feet of impervious surface requires a Storm Water Approval from the Department of Fish and Wildlife.

The information you provide in your application for coverage under the Baseline General Permit for Storm Water Discharges Associated with Industrial Activities will most likely be sufficient for this approval.

Contact Information

Washington State Department of Fish and Wildlife
Telephone: (360) 902-2200
Fax: (360) 902-2946

Fire Permits/Approvals

All local fire districts in Washington State enforce the Uniform Fire Code, found in the State Building Code WAC 51-34, 51-35. Local fire districts judge whether or not compost materials fall under the definition of "high piled combustible storage". If the fire district considers your compost to be "high piled combustible storage," you will need a permit. The permit provides assurance that contingency plans are in place in the event of a fire. Contact your local fire district for assistance.

Local Stormwater Permit

Some local governments now have designated storm water management areas. Contact your local planning agency to find out if you will need a local permit for stormwater in addition to the state General Permit to Discharge Stormwater Associated with Industrial Activity.

County Solid Waste Authority

Solid Waste Management Plan

The county solid waste management plan required by Chapter 70.95 RCW, Solid Waste Management - Reduction and Recycling, must list composting as one of the ways solid waste will be managed in that county before a compost facility can be permitted. If composting is not included, the plan must be revised before any facilities can be permitted in the county.

Army Corps of Engineers

Army 404/10 wetlands permit(s)

Construction around wetlands, shorelands, lakes, rivers, and streams requires special consideration. Please contact the Permit Assistance Center at the Department of Ecology for information.

The Permitting Process

The regulatory framework for compost facilities in Washington State has developed over the past decade in response to growth in the industry and challenges at individual sites. As a result, individual agencies usually review permits with a focus on one element of the framework.

In order to make the permitting process as efficient as possible, Ecology strongly recommends arranging a pre-application meeting to include health departments, air quality authority, department of Ecology regional staff (in both Water Quality and Solid Waste programs), and land use planners, as appropriate. Coordination at the beginning of facility planning encourages a comprehensive view of the various requirements.

Chapter 3
Important Questions and Answers - Clarifying Compost Facility Requirements

This chapter presents important questions and answers about how the state solid waste regulation applies to compost facilities. Since many issues involve integration with water and air quality regulations, answers include clarification of all three regulations.

These questions were posed by members of the advisory committee for the Compost Facility Resource Handbook during development of the document.

What are the exemptions related to composting under Chapter 173-304 WAC?

Exemptions from solid waste handling permits can be grouped into the categories listed below.

Please remember: Exemption from a solid waste handling permit does not necessarily mean exemption from other permits.

Single family residences and single family farms composting their own wastes.

(1) "*Single family residences and single family farms engaged in composting of their own wastes,"* are exempt from the waste recycling facility standards, WAC 173-304-300(b)(i).

(2) "*Single* family *residences and single family farms whose year round occupants engage in solid waste handling of the single family's solid waste on-site*," are exempt from the solid waste handling facility standards, WAC 173-304-400(1)(c). (Note: this exemption includes any of the standards in Sections 405 through 490.)

Backyard composting has tremendous benefits to our society in reducing the amount of organic materials that would otherwise end up in the municipal waste stream. Requiring permits for backyard composting would be counter-productive to this effort and burdensome for local health departments.

In the strictest interpretation of the MFS, only composting by *single families* or *single farms composting solid waste generated by the single family* are exempt from solid waste handling permits. However, Ecology recognizes the value in cooperative backyard composting projects such as the Pea Patch Community Garden in Seattle, and promotes these activities without permits as long as they don't create nuisance odors or attract pests.

For a discussion of on-farm composting, see "How is on-farm composting regulated?"

In both situations, backyard composting and on-farm composting, jurisdictional health departments ultimately decide whether or not a particular operation requires a solid waste handling permit.

Wood waste

(1) Wood waste is exempt from the entire solid waste regulation under the following circumstances:

- "*Wood waste used for ornamental, animal bedding, mulch, plant bedding, or roadbuilding purposes*;" WAC 173-304-015(4).

- "*Wood debris resulting from the harvesting of timber and whose disposal is permitted under Chapter 76.09 RCW, the Forest Practices Act*;" WAC 173-304-300(9).

(2) Wood waste is exempt from the waste recycling facility standards (WAC 173-304-300) as follows:

- "*Wood waste or hog fuel piles to be used as fuel or raw materials stored temporarily in piles being actively used so long as the criteria of WAC 173-304-300(3)(c)(i) are met,*" WAC 173-304-300(b)(iv).

(3) Wood waste piles at a compost facility may be exempt from the pile standards if the material is stored before processing for less than three months (WAC 173-304-420(1)).

Important note: Wood waste processing is not addressed in this handbook since it is a separate industry. However, wood waste processing is **not** categorically exempt from state solid waste permitting requirements. Consult your local health department for details on how wood waste processing is permitted in your jurisdiction. Wood waste processing also requires a stormwater permit if the activities occur outdoors.

Composting in a fully enclosed building

This exemption appears in both the waste recycling facility standards, WAC 173-304-300, and the pile standards, WAC 173-304-420. The rationale behind this exemption is straightforward: the environment is protected from water pollution when waste is processed inside a building.

(1) "These standards do not apply to any facility that recycles or utilizes solid wastes in containers, tanks, vessels, or in any enclosed building, including buy-back recycling centers," WAC 173-304-300(c).

(2) "*Waste piles stored in fully enclosed buildings are not subject to these standards, provided that no liquids or sludges with free liquids are added to the pile*," WAC 173-304-420(1)(c).

Health departments should carefully consider exemptions for enclosed compost facilities on a case-by-case basis. Since composting is a treatment process, final product quality is an additional concern beyond preventing water pollution. Health departments should have confidence that a facility will produce compost that is safe for use by the general public before exempting it under these sections.

Even if exempt from solid waste handling permits, composting in a fully enclosed building may still require an air pollution control permit, especially if there is an air discharge. Contact your local air quality authority listed in Table 2-4.

How do wood waste processing facilities and wood waste components of compost facilities differ?

Wood waste processing is an industry separate from the composting industry. Wood waste processing is a mechanical process whereby wood is processed into a variety of products such as processed chips to secondary wood fiber markets, biomass fuel, animal bedding, mulch, compost bulking agent, road building material, etc.

Composting, on the other hand, is a biological process, requiring management to control decomposition and transform biodegradable materials into a humus-like end product.

Processed wood waste products and byproducts marketed as mulch, soil amendment or compost bulking agents, are materials that have not gone through the composting process. The only biological degradation which occurs at a wood waste processing operation is incidental to the nature of wood waste materials and the short handling period for which the material is held. Any operation that uses material from a wood waste processor in a compost process or functions as both a wood waste processor and compost producer, is subject to the regulatory structure of compost facilities.

How are small in-vessel composting systems regulated?

What is a "small in-vessel composting system?"

A small in-vessel composting system is a portable unit, designed to biodegrade feedstocks in batches. It consists of a composting compartment that has forced aeration, leachate collection, and usually some kind of air emissions control device, such as a biofilter, attached to it. The size of the compartment varies, but is usually similar to a recycling drop box. Feedstock materials are pre-mixed and loaded into the composting container where they are allowed to compost for a specific amount of time. Examples of this type of composting system now available include the systems developed by Naturtech and Green Mountain Technologies.

What regulations are applicable to small in-vessel composting systems?

Solid waste regulations

Local health departments have the authority to decide how small in-vessel composting systems are regulated under the Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC, or under a local solid waste ordinance. Since circumstances will vary from operation to operation, it is necessary to look at system components, overall facility design, facility location, and local ordinances to determine how a system will be regulated.

How do the sections of Chapter 173-304 WAC apply to small in-vessel facilities?

As described in Chapter 2, the state solid waste regulation has two sets of standards under which composting is regulated:

- WAC 173-304-300, Waste Recycling Facility Standards; and
- WAC 173-304-400, Solid Waste Handling Facility Standards (including Section 420, Piles used for storage and treatment)

The waste recycling facility standards, WAC 173-304-300, do not apply to these small in-vessel systems themselves because, as stated: "*These standards do not apply to any facility that recycles or utilizes solid wastes in containers, tanks, vessels or in any enclosed building, including buy-back recycling centers.* WAC 173-304-300(1)(c).

The pile standards, WAC 173-304-420, do not apply to these small in-vessel systems themselves because a "pile" means "*any uncontainerized accumulation of solid waste that is used for treatment or storage.*" If the entire composting process occurs inside a container, the pile standards do not apply.

Important note: Local ordinances may be more stringent than the Minimum Functional Standards for Solid Waste Handling, and local health departments have the authority to issue permits.

The discussion of exemptions for composting in a fully enclosed building (see previous section in this chapter) applies to small in-vessel composting systems. Health departments should carefully consider the issue of final product quality (in addition to water pollution prevention) when making individual decisions about solid waste permit exemptions. Final product quality and processing parameters are especially important when several modular units of this type are linked together, and the compost is available to the public for general use.

Examples of possible variations in solid waste permitting:

(1) If the active phase of composting takes place inside a vessel, but the curing is done outside the container in an open pile, the pile standards in WAC 173-304-420 would apply and a solid waste handling permit would be required.

(2) If feedstocks are stored outside prior to processing, the pile standards in WAC 173-304-420 would apply, depending on the feedstock and length of storage.

(3) If the entire facility is located at a transfer station, landfill, or other solid waste handling facility, the solid waste permit for that facility should be amended to include the composting activities, and possibly a separate solid waste permit may be required.

Water Quality Regulations

Since these types of composting systems are built with their own leachate collection devices, water quality discharge permits for leachate are not needed if the leachate is recycled back into the composting process. Coverage under the Baseline General Stormwater Permit may be required depending on the facility design. Coverage is needed if:

- Any part of the operation takes place outside the container and without a roof; and
- Stormwater from the above mentioned area is conveyed to a storm drain (as opposed to infiltrating the surrounding ground).

Please see Chapter 2 for more information.

Air Quality Regulations

Composting in small in-vessel containers may require registration as a compost facility under Chapter 173-400 WAC, General Regulations for Air Pollution Sources. Contact your local air pollution control authority (or the Department of Ecology, see Table 2-4) for information.

Land Use Regulations

Depending on the location of your facility, you may need a conditional use permit from the local planning agency. Contact the city or county planning agency for information.

Requirements for composting biosolids in small in-vessel composting systems.

Any compost facility incorporating biosolids as a feedstock is subject to the requirements in Chapter 173-308 WAC, Biosolids Management. This includes keeping records, maintaining proper temperatures and duration of composting for pathogen control and vector attraction reduction, and testing the final product. Please see the explanation in Chapter 2 under "Regulatory requirements for biosolids compost facilities."

Compost product quality

Whether or not you are required to have a solid waste handling permit for your small in-vessel composting system, Ecology recommends testing the final product according to the Interim Guidelines for Compost Quality (Department of Ecology Publication 94-38).

Biosolids compost must be tested according to Chapter 173-308 WAC, Biosolids Management.

How is on-farm composting regulated?

Important note: Currently, the regulation of on-farm composting varies considerably from jurisdiction to jurisdiction across Washington State. Several factors contribute to the variability, including individual health department decisions, type of agriculture, land use and zoning issues, watershed protection, and feedstock types. The Department of Ecology recommends continued collaboration with health departments, extension agencies, conservation districts, and the Natural Resources Conservation Service to develop policies that will foster responsible composting in the agriculture sector. The following paragraphs explain, in general terms, how on-farm composting is typically regulated. Please contact your jurisdictional health department for detailed information in your location.

What is on-farm composting?

Generally speaking, on-farm composting refers to the biological conversion of agricultural manures and crop residues into a humus-like material primarily used as a soil amendment. Composting on the farm turns nuisance-causing waste products into a valuable commodity. The benefits to farm operations are many. However, composting on the farm is a major undertaking and deserves the same commitment given to other farm tasks such as milking, egg handling, or pest control.

When is composting on a farm considered solid waste handling?

At the current stage in Washington's composting industry development, there is considerable variability across the state when determining whether or not on-farm composting is regulated as a solid waste handling facility or managed as a farm operation.

The following paragraphs describe when on-farm composting is regulated as a solid waste handling facility and when it should be managed as a farm operation. This clarification is directly related to the Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC, and standards from the Field Office Technical Guide (Section 4) of the Natural Resources Conservation Service.

On-farm composting is an agricultural operation when:

- Feedstocks consist of manures, crop residues, and/or animal morts (dead animal carcasses), all generated on the farm;
- End product is used on farm (e.g. as soil amendment, poultry litter);
- Composting occurs on the farm in an agricultural zone; and
- Composting is managed according to an approved nutrient management plan in conjunction with the local Conservation District and Natural Resources Conservation Service (NRCS) standards.

On-farm composting requires a solid waste handling permit when:

- Feedstocks include municipal and/or industrial wastes generated off the farm; and
- End product is sold or distributed commercially

Important note: Jurisdictional health departments ultimately decide whether or not a particular operation requires a solid waste handling permit.

What about small farms managing their wastes cooperatively?

The Department of Ecology recognizes the advantage of managing agricultural wastes from small farms by composting in a joint enterprise with neighboring farms. Even though this would involve bringing manure and crop residues from one farm to another, Ecology recommends that this type of composting be considered an agricultural operation as opposed to solid waste handling. In setting up cooperative composting, farmers should:

- Limit feedstocks to crop residues and manures;
- Follow design standards promoted by the Natural Resources Conservation Service; and
- Work with local Conservation District personnel.

In accordance with RCW 70.94.640, odors from agricultural activities, consistent with good agricultural practices, are exempt from air pollution requirements. This implies that if an activity is not a good agricultural practice, it could be subject to enforcement action if there are odors. Generally, state and local air authorities seek advice from conservation districts, Natural Resources Conservation Service (NRCS), and other independent agricultural authorities to determine if a particular practice constitutes a good agricultural practice.

Do the locational standards (173-304-130) apply to compost facilities?

No. The locational standards for disposal sites (WAC 173-304-130) do not apply to compost facilities. The only siting criterion for compost facilities appears in Section 420 and relates to locating a compost facility in a 100 year flood plain:

In designing a compost facility, you must, “design piles located in a one hundred year flood plain to:

(1) Comply with local flood plain management ordinances and chapter 508-60 WAC, Administration of flood control zones; and

(2) To avoid washout or restriction of flow.”

What is the endpoint of regulatory control? (When is compost product no longer considered solid waste?).

Once compost has been processed and meets either one of the grades of quality recommended in the Interim Guidelines for Compost Quality, it is no longer considered solid waste. These composts can be offered to the public and applied to the land without further oversight from regulatory agencies.

Important note: Composts should be applied at the rates recommended in the Interim Guidelines for Compost Quality.

What parts of the composting operation require an impermeable layer or pad

Under the state solid waste regulation, waste pile liners or "pads" are required for garbage, sewage sludge, biosolids, any putrescible waste, and wastes likely to produce leachate, when these materials are composted or stored. This includes piles of materials prior to composting. (See WAC 173-304-420 for storage time details.)

Under state water quality regulations, compost pads are required for active compost and curing areas of all facilities regardless of feedstocks in areas of the state with wet climates. Compost facilities covered with a roof are not required to have impermeable pads for water quality protection. However, composting operations are typically easier when machinery runs on a concrete, asphalt or other hard surface.

Leachate collection ponds must have a liner to protect groundwater. See Chapter 5 for more information on compost facility design details.

Finished compost, i.e. compost that has completed the high rate composting process **and** curing, does not require an impermeable liner or pad. However, provision must be made in the Storm Water Pollution Prevention Plan to control pollutants such as suspended solids in the storm water run-off from the product storage area.

Clean wood waste (**not** including yard waste) and clean sawdust may be stored temporarily before composting without an impermeable liner provided the area has been included in an approved storm water pollution prevention plan. The material must be incorporated in the composting process within three months. (WAC 173-304-420(1)(a))

Chapter 4
Planning and Siting Compost Facilities: The "Good Neighbor" Strategy

Introduction

Planning and siting are two critical issues in developing a compost facility. This chapter outlines a "good neighbor" strategy as the basis for creating a facility that will be compatible with the community for many years.[11] The "good neighbor" strategy involves planning and siting a facility with careful attention to the various ways a facility may impact the people living and working nearby.

This chapter includes sections describing:

- Potential problems - basic things to watch for at a compost facility;
- Elements of planning a compost facility; and
- Elements of an operations plan.

What are the potential problems at compost facilities?

This section briefly describes the potential problems at compost facilities. Careful planning and proper management practices will go a long way toward solving these problems. Refer to the other parts of this chapter for more information on planning. Refer to Chapter 6 for suggestions on how to solve these problems through good management practices.

Limiting the incoming feedstock to design capacity of the facility may easily prevent many of the problems listed in this chapter.

Potential Problems Related to Air Quality

Odor

Odor generated at a compost facility is the most problematic issue for the industry. When planning a new facility, you should keep odor issues in mind at every step of the planning process.

[11] In this handbook, "neighbors" refers to those residents and businesses adjacent to or near the site, and also those located down wind, down stream, or on the access route to the site.

The extent to which odor becomes a problem for a facility depends on a number of general factors.

- Proximity to/sensitivity of neighbors
- Population density
- Planned development in the immediate area
- Material collection and handling - especially fresh, in-coming material
- Composting process control
- Climate/air flow
- Geographical features
- Odor control devices

Please refer to Chapters 6 and 7 for information on odor control.

Dust

Dust can be generated by:

- Vehicle traffic on access roads and other areas of the site;
- Tracking of dirt onto roadways outside the facility; and
- Handling compost materials that are too dry, including windrow turning.

Bioaerosols

Bioaerosols are organisms or biological agents (bacteria fungi, actinomycetes, arthropods, endotoxins, microbial enzymes, glucans and mycotoxins) which can be dispersed through the air and affect human health.

Over the past several years, many people have voiced concern about the potential danger of bioaerosols from compost facilities, especially the fungus Aspergillus fumigatus. In response, The Composting Council assisted several federal agencies in convening a workshop in January 1993, with twenty-five scientists and engineers to debate the question, "Do bioaerosols associated with the operation of biosolids or solid waste composting facilities endanger the health and welfare of the general public and the environment?" After reviewing and analyzing existing data, workshop participants concluded "composting facilities do not pose any unique endangerment to the health and welfare of the general public."

Equipment Exhaust

Exhaust from heavy machinery at a compost facility may be a concern because of particulates and other air contaminants generated by internal combustion engines. Check with your local air pollution control authority for specific requirements in your region.

Potential Problems Related to Water Quality

Stormwater

As described in Chapter 2, stormwater is "rainfall and snow melt runoff." In vegetated areas such as forests and fields, rain water seeps into the ground. In contrast, compost facilities, like other developed lands, have hard surfaces which don't allow rain and snow melt to infiltrate the soil. As the stormwater travels across hard surfaces, it can pick up pollutants and convey them to streams, lakes, and wetlands.

Stormwater at a compost facility can be a problem when proper pollution prevention measures have not been implemented. Compost facilities should be designed to keep stormwater from running onto the site from surrounding areas. A Stormwater Pollution Prevention Plan will address this and other aspects of stormwater management. Refer to the *Guidance Document for Applying for Ecology's General Permit to Discharge Stormwater Associated with Industrial Activity*. (See Chapter 2 and Appendix 2 - References).

Designs for preventing stormwater pollution can be found in the *Stormwater Management Manual for Puget Sound Basin.* These designs are appropriate for use statewide. (See Appendix 2 - References.)

Leachate

Leachate may contain pollutants that would impact surface water and groundwater if allowed to flow, unchecked, onto the surrounding land. Federal and state laws and regulations require that leachate be collected and treated prior to discharge to surface water or groundwater.

Leachate disposal is a problem at compost facilities located in those areas of the state with considerable rainfall. Most leachate is produced at the time of year when it is least usable as makeup water for the composting process or in land application systems. Most existing facilities in western Washington collect leachate into lagoons or tanks and discharge it to municipal wastewater treatment plant when necessary. If a facility is sited in a location where sewer lines are not available, then the leachate may be hauled in a truck to the treatment plant.

Another source of wastewater at a compost facility with forced aeration is the condensate from aeration pipes and blowers. Condensate from these systems can require special treatment.

Proximity to surface water

If your compost facility is located near wetlands or shorelines, there is a greater potential for negative impact to adjacent surface water. If you choose such a location, the process of getting necessary permits will be substantially longer and more involved. See Chapter 2 for a list of required permits, and contact Ecology's Permit Assistance Center for more help.


Careful consideration should be taken before locating your compost facility in a one hundred year floodplain. The occurrence in flooding has increased for many parts of Washington in the recent past. If you locate your facility in a 100 year floodplain, you must design the facility according to requirements in the solid waste regulation. See Chapter 2 and Appendix 4.

Potential Problems Related to Traffic


Traffic at a compost facility can create problems if proper attention has not been paid to planning access routes to the facility. It would be best to:

- Avoid residential neighborhoods, and already congested areas for main access routes;
- Provide proper turning and entry access; and
- Be sure access roads are adequately developed.


Traffic can also be a problem on the site, especially at facilities that have both commercial/municipal and self-haul vehicles on site at the same time. It is important to plan traffic flow patterns on site and provide directional signs.

Potential Problems Related to Noise


Noise from equipment operating at a compost facility can be a problem for neighbors and employees. Noise is generated by mobile equipment such as trucks and front end loaders and stationary machinery used for processing. Commonly used methods for controlling noise are:

- Using muffling devices for machinery;
- Enclosing some operations;
- Providing distance between site and neighbors;
- Creating noise barriers; and
- Limiting operating hours.

Important note: Limiting the operating hours of a facility may limit the facility's capacity. If this method of noise control is used, careful decisions need to be made about the amount of material that can be processed during operating hours.

It is also important to provide proper ear protection for employees.

Potential Problems Related to Visual Aesthetics


The visual impact of a compost facility is an important aspect of acceptance by a community. Site plans should incorporate buffer zones in keeping with surrounding areas, e.g. landscape plantings or natural vegetation. Fencing can also be used to block direct view of compost operations by community members.[12]

[12] Consult your local planning agency in Appendix 4.

Potential Problems Related to Vectors/Sanitation

Vectors are carriers, such as animals or insects, that can transmit odors, microorganisms or pathogens from one location to another.

Vectors need to be controlled for public health and aesthetic reasons. Rodents and flies can be attracted to fresh compostable materials (highly putrescible materials such as food waste) when delivered or at the beginning of the composting process. Mosquitoes can be a problem where water is allowed to accumulate and stand for extended periods of time.

Controlling vectors is best accomplished by good housekeeping at the facility. Areas which accumulate waste such as conveyor belts and receiving areas should be cleaned frequently. In some cases, it may be necessary to enclose the receiving/processing areas. Insect "zappers" and rodent traps may also be useful. Since flies are attracted to ammonia, balancing the C:N ratio is an important tool to fight maggot infestation of compost materials just under the surface of the pile. Frequent turning may also be necessary.

Planning a compost facility

This section reviews several general steps for planning a compost facility. Your planning process may include many or all of these steps, not necessarily in the order listed. The planning process will be more or less complicated depending on the size, ownership, location, feedstocks, and technology of the proposed project. Ecology recommends devoting ample time to plan your project.

One of the most important parts of the planning process involves evaluating a potential site. Several suggestions are included for siting criteria. See Appendix 1 for a checklist designed to help potential facility owner/operators work through the planning and permitting processes.

Important note: Each county in Washington State has a solid waste management plan. Each county also has local zoning ordinances which list the kinds of activities/development allowed in specific zones. It is important to find out how compost facilities fit into both local frameworks at the beginning of the planning process.

Identify goals of the compost facility

Clearly identifying the project's goals can help pave the way for almost every other step of planning and implementation. All parties involved will better understand the purpose of the facility, making the review process easier.

For example, clear goals will help to identify needed technology and design features. If one of the goals is to produce compost in a short time frame (3-4 months), active aeration for controlling the process will most likely be included in the design.

Create a plan for public relations

An important part of the good neighbor strategy involves letting neighbors and other interested people know about your plan to start a compost facility. Your plan should include a description of how you will address each of the potential problems at your facility. Be prepared to answer many questions and engage in an open dialogue.

The forum for public involvement may include a formal public hearing through the SEPA (State Environmental Policy Act) process or a more informal series of public meetings of your own design. The purpose of informing the public is to garner support for the project, determine the extent of opposition, and identify possible changes to the facility proposal that will allow the project to move forward in harmony with the community.

Important note: Experience in Washington State has shown that despite your best efforts to enlist community support, some people may still oppose the facility. They may expect political leaders or officials in charge of issuing permits to "do something about it."

Identify and estimate organics

The type of organic materials or feedstock to be composted has a tremendous impact on planning, design and operations at the facility. You will need to identify:

- Type of materials;
- Amount of material (per day, week, or month);
- Source of material;
- Condition of material when delivered to the site; and
- How end markets will impact the choice of feedstocks (if at all).

The list of feedstocks will most likely fit into one or more of the following categories:

- Leaves, brush and yard trimmings;
- Grass clippings;
- Food processing wastes;
- Manures and agricultural wastes;
- Forestry and forest products residuals;
- Biosolids (sewage sludge, including septage);
- Source separated compostable material; and
- Mixed municipal solid waste[13].

[13] Composting mixed municipal solid waste is listed here and in the Introduction as a category of feedstocks. It is important to note that according to Washington state law (Chapter 70.95 RCW, Solid Waste Management - Reduction and Recycling), "source separation of waste must become a fundamental strategy of solid waste

Important note: Facility planners should make a clear decision about whether or not to accept and how to best process grass clippings at the compost facility. Experience has shown that grass clippings have a high potential to cause odors and need special attention in handling from collection to mixing and active composting.

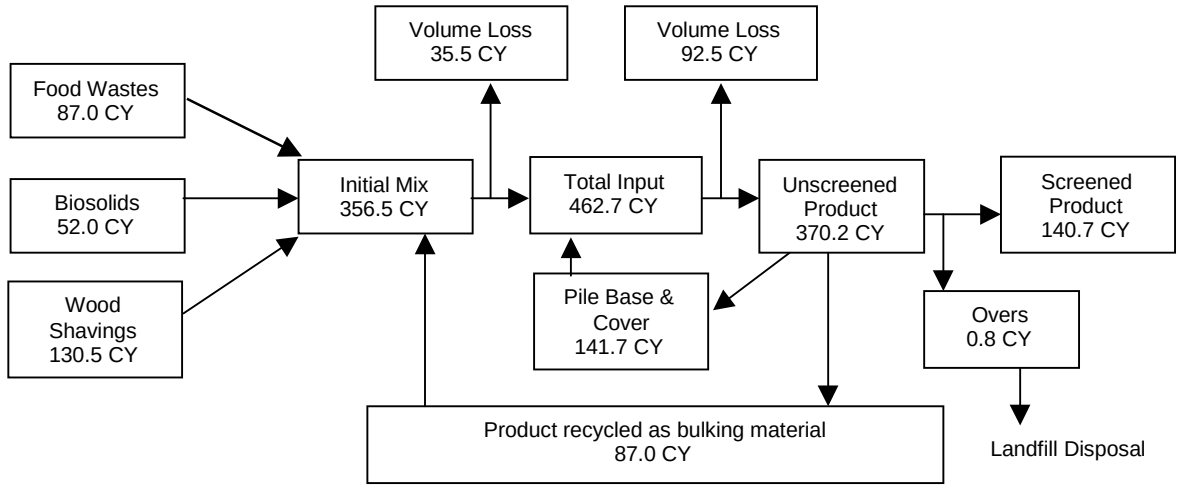
Mass balance Calculations

Mass balance calculations provide an important overall picture of the composting process. Facility planners and engineers can use a mass balance flow chart to consider the following elements of the facility design:

- Capacity of facility
- Flow of materials
- Process operations
- Mixing ratios
- Quantity of feedstocks, bulking agents, final product, residuals, screening overs

Ecology recommends completing a mass balance of compost feedstocks as an integral part of the planning process. Figure 4-1 provides an example of a mass balance flow chart for a small facility composting food waste and biosolids. The figure includes volume measurements of materials processed annually. Table 4-1[14] provides example data to illustrate weights and volumes of corresponding inputs and outputs on a weekly basis. Your mass balance flow chart and data table will vary depending on the inputs and outputs of your particular facility.

Figure 4-1. Example Mass Balance Flow Chart



management. Collection and handling strategies should have, as an ultimate goal, the source separation of all materials with resource value or environmental hazard."

[14] Figure 4-1 and Table 4-1 reproduced with permission from "On-Site Commercial Food Waste Composting Implementation at the Echo Glenn Children's Center, E&A Environmental Consultants, Inc.

Table 4-1. Example Data – Weekly Mass Balance

Feedstock	TS (%)	Dry Wt. (tons)	Wet Wt. (tons)	Density (lb/cy)	Volume (cy)	Volume ratio
Food Waste	25.0	0.31	1.25	1,488	1.7	1.0
Biosolids	20.0	0.18	0.90	1,800	1.0	0.6
Wood Shavings	85.0	0.28	0.33	260	2.5	1.5
Recycled Compost	60.0	0.30	0.50	600	1.7	1.0
Initial Mix	34.5	1.07	2.97	1,066	6.2	
Cover and Base (compost)	60.0	0.49	0.82	600	2.7	
Total Input	39.6	1.56	3.79	923	8.9	
Unscreened Product	60.0	1.28	2.14	600	7.1	
Recycled in Process	60.0	0.79	1.32	600	4.4	
Overs	60.0	0.00	0.00	600	0.02	
Screened Product	60.0	0.49	0.81	600	2.7	

Initial mix consolidation = 90%
Composting volume reduction = 20%
TS = Total Solids

Identify markets and compost specifications

Markets for compost products have a crucial impact on the kind of processing required to prepare the materials for end users. For this reason, it is important to research markets and product specifications at the beginning of the planning stage. Knowing the quality of material necessary to meet customers' needs will direct the decisions you make about feedstocks, technology, and product preparation.

Evaluate technologies

The technology chosen for a compost facility can vary from simple processing equipment in the open air to automated machinery in enclosed buildings. A peer review group convened by The Composting Council developed an approach to placing facility types into five groups based on composting unit operations. These technology groups are described in a guide titled "Municipal-Scale Composting: A Decision Makers Guide to Technology Selection." The guide is published by the United States Conference of Mayors.

Many factors are involved in choosing the best technology for a compost facility. These include:

- Cost/funding mechanism
- Available area
- Feedstocks - type and quantity
- Proximity to neighbors
- Operator expertise
- Existing waste management systems
- Regulatory requirements

Evaluate the site

Zoning and land use

The land identified as a potential compost facility site must be located in an area that allows composting according to the local zoning ordinance. Composting will either be listed as an accepted activity for that zoning classification, or more typically, it will require a conditional use permit.

Current development or land use in the area surrounding a proposed site should be carefully evaluated. The current neighbors will be most sensitive to composting activities, especially during start-up.

Please see the general description of land use requirements in Chapter 2 and the appropriate contacts in Appendix 4 for more information.

Getting the facts - gathering history of the site

The history of any potential compost facility site could be an important element in evaluating the appropriateness of the site. Information on past activities at the site may alert you to potential problems. Some items you may want to investigate include previous:

- Ownership
- Industrial activity
- Agricultural/forestry practices
- Major excavations/regrading
- Possible site contamination
- Complaint history

The history of a site may have a potential effect on the reaction of neighbors to a composting operation. It will also provide information on recent development patterns in the surrounding area.

Looking at physical features

Physical features of the proposed site should be evaluated, including:

- Topography
- Any existing structures (e.g. buildings)
- Surface water and surface water flow direction
- Vegetation
- Soil type


You may also want to complete an environmental assessment to find out if hazardous or dangerous wastes have been a problem on the site. This evaluation should be done by a qualified professional.

Looking at climatic features


Evaluating climatic features of the proposed site involves looking at the following conditions:

- Prevailing winds - velocity and direction
- Annual rainfall
- Average temperatures through the seasons
- Potential for air inversions - humidity and pressure conditions
- Air shed – the geographic area of potential impact from odors generated at a compost facility

Looking at access and infrastructure issues


In addition to other physical features of the site, you should consider how accessible the facility will be to main delivery routes. For facilities servicing municipalities and large commercial haulers, access roads need to accommodate large trucks.

Utility lines and services should also be considered when choosing an appropriate site.

Consider the collection system


Several issues related to the collection system at a compost facility have an impact on the rest of the operation. In the case of municipal facilities composting source separated materials, some questions that need to be considered during the planning stages are:

- How does the transportation of organic feedstocks to the compost facility fit into the current system of solid waste transportation?
- How often will feedstocks be collected?
- Will the feedstocks be stored in containers for a length of time before being delivered to the compost facility?
- Will the materials undergo any pre-processing before delivery?
- What kind of trucks or delivery containers will be used? (e.g. drop boxes, packer trucks, etc.)
- For safety reasons, can curbside pick-up vehicles (larger trucks) be separated from private vehicles delivering self-hauled materials to the facility?
- Will feedstocks collected and delivered in plastic garbage bags be allowed at the facility?
- Are there barriers (e.g. waste management ordinances, inter-local agreements) that might limit your ability to secure feedstocks?

Secure financing

Ownership of the compost facility will dictate the terms and type of financing. Private vendors may share costs. Municipal facilities may finance small-scale projects through general funding mechanisms; larger facilities may require financing through municipal bonds.

Currently, there are no requirements under the solid waste regulation for compost facility owners to provide financial assurance (for construction or closure).

Important note: Even small-scale, privately owned facilities need to have a plan for financing facility development and operation. If an owner/operator relies on tipping fees to generate income for the start-up phase of the operation, cash flow problems may impact the composting process.

Operations Plan

Developing an operations plan is a critical part of planning any compost facility, regardless of the facility size or technology used. The Department of Ecology recommends formulating a complete plan whether or not you are required to for your solid waste handling permit, air pollution control permit, or other permits. [15]

Figure 4-1 outlines the recommended elements of an operations plan. A brief description of each element is provided in the text that follows.

Figure 4-1. Recommended Elements of an Operations Plan

- ❑ Material flow plan
- ❑ Air quality control plan
- ❑ Leachate and stormwater management plan
- ❑ Moisture management plan
- ❑ Equipment
- ❑ Employee training
- ❑ Safety plan
- ❑ Neighbor involvement
- ❑ Fire emergency plan
- ❑ Monitoring plan
- ❑ Sampling plan/quality assurance plan
- ❑ Inspections
- ❑ Record keeping
- ❑ Reporting
- ❑ Closure plan

Important note: Some of the recommended elements are also mandatory requirements if your facility is permitted under the pile standards in WAC 173-304-420.[16] For clarity, Figure 4-2 lists the mandatory requirements in the solid waste regulation.

[15] Please refer to Chapter 2 - Understanding the Regulatory Framework for a description of solid waste, water quality, and air quality requirements.

[16] They are marked with the "regulatory requirement" symbol even though the text uses suggestive language.

Figure 4-2. Plan of Operation Required Under the Minimum Functional Standards for Solid Waste Handling

"Each owner or operator shall develop, keep and abide by a plan of operation approved as part of the permitting process in WAC 173-304-600. The plan shall describe the facilities' operation and shall convey to site operating personnel the concept of operation intended by the designer. The plan of operation shall be available for inspection at the request of the jurisdictional health officer. The facility must be operated in accordance with the plan or the plan must be so modified with the approval of the jurisdictional health department. Owners or operators of drop boxes may develop a generic plan of operation applicable to all such drop boxes, owned or operated.

Each plan of operation shall include:

- ❑ *How solid wastes are to be handled on-site during its active life;*
- ❑ *How inspections and monitoring are conducted and their frequency;*
- ❑ *Actions to take if there is a fire or explosion;*
- ❑ *Action to take if leaks are detected;*
- ❑ *Corrective action programs to take if ground water is contaminated;*
- ❑ *Actions to take for other releases (e.g. failure of run-off containment system);*
- ❑ *How equipment such as leachate collection and gas collection equipment are to be maintained;*
- ❑ *A safety plan or procedure; and*
- ❑ *Other such details as required by the jurisdictional health department." (WAC 173-304-405(2))*

Material flow plan

The material flow plan should include a description of how incoming material is handled throughout the composting process, including: feedstock receiving and storage, mixing and grinding, composting (high rate, stabilization, curing), screening, product storage, disposal/recycling of rejects. It should address procedures for peak and low flow of materials as well as variability in feedstocks. The plan should include procedures for preventing recontamination of compost from fresh incoming materials. The plan should include the permitted capacity of the facility.

Air quality control plan

The air quality control plan should contain the procedures for handling potential problems related to dust, equipment exhaust, and odor. Suggestions for treating each of these problems are presented in Chapter 6, Recommended Management Practices. Be sure to contact your local air pollution control authority for any specific requirements at your facility.

Leachate and stormwater management plan

Plans for operating and maintaining the leachate collection and stormwater management at the facility should be included as part of the operations plan.

Moisture management

Each facility should develop standard operating procedures for making sure that correct moisture levels are maintained in the compost in all stages.

Equipment

There should be a description of all equipment, including maintenance procedures. There should also be a plan for backup equipment in the event of a breakdown. We suggest having an inventory of critical spare parts on hand at all times.

Employee training

The plan should describe how employees will be trained in both facility operations and compost science. Ecology suggests using one or more of the available home study courses or attending workshops or training seminars sponsored by various trade organizations. See Appendix 3 for a list of training materials and sponsoring organizations.

Safety plan

The operations plan should address how activities will be carried out at the facility in a safe manner. It should describe safety equipment for workers and visitors, (e.g. ear plugs, hard hats, etc.), and conditions under which the safety equipment should be used.

Neighbor involvement

Experience in Washington State over the past several years has shown the importance of public involvement at compost facilities. Ecology recommends developing a plan that will educate and inform neighbors about the facility.

In addition, it is important to address how neighbor complaints will be addressed during the start-up phase, a time frame when complaints may be most common.

Neighbor involvement should also be included as part of the overall planning process outlined in the previous section of this chapter.

Fire emergency plan

Contingency plans at your facility should include actions to take in case of fire. Your plan should include requirements from your local fire district.

Monitoring plan

The monitoring plan for your facility should include descriptions of the following:

- How you will inspect incoming feedstock;
- How you will distinguish between "good" and "problem" feedstocks;
- How "problem" feedstocks will be handled;
- How to identify "problem" compost piles and what actions will be taken to correct the problems;
- How you will monitor for moisture, temperature, and if needed, oxygen content throughout the composting process, and the frequency of monitoring for these parameters; and
- Any monitoring required by your wastewater discharge permit (if you have one). The monitoring parameters and frequencies will be specified in the permit.

Your monitoring plan should include sample data collection sheets.

Monitoring for biosolids compost facilities must include time/temperature monitoring and final product testing to comply with Chapter 173-308 WAC, Biosolids Management. Please see Chapter 2 and Appendix 6.

Sampling plan/Quality Assurance plan

The Interim Guidelines for Compost Quality contain an appendix that describes how to put together a Quality Assurance Project Plan.

Inspections

The operator should make routine inspections of the facility on a daily basis to make sure machinery and equipment is running smoothly. The operator should note any problems, and record them in an inspection log with signatures and date/time notations.

Health department, water quality, and air quality inspectors must be allowed on site to determine compliance with the solid waste rules and liner integrity, leachate and stormwater permit requirements, and air quality requirements, respectively

The General Baseline Stormwater Permit requires wet weather and dry weather inspections every year.

Record keeping

Owners/operators must keep records on the amount and type of waste received at the facility, the number of vehicles entering, any major deviations from the operation plan. (See WAC 173-304-405(3).)

Record keeping is an important tool for tracking day to day activities at the facility and relating them to any problems with the composting process, odor generation, or compost product quality. You should keep records of all monitoring activities and data collection sheets. Records of climatic conditions may assist in managing nuisance odors.

Biosolids composters must keep records according to WAC 173-308-290.

Reporting

Owners/operators must submit annual reports to the local health department and the Department of Ecology by March 1st of each year (for the previous year's activity). The reports must contain quantities and types of solid waste handled, and the results of ground water monitoring, if conducted. (WAC 173-304-405(4))

Closure plan

Owners/operators must have a closure plan. See Chapter 2, Solid Waste Regulations for details.

Chapter 5
Compost Facility Designs

Introduction

This chapter is a guide to the general concepts that need to be considered when designing a compost facility. The Department of Ecology recommends using these concepts to develop facility designs that will address:

(1) Site layout - a successful design will arrange the basic components of the facility (e.g. feedstock preparation area, active composting area, etc.) so that the process runs smoothly and efficiently, and creates a good finished product; and

(2) Regulations - a successful design will incorporate features that meet performance standards[17] in the solid waste, water quality, and air quality regulations of Washington State.

Important note: The information in this chapter is not meant to replace the need for a qualified compost facility designer.

Basic Design Concepts

The Composting Council (in cooperation with other organizations),[18] has developed two models to describe basic design and operation concepts for compost facilities. These models go beyond the current regulatory framework in Washington State. Ecology recommends using the models as a conceptual aide in determining the best designs and management practices for your facility. The two models are:

- Compost Technology Groups (Table 5-1) - a matrix of five technology groups separated by process management characteristics (e.g. pile configuration) and key process variables (e.g. temperature, moisture); and,
- Composting Process Model (Figure 5-1) - a flow chart of the various steps in the composting process.

The Composting Technology Groups in Table 5-1 do not reflect the permit structure for compost facilities under solid waste, water quality, or air quality regulations. However, they provide a convenient way to look at combined features for determining appropriate design and permitting of individual facilities. For example, Groups 3-5 will provide greater separation of stormwater and leachate than uncovered facilities. Please refer to Chapter 4 for information on evaluating composting technologies.

[17]"Performance standards" are the requirements in a regulation that state the end result desired by the regulator, but they don't go into detail on how to accomplish the outcome. For example, in the solid waste regulation, compost facility designs must contain a system to prevent stormwater from flowing on to the facility in the event of twenty five year storm. The system must "perform" well enough to meet this standard. However, the regulation does not dictate the design details required to meet the standard. There are usually several ways to meet the standard depending on the individual site.

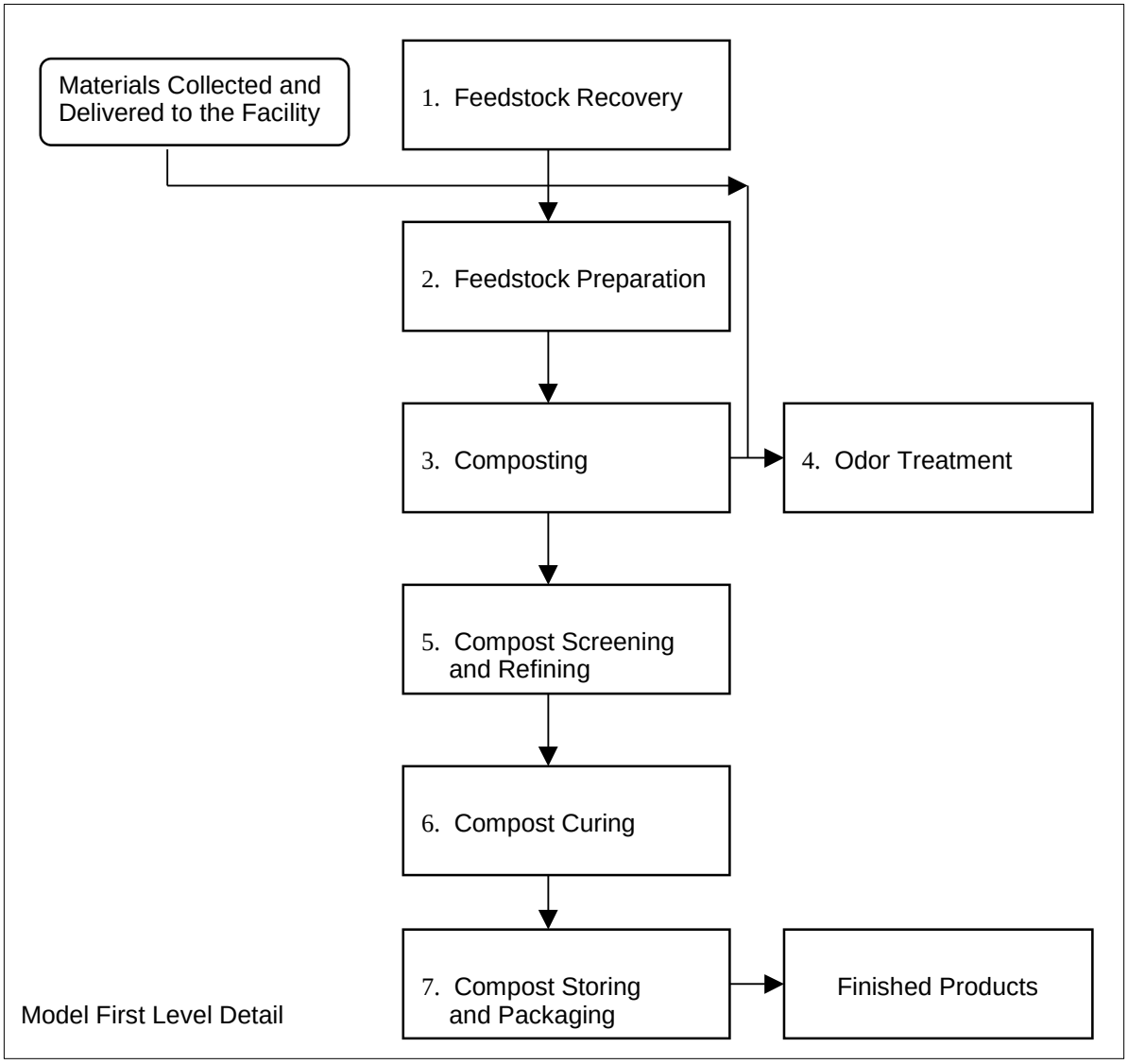
[18]Please see References by Chapter in Appendix 2 and Contacts and Sources for More Information in Appendix 4.

Table 5-1. Composting Technology Groups

Composting Management Characteristics	Group 1	Group 2	Group 3	Group 4	Group 5
Weather protection	Open	Open	Covered	Covered	Covered
Pile Configuration	Piles	Windrows and piles	Piles and tunnels	Windrows, bays/trenches and beds	Tunnel and vessel systems
Process management	Passive	Active	Active	Active	Active
Management of key process variables					
Porosity	Undisturbed	Turned	Static structure	Turned	Turned
Nutrient balance	Unmanaged	Initial C:N ratio set	Initial C:N ratio set	Initial C:N ratio set	Initial C:N ratio set
Oxygen	Unmanaged	Convective aeration	Forced aeration	Forced aeration	Forced aeration
Moisture	Unmanaged	Mix in makeup water	Mix in makeup water	Mix in makeup water	Mix in makeup water
Temperature	Unmanaged	Turning control	Blower control	Blower control	Blower control
Time	12 - 24 months	2.5-12 months	2.5 - 6 months	2.5 - 5 months	1.5 - 4 months

Source: Municipal-Scale Composting: A Decision Makers Guide to Technology Selection, United States Conference of Mayors in partnership with Santa Barbara County, California, Department of Public Works with technical assistance from The Proctor and Gamble Company

Figure 5-1 Composting Process Model



Basic elements in site layout

Site layout can be designed by looking at the Composting Process Model (Figure 5-1) and deciding what physical structures and equipment are needed for the various stages in the composting process. Site layout should also consider other design features such as office buildings, water pollution prevention and traffic flow.

The biggest variation in site layout between facilities will be based on whether or not the facility incorporates structures to cover most or all of the composting process.

The following sections outline the basic elements in site layout.

Vehicle entry/traffic flow

Vehicle entry to the facility from access roads should be planned to accommodate entering and exiting trucks. Routes and unloading areas for large commercial vehicles should be separated from residential drop-off areas as much as possible. Sufficient area should be allowed for turning around machinery (front end loaders and compost turners) without interfering with traffic flow of delivery trucks and employee vehicles, etc.

If finished product will be available for customers to pick up on site, the plan should include vehicle flow patterns for pick-up. Some facilities may not need permanent pick-up areas if product is only available a few times per year.

Office buildings/parking

Site layout should include office buildings. Some facilities may only need a small shed or mobile trailer. The office area should include parking for employees and visitors. Parking areas should include sufficient space for backing out vehicles without interfering with composting equipment.

Equipment maintenance

Site layout should include an area for equipment maintenance and repair. Ideally, this area should be under a roof. Storage for petroleum products and waste should be in a covered area with secondary containment.

Utilities

Electrical service, water lines, and phone lines should be included in the site layout to incorporate utilities with other design structures.

Leachate collection

The size and location of leachate collection areas will depend on several factors including:

- Climate (i.e. eastern Washington vs. western Washington)
- Cover - whether or not compost materials are under a roof
- Design capacity - how much material is composted
- Windrow configuration (for outside facilities)
- Topography
- Separation of clean stormwater from leachate
- Choice of collection structure (e.g. tank vs. open pond)

Leachate disposal

The leachate disposal option chosen for your facility is an important component of the overall facility design, especially designs for leachate storage systems. Options for disposal with the corresponding permit requirements are described in Chapter 2. The options include discharging to a wastewater treatment plant, applying leachate to land, treating and discharging to surface water, and "zero discharge" option (zero discharge is best achieved by covering a facility and recycling leachate into the composting process). Please see "Design Features to Meet Regulations" in this chapter for more information.

Stormwater flow

Both water quality and solid waste regulations require that compost facilities be designed to prevent stormwater from running on to the site. In addition, clean stormwater generated on site needs to be directed to infiltration basins or grass swales, etc. The site layout should incorporate these stormwater structures.

The Stormwater Management Manual for the Puget Sound Basin: The Technical Manual (publication 91-75)[19] provides Best Management Practices and designs for stormwater management.

Visual screens

Fences, berms, and landscape plantings, etc. used to block the view of compost facilities from surrounding areas should be shown on the site layout. Some local ordinances require specific types of landscaping. Be sure to check with the local planning agency.

Feedstock unloading

Feedstock unloading areas should be located out of the main traffic flow. If both commercial and residential customers will be bringing materials to the site, consider separate areas for unloading. Some feedstocks, e.g. septage and biosolids, may need containment structures in the unloading area. Site layout should include these structures. The unloading area should be paved.

Feedstock preparation

The area where feedstocks are prepared should be close to the unloading area for efficient material handling. Space will be needed to accommodate necessary equipment and materials that may include:

- Conveyor belts set at an angle for rock removal
- Conveyor belts for hand picking non-compostable materials and contaminants
- Grinders

[19] See References by Chapter.

- Mixers
- Front end loaders (space needed for maneuvering loader with compost materials)
- Bulking agent (temporary stockpile space before mixing)
- Other amendments

Active Composting

Composting technology will dictate the size and specific design of the active composting area. The plan should include area for actual compost piles and any extra area needed to operate machinery. For open windrows, the layout should indicate direction and size of the windrows.

Curing

Compost curing is a finishing step to develop the level of compost biological stability required for particular end markets. In some facilities, the curing area will be an extension of the active composting area. Other facilities, particularly those with aeration systems will have separate curing areas. In either case, the site should be designed to avoid contamination of curing compost with fresh incoming feedstocks.

Screening and refining

Screening and refining is a finishing step that removes oversized material like stones and bulking agents, and may include removal of physical contaminants including glass, metal fragments, hard plastic, film plastic, and sharps. Site layout should include area for screens, area for machinery to maneuver, area for temporary storage of residue (rocks, plastics, etc.).

Compost storing and packaging

Compost packaging and storing may prepare compost for the “high dollar” markets with amendments and bagging. Since maintaining proper moisture is critical to bagged product, consider placing these operations under a roof. The area for packaging and storing compost should have easy access to delivery vehicles.

Note: If fertilizer is added to the compost, the area for this operation must be zero discharge according to water quality regulations. See Chapter 2.

Design Features to Meet Regulations[20]

The two design features of an uncovered compost facility that influence water quality protection the most are:

- Compost pads; and
- Leachate collection structures.

Important note: All compost facility designs should separate leachate from stormwater to the greatest extent possible.

Considerations for Designing Compost Pads

This section provides design criteria to assist engineers and facility planners in designing compost pads that will meet state regulatory requirements for protecting groundwater and surface water. In addition, there may be local requirements or restrictions that apply to your area.[21] Please see Appendix 4 for contact information.

The following list provides general design criteria for compost pads:

- Compost pads are required for all uncovered facilities in areas of the state with wet climates (per water quality regulations).
- All compost pads should be curbed to prevent stormwater run-on and leachate run-off.
- All compost pads should be graded sufficiently to direct leachate to the collection device.
- All compost pads should contain one or more sumps or catch basins capable of collecting all leachate generated by the design storm and conveying it to the leachate holding structure.
- All compost pads should be constructed over soils of sufficient competence to support the weight of the pad and the proposed pile with an appropriate safety factor.
- The entire pavement area must maintain its integrity under heavy machinery.

When calculating the size of a compost pad, the following factors need to be considered:

- Amount of incoming feedstock
- Amount of bulking agent or amendment, if needed
- Composting technology (static or turned system)
- Turning radius of equipment

[20] This section represents Ecology's recommendations for design features that will meet requirements in current solid waste and water quality regulations. To avoid confusion, no symbols will be used.

[21] For example, some counties have their own surface water management requirements for protecting water quality.

- Pile or windrow dimensions
- Expected volume loss during the composting process

Figure 5-2 provides information on three materials that have proven successful for use in compost pad construction in Washington State.[22]

Figure 5-2 Example Materials for Compost Pads

Portland cement concrete, asphalt, and soil cement are three materials for compost pads that have been used successfully in Washington State. The following provides a brief description of each material.

Portland cement concrete is a mixture of Portland cement, water, sand and coarse aggregate (rock or gravel). Concrete in the quantities necessary for composting pads is usually mixed at a concrete batch plant trucked to the site. Portland cement comes in five different types[23]. Type I and II are the most common; both are suitable for use in Portland cement concrete pads.

Asphalt. The type of paving usually referred to as asphalt is more properly asphalt concrete. It is a mixture of aggregate with a petroleum based asphalt cement. As with Portland cement, concrete asphalt concrete pads that meet the permeability requirement are easily obtained, and many paving mixes will prove adequate.

Soil cement is a highly compacted and hydrated mixture of soil and Portland cement. It was used extensively for road paving from the 1920's to the 1940's but lost popularity because it could not support heavy loads and high traffic. It is still used in low traffic areas, and for sub-bases for other types of paving. Soil-cement provides a reasonably low cost low permeability liner for compost facilities. Only one Washington State facility is currently composting on a soil-cement pad (Cedar Grove).

Considerations for designing leachate holding structures

When designing structures for leachate collection and storage, the important question to ask is "What volume of leachate storage is needed on site?" Leachate (which is process wastewater) must be controlled without overflow in order to meet water quality regulations.

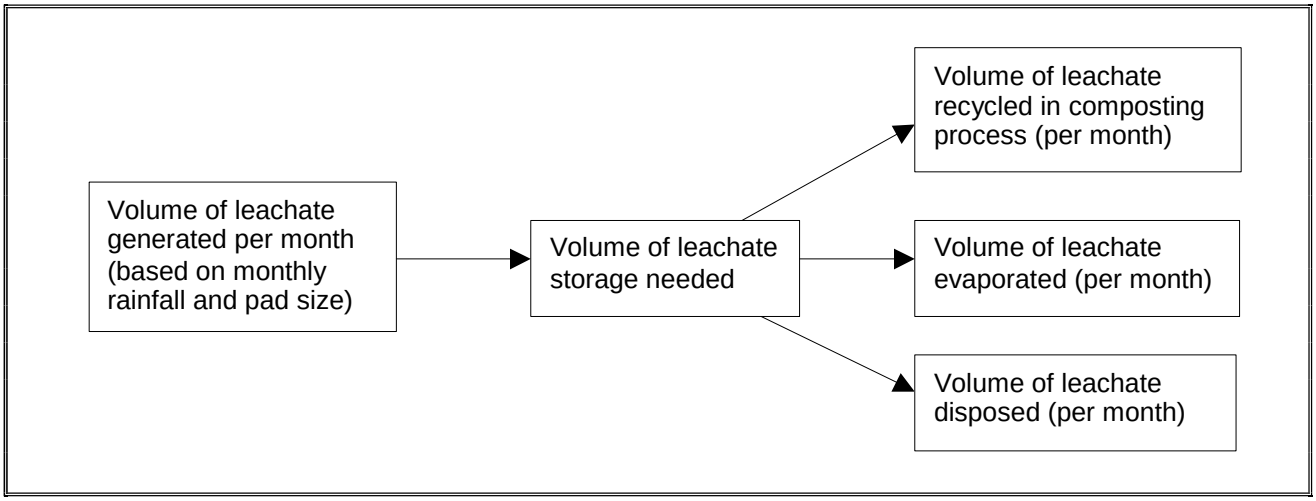
Experience in the wet climates of Washington State has shown that calculations using single event design storms underestimate the amount of leachate generated over the rainy season.

Ecology recommends conducting a monthly water balance as illustrated in Figure 5-3 to determine the volume of leachate storage needed at a facility. Three factors essential to the water balance are:

- Monthly rainfall (including some statistical analysis; used to calculate volume of leachate generated per month)
- Amount of water recycled in the composting process
- Rate of disposal available (involves disposal permit)

[22] As of this writing, roller compacted concrete is also being used successfully for compost pad construction in Western Washington.
[23] See References by Chapter.

Figure 5-3 Water Balance for Determining Leachate Storage Requirements



Ecology recommends using one of the continuous simulation models (such as the HSPF model used in the new King County Stormwater Design Manual) to estimate the amount of leachate generated. The calculated volume, on a monthly basis, can then be used to size the leachate holding structure (as long as the leachate recycling rate and disposal rate are included in the calculation).

Other models or methods of calculating leachate volume (such as the Rational Method) may also be used, provided that care is taken in choosing appropriate data and assumptions in the equations or modeling program.

Important note: Designers of compost facilities in dry climates of the state should pay particular attention to evaporation when completing a water balance calculation. Some facilities have successfully used evaporation as a method to decrease the amount of leachate that requires storage.

Ponds

All ponds for holding leachate from compost facilities must be lined to prevent groundwater contamination. The liner can be constructed of synthetic or natural materials. However, when natural materials (i.e. low-permeability soils, compacted to prevent leaking) are used, quality assurance/quality control is more complicated than with a geomembrane. Designing a liner with low-permeability soils will require the expertise of a geotechnical engineer.

"AKART" or All Known Available and Reasonable Methods of Prevention and Treatment must be applied to all pond liners, regardless of the construction materials. Permit writers determine the appropriate design details for each facility on a site-specific basis during the solid waste and/or water quality permitting processes. Figure 5-4 presents recommended design details for pond liners that should be considered during construction of leachate ponds.

In addition, leachate ponds must meet the following requirements:

- Ponds having a capacity greater than ten acre feet (3,259,000 gal) must be approved by the Dam Safety section of the Department of Ecology.
- Ponds having a capacity of greater than two million gallons must have either a groundwater monitoring system or a leak detection system.

Figure 5-4. Recommendations for Pond Liner Design Details

Ecology recommends constructing leachate ponds with a geomembrane liner over a prepared subgrade. In many cases, geomembranes provide simpler quality assurance/quality control than natural liners. The following bullet items address design details that should be considered during construction.

- The soils underneath the liner need to support the weight of the pond with an adequate safety factor.
- Hot wedge welding is the preferred method of bonding seems in pond liners.
- Inlet and outlet structures should be properly sealed.
- Geomembrane should be anchored at the top of the side slopes using a suitable trench or mechanical anchor system.
- Quality assurance/quality control on geomembrane liners should include trial seams before beginning seaming and after any break longer than one hour.
- Each seam should be tested using the pressurized dual seam method.[24]
- Pond side slopes should not exceed 3 horizontal feet to 1 vertical foot.

Tanks

Tanks for leachate containment are usually much more expensive than ponds. However, they take up less area for a given volume, and may be more appropriate for covered or enclosed facilities. Underground tanks should include monitoring for potential leaks.

[24]Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities. Publication # EPA/600/U/R-93/182. US EPA, Washington DC.

Chapter 6
Recommended Management Practices

Introduction

This chapter gives an overview of management practices based on the Composting Process Model introduced in Chapter 5 (see Figure 6-1), and experiences from composters in Washington State.

Each section contains a list of best practices recommended for each stage of the composting process.[25] The lists provide general operations or conditions needed at a facility to promote good composting. Detailed procedures for individual facilities are beyond the scope of this handbook. Each facility will have its own methods of achieving optimum conditions for the microorganisms to grow based on technology, feedstocks, and equipment.

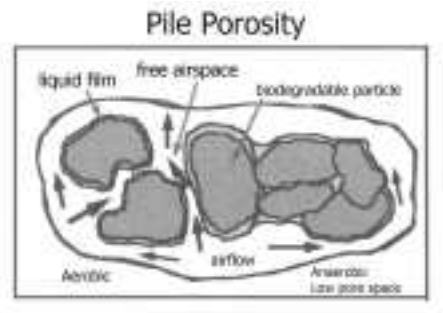
Review of the Composting Process [26]

Key process variables

Successfully managing a compost facility requires careful attention to the following key process variables:

- Pile porosity
- Nutrient balance
- Pile oxygen
- Pile moisture percent
- Pile temperature
- Retention time

These process variables are listed in order of importance for optimum composting. The one exception is retention time. The amount of time required to maintain compost at a given temperature is a basic requirement to kill pathogens.



Pile porosity

Pile porosity or pore space refers to the area around individual compost particles. For optimum growth of microorganisms, both oxygen and moisture are needed in the pore space. Too much water in the pore space creates anaerobic decomposition which leads to odor problems.

[25]From The Composting Council Supplement - Compost Facility Operating Guide, draft November 26, 1996.
[26]Adapted from the Best Practices Workshop, December 9-11, 1996, presented by Philip Leege, (formerly) Proctor & Gamble.

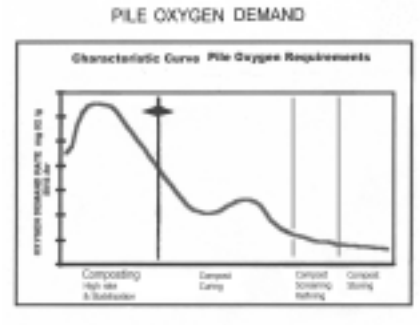
It is important to establish good porosity at the beginning of the composting process by adding a bulking agent or grinding feedstocks to a specific particle size. Turning can also maintain pile porosity.

Nutrient balance

The ratio of carbon to nitrogen in compost feedstocks is an important variable. Generally speaking, microorganisms work most efficiently when feedstocks contain 30 parts carbon to 1 part nitrogen. Materials with higher ratios (more carbon) take longer to decompose. Materials with lower ratios (less carbon) tend to lose nitrogen (as ammonia) since the microorganisms can only use a certain amount of nitrogen per "dose" of carbon. Carbon to nitrogen ratios should be balanced at the beginning of the process by mixing feedstocks in the appropriate amounts.

Representative Carbon to Nitrogen Ratios

Biosolids: Activated	6:1	Foliage	40-80:1
Biosolids: Digested	16:1	Corn stalks	60:1
Humus	10:1	Straw	80:1
Food waste	15:1	Bark	100-130:1
Grass clippings	19:1	Paper	170:1
Cow manure	20:1	Sawdust	500:1
Horse manure	25:1	Wood	700:1
Fruit wastes	35:1		

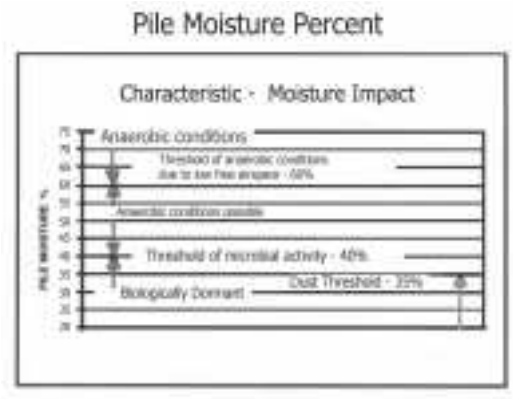


Pile Oxygen

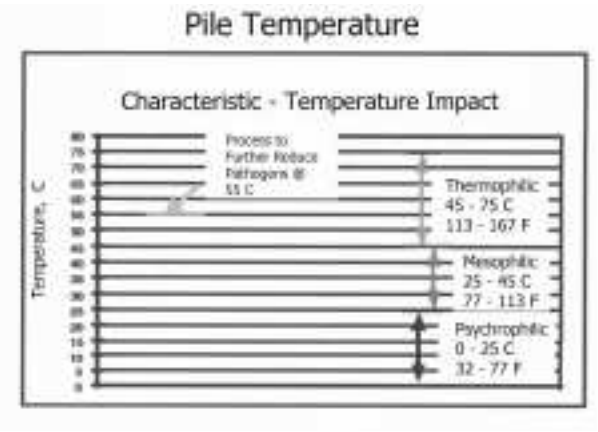
Oxygen is provided to microorganisms by natural air flow (convection), restoring porosity (turning), and forced aeration (blowers). The technology chosen for each facility will dictate how the oxygen level is maintained in the compost piles.

Pile Moisture

Initial pile moisture percent should be established at a level that allows a film of moisture to surround each biodegradable particle but not so much water that free air space between particles is blocked and oxygen is prevented from reaching the microorganisms. Since significant moisture is lost during the composting process, it is usually necessary to add water and mix it in as thoroughly as possible throughout active composting. Care should be taken to use clean water after the compost has undergone pathogen reduction.



Pile Temperature

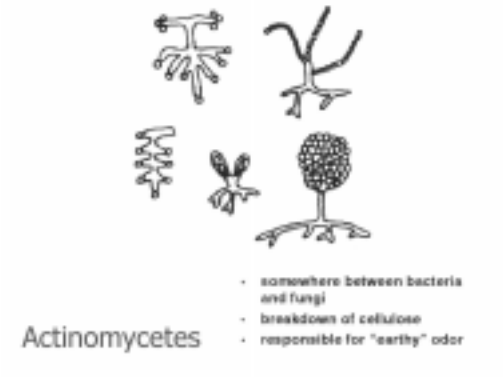


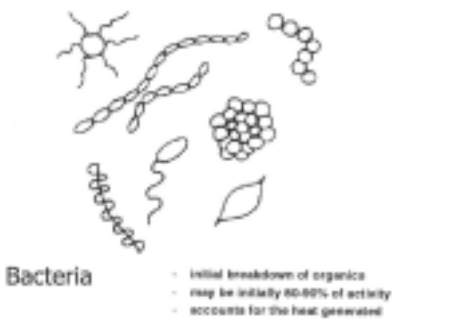
Compost pile temperatures should be allowed to exceed 55 degrees Celsius long enough to kill pathogens and weed seeds.[27] After the time/temperature requirement has been met, the optimum composting temperature for encouraging diversity in the microorganism populations is 45 degrees Celsius. Diverse populations can degrade the compost materials faster (provided other process variable are optimum.) Temperatures can be regulated using aeration which removes heat. Without aeration, the process will take longer.

Retention Time

Sufficient time should be provided for the following distinct purposes:

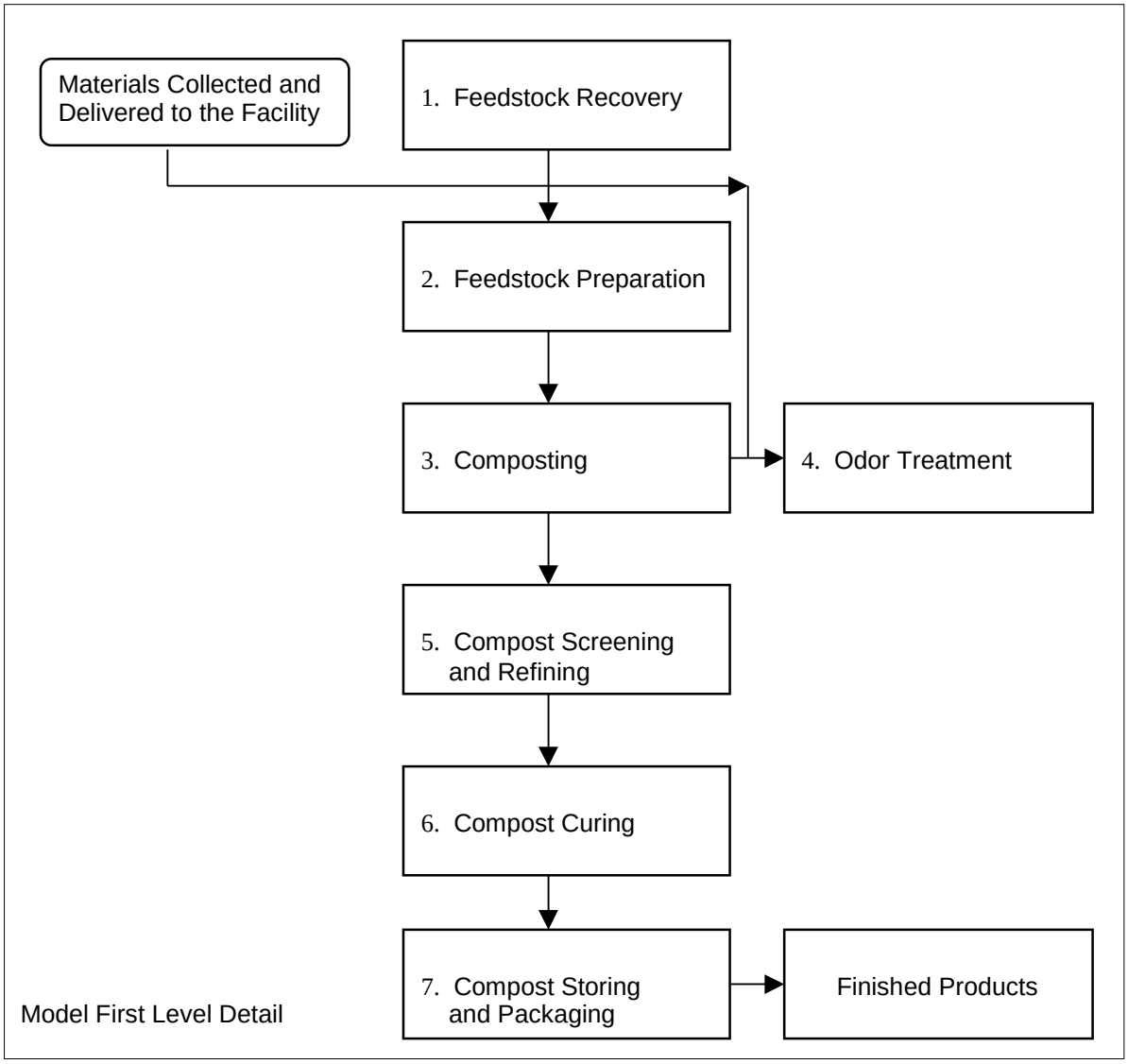
- At temperatures in excess of 55 degrees Celsius, for pathogen reduction and weed seed destruction;
- At mesophilic temperatures (less than or equal to 45 degrees Celsius), to achieve the biological stability needed by the customer;
- To degrade substances that inhibit seed germination and plant growth (organic phytotoxins); and
- To consume substances that promote fungal growth.





[27] In some feedstocks, pathogen issues are not as important as with other feedstocks.

Figure 6-1 Composting Process Model



Management Practices

Feedstock materials collected and delivered to the facility

Management practices for this phase of the composting process are best addressed at the planning stage of the project (see Chapter 4 - Planning and Siting Compost Facilities). The following tasks should already be completed before the facility is in operation:

- Define composting project objectives.
- Identify compost markets and market specifications.
- Define required compost performance attributes.[28]
- Note any feedstocks prohibited by crop buyers from farms using compost.
- Plan for compliance with Interim Guidelines for Compost Quality:
  - Plan management and control of regulated and hazardous chemicals.
  - Plan management and control of lead.
  - Determine compost grade designation and use restrictions.
  - Identify regulated parameters and limits.
  - Identify feedstock prohibitions.
- Define detailed list of acceptable feedstock materials.
- Define limitations on condition of feedstock materials delivered to the site.
- Determine type of collection containers and how they affect the composting system (e.g. if yard debris is collected in plastic bags, film plastic can become a problem)
- Develop communications plan with haulers and suppliers (residents, institutions, etc.).
- Provide training to generators, collection services and haulers.

Feedstock recovery

For source separated feedstock materials delivered to the facility:

- Remove contamination by regulated chemicals; remove lead.
- Avoid commingling with other waste materials.
- Remove items that can damage composting equipment, or cause injury to workers; remove ferrous metals.

[28]"Attributes" is a term used in the Compost Facility Operating Guide to describe characteristics of finished compost that should be tested. These include regulated chemicals, pathogens, man-made inerts, growth screening, stability, organic matter content, pH, soluble salt content, water holding capacity, bulk density, particle size and distribution (texture) moisture percent, and plant food content.

Feedstock preparation

- Set initial pile porosity at about 60 percent
  - set initial particle size between 1 to 2 inches; (monitor structural integrity of mix, match to pile turning frequency to manage porosity during composting)
  - mix bulking agent material
- Set initial nutrients balance (the "recipe" of feedstock materials):
  - approximately 30 parts carbon : 1 part nitrogen
  - mix additives needed for initial carbon to nitrogen ratio:

  "browns" = carbon; "greens" = nitrogen
- Conserve/immobilize ammonium:
  - control initial pH: 5.0 to 5.5 for about 24 hours
- Set initial moisture content:
  - without paper 50% to 55% water
  - with paper 55% to 60% water
- Control oxygen content
- Initiate microbial diversity
  - recycle finished compost into feedstock mix 10-15%

Composting

<u>Destroy pathogens</u> (regulatory requirement)

- Control temperature >55^{o}C to <60^{o}C
- Homogenize: turn piles according to 40 CFR Part 503 requirements
- Document pathogen destruction via temperature/time relationship
- Degrade pathogen nutrients (sugars, starches, proteins, fats)

<u>Degradation and biological stabilization</u>

- Control pile porosity, to support aeration needs
  - manage pile height versus slump: about 8 feet maximum
  - manage turning frequency - daily to weekly
- Manage nutrients: turning and aeration (maintaining pH above 6.0)
- Control pile oxygen content at greater than 16% oxygen
  - establish and control forced aeration cycles
- Control pile moisture content:
  - without paper - 50% to 55% water
  - with kraft paper - 55% to 60% water
  - establish and control moisture make-up cycles
- Control pile temperature: 45^{o}C+/- 2^{o}C to maintain maximum diversity of microorganisms

- Homogenize composting materials
- Destroy fly larva: turn frequently for high temperature exposure
- Monitor and analyze samples

Compost Curing

- Control pathogen regrowth
  - reduce pathogen nutrients (sugars) produced by actinomycetes and fungi
  - prevent bird and rodent access
  - handle with clean implements
  - use clean water
- Stabilization
  - control pile porosity by turning
  - control pile moisture at about 45% water
  - control dust: keep pile moisture above 35% water
  - control pile oxygen: greater than 16% oxygen, the odor threshold (consider continuous ventilation)
  - homogenize by turning
- Maturity
  - control pile porosity by maintaining bulking material as long as possible
  - control pile oxygen: greater than 16% oxygen, the odor threshold (consider continuous ventilation)
  - homogenize by turning
- Prevent fire risk by limiting pile height to 8-9 feet maximum height

Compost Screening and Refining

- Manage moisture content : at about 42%$\pm$2% water
  - prevent screen blinding (compost caught in screen mesh)
  - prevent dust: keep moisture at greater than 35%, the dust threshold
- Remove oversized material
  - bulking material (recycle within operation)
  - woody material (potential product to market separately)
  - metal items (recycle or trash)
- Remove inert material
  - metal fragments, glass shards, leather, bones, textiles
- Remove sharps
  - steel sewing needles and straight pins, hypodermic needles

Compost Storing and Packaging

- Control pile porosity by turning
- Homogenize by turning
- Control pile moisture at about 45% water
- Control pile oxygen at greater than 16% oxygen, the odor threshold (consider continuous ventilation)
- Blend amendments as required for markets

Management Practices for Odor Control[29]

Causes of Odor Generation

- Pile porosity less than 35% inhibits air circulation
- Pile moisture greater than 60% eliminates adequate free airspace
- Initial C:N ratio below 25:1 promotes ammonia volatilization
- Pile pH greater than 7.5 promotes hydrogen sulfide and mercaptan generation
- Pile oxygen below 16% promotes volatile organic acid formation

Odor Generation Control

- Attempt to control odor before feedstock is delivered to the site (e.g. by addressing feedstock collection)
- Begin treatment of all waste deliveries the day of receipt
- Prevent water ponding at site; insure good pile drainage and prevent ponding beneath, around, and between piles
- Keep site roadways, buildings and equipment clean
- Establish and maintain pile porosity at greater than 60%, or at least never less than 35%.
- Maintain pile porosity by:
  - turning - break up clumps and overcome pile slump
  - using structurally stable bulking agents
  - avoiding excessive pile height
- Manage initial nutrient balance by:
  - setting initial carbon to nitrogen ratio at 30:1 (lower initial carbon to nitrogen ratios promote ammonia volatilization)
  - controlling grass clippings

[29]From The Composting Council Supplement - Compost Facility Operating Guide, draft November 26, 1996.

- Control pile oxygen content at greater than 16% oxygen (16% oxygen is the odor onset threshold; 5% oxygen is odor saturation)
  - control pile aeration
  - control pile pH at about 6 or above
- Manage pile moisture to avoid excess moisture that clogs free air space
- Manage unincorporated feedstocks and freshly incorporated feedstocks to minimize odor generation
- Reject and promptly dispose of “off-specification” feedstocks

Chapter 7
Odor Management

Introduction

Odor continues to be the most challenging problem at compost facilities in Washington State. Managing odor requires a concerted effort in developing a framework that addresses:

- How odors can be prevented through proper planning, siting, process control, and good housekeeping techniques; and
- How nuisance odor conflicts can be resolved among compost producers, neighbors and regulators.

This chapter presents an odor policy framework based on work done by members of the Composting Council for the Council's annual meeting in November 1996. The information has been adapted to address unique situations in Washington State.

This chapter contains information that appears in other parts of the handbook. The information is reiterated here in one chapter to emphasize the importance of odor issues and recommend ways to minimize odor impacts on the compost industry.

Important note: Some local air pollution control authorities and health departments already have odor policies or odor conflict strategies in place. The Department of Ecology recommends using local policies that are based on experience as a starting point, and adding any additional suggestions from this chapter as needed.

What is odor?

One of the difficulties in determining how best to manage the odor issue lies in the ambiguity of the word itself: "odor." Webster's Dictionary defines odor as "an agreeable scent" and then goes on to offer a second, seemingly contradictory definition - "a disagreeable smell."

These two definitions illustrate a basic challenge in odor management: odor perception is subjective in terms of acceptance (character) and intensity (strength).

Like any potential nuisance odors, compost facility odors have two basic aspects: character and strength. Odor character, sometimes expressed in terms of "hedonic tone," is particularly subjective. Odor strength, which is often determined by odor panels and expressed in terms of a numeric "dilutions to threshold" (D/T) value, is generally regarded as more objective. Depending on the constitution of the odor panel, however, odor strength assessments can also be subjective to a significant degree. Sound odor policy and successful odor prevention and control must take both aspects, particularly the subjective nature of odor characterization, into account.

Odor Policy Framework for Compost Facilities

An effective odor policy is a delicate balance between:

- The uniqueness and subjectivity of each odor situation;
- The need for accountability on the part of compost producers; and
- Appropriate enforcement by regulatory agencies.

The odor policy presented here attempts to achieve this balance and build a framework for evaluating, regulating, and controlling odors at compost facilities.

The central concepts of this framework are:

- Control; and
- Accountability.

Odor Control

The single best strategy for managing the odor issue is to control nuisance odors beginning with the facility planning, siting, and design stages. The facility developer/operator must take into careful consideration a variety of factors which will determine both the potential for malodor generation and the potential for these malodors to be perceived as a nuisance.

Odor Conflict Potential: Feedstocks, Throughput, and Proximity to Receptors

The type, size, and location of a composting facility represent three key determinants of odor conflict potential. Therefore, it is very useful for all interested parties to ask a series of basic questions about a facility prior to its development. Many of these questions will have to be answered to obtain regulatory approval for a new compost facility, but it is surprising how many operations overlook basic siting issues prior to development. Key questions include:

What feedstocks will be composted at the facility?

Importance: Certain feedstocks have much higher odor potential than others. For example, glass clippings, organic waste, biosolids, municipal solid waste, and poultry manure have more nuisance potential than leaves, horse manure, and other feedstocks.

What is the odor potential for the particular composting process?

Different processing techniques have differing odor potentials. A process which enhances aerobic conditions will have different odor characteristics from a process which allows the material to go anaerobic. A process which turns the composting materials may have the temporary effect of releasing odorous compounds, whereas a process which doesn't turn the materials would not have this problem.

What is the setback from the nearest residence, school, retail business or other sensitive receptor?

Importance: This surprisingly basic concept is often overlooked. Odors disperse. The more distance they have to disperse, the less likely they are to be perceived as nuisance odors, even when a facility makes a ”mistake” in its odor management.

What will the facility's throughput capacity be?

Importance: The greater the volume of material on site, the greater the potential for odor generation. Why? Three primary reasons: a greater composting mass can generate more odorous compounds than a small mass; a larger volumes means more composting piles are being turned or disturbed in a given period of time; and more frequent deliveries to the site can create more opportunities for odor release.

What is the character of the neighborhood in which the facility will operate?

Importance: Certain neighboring land uses may increase or decrease the likelihood of odor conflicts. For example, a compost operation situated next to a pig farm or paint factory is less likely to become a nuisance than one located next to a grocery store, or**,** outlet mall. In other words, context is critical.

What are the prevailing meteorological conditions around the facility?

Importance: Temperature, wind, humidity, and atmospheric pressure conditions all have a profound impact on odor dispersion and therefore perception. In general, high temperatures, light winds, high humidity, and low atmospheric pressure all worsen dispersion. On the other hand, winds may carry odors towards sensitive receptors.

Are there any special geographical/terrain features that might affect odor dispersion around the facility?

Importance: Berms, forests, hills, and other unique land features can affect the way in which odors move from point A to point B.

Facility developers and those potentially impacted by a facility should explore these questions thoroughly when planning, siting, and building a new operation or expanding an existing site (either in terms of overall capacity or new feedstocks).

Facility Design and Process Control

The preceding questions focus on the "where, what, when, and how much" aspects of a facility. The next critical area of concern is the "how." Facility design, including operating procedures, dictate how composting materials are managed from beginning to end. There are many different facility designs and levels of technology which may be employed. Generally speaking, the higher the level of technology, the better the odor control. However, high technologies (e.g. forced aeration systems and odor control systems) are **not** necessarily a

requirement for all composting facilities. On the contrary, facility design, just like a good odor policy, should be situation-specific. The following factors generally determine the level of technology employed for a given site:

- Type of feedstock processed;
- State/local/federal regulatory requirements;
- Volume of feedstock anticipated;
- Capital resources available; and
- Proximity to sensitive odor receptors.

Once the facility developer has arrived at a design concept for the operation, certain questions should be asked to ensure that the design is sound. For example:

- Have other facilities used this design for a similar feedstock, at comparable volumes, and with satisfactory odor control? In other words, is the technology proven?
- Does the facility provide for the biological demands of the feedstock (i.e. its energetics, porosity, moisture content, and odor precursors)?
- If any experimental technologies are to be used, are they based on sound theory and is there a provision for pilot-scale testing prior to operating at full capacity?
- Does the design/operating plan contain adequate contingencies for operational problems, including nuisances such as malodors?
- Does the developer/operator have experience operating this type of facility (i.e. can they produce credible references)? In other words, is the operator proven?

The answers to the above questions cannot eliminate the possibility for facility design flaws or operational errors, but they can substantially reduce the likelihood of such problems. Just as in the siting and planning stage, basic design questions force an operator/developer to consider the key factors which ultimately determine odor production and perception.

Important note: This chapter is not a blanket endorsement for high-tech, composting systems. A bucket loader and a thermometer may be all the technology needed for a small leaf composting site located in a rural area. It is important to apply a decision-making process, such as the one described in this chapter, when choosing the appropriate technology for any compost facility.

Process Management and General Operational Considerations

A variety of site management tools are available to control odor strength, character, or both. These tools include:

- Process optimization (i.e., keeping oxygen, moisture, feedstock mix, windrow configuration, and amendments at ideal levels);
- Neutralizing odors with chemical agents;

- Observation of atmospheric conditions prior to turning or handling potentially odorous materials; and
- Creating an insitu biofilter on piles and windrows using finished compost.

Other preventive measures include the use of stacks, fans, larger site setbacks, buffers such as berms or plantings, and capture and treatment of emissions.

The combination of these tools at a particular facility will depend on site specific factors, including facility design, technologies used, feedstocks, location relative to sensitive receptors, local topography, and local atmospheric/weather conditions and patterns. Selection and implementation of these tools is more effectively done in a dynamic, flexible manner, from the outset of the facility's design and development and continuing through operations and any significant facility modifications.

The Compost Facility Operating Guide, published by the Composting Council, covers a number of key-process and nuisance control areas that should be addressed by an operator regardless of size, technology, or feedstock. In brief, critical process parameters that should be addressed in a facility operations manual include:

- Feedstock particle size and porosity
- Carbon-nitrogen ratio
- Oxygen content and aeration
- Moisture content
- Temperature
- Additive (e.g. bulking agent mixing)
- Biological activation (e.g. culturing)
- Turning and mixing
- pH control
- Compost maturity and stabilization

When a facility is being planned and designed, the operator should demonstrate that he/she has considered these and other critical operational parameters in detail so that the potential for odor generation is minimized.

Dispersion Modeling

Some states have considered a requirement for dispersion modeling prior to facility construction and operation to determine how local atmospheric conditions will affect odor dispersion for a facility of a given size and design. Modeling represents a useful tool to help predict how odors may impact on facility neighbors, but it is expensive. It is also difficult to model accurately in complex terrain (e.g. hills and valleys). Ecology recommends limiting the use of the tool to situations that justify its cost, such as large composting operations in close proximity to sensitive receptors such as residences or commercial businesses.

Simple historical weather charts, local land use maps, neighbor surveys, research of comparable facilities, and local history can provide useful information for planning and siting most compost facilities in Washington State.

Accountability

The second concept of the odor policy framework is accountability. Compost facility owners/operators must be willing and able to accept responsibility for odor management and be held accountable for their actions.

The Framework for A Progressive Odor Management Plan

One way to ensure that all parties will accept the consequences of odors and their mitigation is by requiring a progressive odor management plan that is agreed upon up-front by all interested parties and followed diligently by the facility operator.

A progressive odor management plan details how and when an operator will step up process and/or odor control technologies to reduce or eliminate nuisance odors.

The goal is to quickly remedy odor situations without court battles, shutdowns, or other costly and difficult confrontations.

During the planning stages, facility designers should develop in detail progressive remedial upgrades in process management, emissions capture and control, or other related areas, and state how and where these upgrades will be implemented if necessary.[30] Facility owners/operators should commit to upgrading their facility and practices to manage odors as outlined in these designs if an evaluation of operating conditions determines that more odor control is necessary. In addition, the facility owners must demonstrate that they have adequate funding sources in place to finance the cost of implementing upgrades.

Once up and running, a facility should be required (e.g. by regulation or by its operating permit) to operate under its approved process management system in order to achieve self-imposed process and odor control goals. Health/regulatory officials should review operations and assess whether these goals are being met. These assessments should be communicated to the facility operator in a timely fashion and in an appropriate level of detail. The original site operating and odor management plans should be updated and fine-tuned as the operator gains experience in composting and receives feedback from neighbors.

[30] It is not the intent of this chapter to identify the specific measures which constitute a good progressive odor management plan. On the contrary, it is important for a facility to have the flexibility to propose a plan that is appropriate for its feedstock, location, size, local/state regulatory framework, and other site specific factors. The act of developing the plan itself often gives a facility operator insights into odor management which might not have otherwise been discovered. The operators should be prepared to modify the plan as he/she gains experience.

Case Study - Odor Policy in Spokane County, WA

The information in Figure 7-1 was distributed to concerned citizens in the Spokane area in May 1996. It describes an odor policy developed by the Spokane County Air Pollution Control Authority. The policy is based on the premise that:

(1) Composting is not odor free, and therefore some off-site odor mitigation is to be expected;

(2) The key to managing odors is in adhering to recognized practices; and

(3) Site inspections need to be done on a regular basis.

SCAPCA has determined that a "reasonable minimum" odor (see WAC 173-400-040(4) cited below) is an "earthy" odor typical of compost as opposed to the rotten odor of anaerobic compost materials. In addition, the best management practices for the Colbert Facility are considered the best available control technology (BACT) for that facility. (See Chapter 2 for information on BACT.)

Good facility management will not guarantee an odor-free environment, but it is the best approach to maximize compliance with air quality regulations.

Figure 7-1. Colbert Compost Facility Information

Background

The Spokane County Air Pollution Control Authority spent literally hundreds of hours in 1994 and 1995 investigating odor complaints registered against the Colbert Compost Facility. (The Colbert facility is a yard debris compost facility using traditional windrow technology.) Violations were documented on only three occasions in 1995, and in all three instances, the excessive odors were tied to problems with management practices which led to anaerobic (i.e. lack of oxygen) decomposition of the composting material. On all other occasions, when the process was well managed, the odors were minimal and could be characterized as the more typical "earthy" type of odor associated with compost. Residual odors were within the realm of what could be reasonably be expected from a well managed compost site, and therefore within legal limits, notwithstanding intermittent off-site odors.

Roles and Responsibilities

SCAPCA's role regarding the Colbert Compost Facility is to legally enforce the state of Washington odor regulation, (WAC 173-400-040(4)),

Any person who shall cause or allow the generation of any odor from any source which may unreasonably interfere with any other property owner's use and enjoyment of his property must use recognized good practice and procedures to reduce these odors to a reasonable minimum.

Most air quality regulations are based on measurable, numeric standards. Odor regulations are often misunderstood because there are no numerical standards. But odor regulations have long been part of the mission of air pollution control programs, and have been effectively implemented.

SCAPCA's approach in 1996 is to assure that good facility management is ongoing, by first defining the parameters which enhance aerobic (i.e. oxygen enriched) composting and odor control (thereby reducing the opportunity for anaerobic processes) and then focusing our efforts on monitoring those parameters.

What are the Good Facility Management Parameters?

The following parameters and practices will be monitored to assure consistent good facility management:

- Windrow size and density
- Windrow turning (thoroughness, timing, and frequency)
- Windrow temperature
- Physical and chemical properties (pH, temperature, moisture content, carbon to nitrogen ratio, color and texture)
- Raw material management
- Machinery breakdown avoidance

Case Study - Puget Sound Air Quality Agency

This case study describes how the Puget Sound Air Quality Agency (PSAPCA) regulates odor from compost facilities in King, Kitsap, Pierce, and Snohomish counties. PSAPCA follows a local air quality ordinance which is based on the state regulation Chapter 173-400 WAC, General Regulations for Air Pollution Sources.

When a new compost facility is proposed, PSAPCA evaluates whether or not an air quality permit is required. Agency engineers evaluate each facility proposal on a case-by-case basis. They ask the question, "Does this facility, as it is proposed, have the potential to emit odors that 'interfere with the enjoyment of life and property' of neighbors?" The evaluation process is a risk assessment and involves looking at four important aspects of a facility to determine the best available control technology (BACT) for that facility.

The four aspects of a facility that PSAPCA examines are:

- Type of feedstock
- Quantity of feedstock
- Technology
- Site location

Type of feedstock

Certain feedstocks have the potential to create and emit odors more than others. For example, experience has shown that grass clippings, particularly those from curbside collection programs, have a high potential for causing odor problems.

Quantity of feedstock

As quantities of feedstock at a facility increase, the potential for odors increases. PSAPCA views a clear connection between BACT determinations and the agency's authority to limit facility size as a condition of the permit.

Technology

PSAPCA does not endorse one technology over another. No technology is ruled out. However, the technology must be compatible with the quantity and type of feedstock materials and the proposed location. In the review process, the Agency's regulatory interest is more intense at those facilities with more open designs, or "lower technologies", since they have a greater potential for off-site odors.

Site location

Local zoning of surrounding property is an important component in the risk assessment. PSAPCA looks at the probability of residential encroachment on a potential site. If neighborhood development appears imminent, greater odor control technologies are likely to be required.

PSAPCA administrators and inspectors would like to see a more coordinated approach to permitting compost facilities, addressing odor control in conjunction with the requirements in the solid waste handling permit.

Editor's Note:

The 1998 Legislature directed the Department of Ecology to look at the application of best available control technology (BACT) as applied to similar recycling facilities and issue a report by December 1, 1998. Results of this study (SHB 2960) will be included in revisions to this handbook.

Glossary

Accumulate: To amass, gather, pile up or collect

Active composting: Compostable material that has undergone the time/temperature Process to Further Reduce Pathogen (PFRP), and is undergoing or capable of undergoing rapid decomposition but isn't sufficiently stabilized as a soil amendment; not horticulturally or agronomically beneficial in its present condition.

Aerated static pile: Composting system that uses a series of perforated pipes (or equivalent) air distribution system running underneath a compost pile and connected to a blower that either draws or blows air through piles. Little or no pile agitation or turning is performed.

Aeration: The process by which oxygen –deficient air in compost is replaced by air from the atmosphere to allow microbial aerobic metabolism (biooxidation).

Agriculture: The science, art and business of cultivating the soil, producing crops and raising livestock; farming.

Air inversion: An atmospheric condition in which a layer of warm air traps a layer of cooler air next to the ground, trapping pollutants near the ground and preventing the air from dispersing.

Ammonia: A gaseous inorganic compound comprised of nitrogen and hydrogen; ammonia, which has a pungent odor, is commonly formed from organic nitrogen compounds during composting.

Animal manure: The excreta of animals together with whatever bedding materials are needed to follow good dairy barn, feedlot, poultry house, etc., practice in order to maintain proper sanitary conditions.

Animal morts: Dead animal carcasses.

Aquatic: Of or in the water; living or growing in or on the water.

Attributes: A term used to describe characteristics of finished compost that should be tested.

BACT: Best available control technology.

Bioaerosols: Organisms or biological agents that can be dispersed through the air and affect human health.

Biodegradability: The extent to which a material can be degraded by the action of naturally-occurring microorganisms such as bacteria, fungi and algae.

Biodegradable: A material that is capable of undergoing decomposition into simple

compounds such as carbon dioxide, methane, water, inorganic compounds and biomass in which the predominant mechanism is the enzymatic action of micro-organisms, such as bacteria, fungi and algae that can be measured by standardized tests, in a specified period of time, reflecting available conditions for composting (aerobic) or fermentation (anaerobic).

Biomass: Material or mass produced by a biological system.

Biosolids: Means municipal sewage sludge that is a primarily organic semisolid product resulting from the waste water treatment process, that can be beneficially recycled and meets all applicable requirements under Chapter 173-308 WAC. Biosolids includes a material derived from biosolids, and septic tank sludge, also known as septage, that can be beneficially recycled and meets all requirements under Chapter 173-308 WAC.

Buffer zone: That part of a facility that lies between the active area and the property boundary.

Bulking agent: Material, usually carbonaceous such as wood chips, or shredded yard trimmings, added to a compost system to maintain airflow by reducing settling and compaction.

Co-composting: The composting of any combination of two or more wastes or materials.

Compost: The product resulting from the controlled biological decomposition of organic wastes, that have been sanitized and stabilized to a degree which is potentially beneficial to plant growth when used as a soil amendment; compost is largely decomposed organic material and is in the process of humification (curing).

Composting: Means the controlled biological degradation of organic solid waste yielding a product for use as a soil conditioner (WAC 173-304-100); a managed process that controls biological decomposition and transformation of biodegradable material into a humus like substance called compost.

Condensate: The moisture sometimes found in aeration pipes that is formed when the temperature falls below the dew point.

Contaminant: Unwanted material; physical contaminants of compost can include sharps and metal fragments, glass, plastic and stones, chemical contaminants can include trace heavy metals and toxic organic compounds; biological compounds can include pathogens.

Convection: Heat transfer by fluid motion between regions of unequal density that result from non-uniform heating.

Curing: The last stage of the composting process that occurs after most of the readily metabolized material has been decomposed and stabilized.

Decomposition: The breakdown of organic matter by microbial action.

Degradation: An irreversible process leading to a significant change of the structure of the

material typically characterized by a loss of properties (e. g. integrity, mechanical strength, change of molecular weight or structure) and/or fragmentation.

Department of Ecology: A state agency with the authority to manage and develop our air and water resources in an orderly, efficient and effective manner and to carry out a coordinated program of pollution control involving these and related land resource. RCW 43.21A.020

Disperse: To move or scatter in various directions.

Environment: All external conditions that may act upon an organism or soil to influence its development, including sunlight, temperature, moisture and other organisms.

Excavate: To remove by scooping or digging out.

Exceptional quality biosolids (EQ biosolids): Means biosolids that meet the pollutant concentration limits in Table 3 of WAC 173-308-160, the Class A pathogen reduction requirements in one of WAC 173-308-170(2)(a) through (f), and the vector attraction reduction requirements in one of WAC 173-308-180(2) through (7).

Exempt: Freed from an obligation or duty required of others.

Fecal coliforms: Bacteria that fit the description of an aerobic or facultative anaerobic gram-negative, non-sporogenous rod bacteria, which ferment lactose, with the production of acid and gas within 24 hours at 44.5 +/-0.2C.

Feedstocks: Primarily biologically decomposable organic materials used for the production of compost.

Food waste: Residual food from residences, institutions or commercial facilities, unused portions of fruit, animal or vegetable material resulting from food production, putrescible material.

Free liquids: Any sludge that produces measurable liquids when the Paint Filter Liquids Test method 9095 of EPA publication #846 is used.

High rate decomposition: The first stage/step of the composting process characterized by an increasing rate in oxygen consumption and generation of carbon dioxide and heat when the biomass is kept moist and aerated. During high rate decomposition the temperature-time relationship is achieved to comply with the Process to Further Reduce Pathogens (PFRP) as described in the US EPA 40 Code of Federal Regulation Part 503 Appendix B, item B, page 9404.

Homogenous: Of uniform composition or structure throughout.

Humus: A complex amorphous aggregate, formed during the microbial decomposition of alteration of plant and animal residues and products synthesized by soil organisms; principal constituents are derivatives of lignins, proteins, and cellulose combined with inorganic soil

constituents; dark or black carbon-rich relatively stable reside resulting from the decomposition of organic matter.

Impermeable: Not permitting water or another fluid to pass through.

Incinerator: A furnace, boiler, kiln, etc. for burning wastes under controlled conditions.

Industrial solid wastes: Waste by-products from manufacturing operations such as scraps, trimmings, packing, and other discarded materials not otherwise designated as dangerous waste under Chapter 173-303 WAC. (WAC 173-304-100)

Inerts: Non-biodegradable material such as metal, glass, and plastic.

In-vessel: A diverse group of composting technologies in which composting materials are contained in a reactor or vessel.

Jurisdictional health department: County or district public health department

Leachate: Water or other liquid that has been contaminated by dissolved or suspended materials due to contact with solid waste or gases therefrom (WAC 173-304-100); liquid which has come into contact with, percolated through, or condensed out of composting feedstock or compost and extracted dissolved and suspended materials; liquid that drains from the mix of fresh organic matter.

Mixed municipal solid wastes (MMSW): Includes various discards from residential, commercial, and institutional sources, which are commonly disposed at incinerators or landfills. The largest components of mixed municipal solid waste are typically paper and paper products, leaves, brush and yard trimmings, wood, food scraps, glass, plastics, and metals.

Mulch: A benign soil surface cover used to: a) help retain moisture longer in the soil by retarding evaporation; b) discourage weed growth; c) help maintain a constant winter and summer temperature by insulating the soil; and/or d) discourage water absorption and retention. The list of organic material commonly used for one or more of these purposes includes, but not limited to chopped leaves and grass, shredded and chunk bark, coarse compost, organic peat, peat moss, shredded hardwood, shredded paper, straw, and wood chips. The list of non-organic material includes, but not limited to stone, rock, lava rock, and film plastic.

Municipal solid waste (MSW): Discarded materials from which compostable mixed organic material may be recovered by feedstock to make compost and other recyclable material recovered for sale, such as aluminum, ferrous, paper, etc. Municipal solid waste originates from residential, commercial, and institutional sources within a community.

Nitrogen: A nonmetallic element that constitutes nearly four fifths of the air by volume, occurring as a colorless, odorless, almost inert diatomic gas, N_2, in various minerals and in all proteins and used in a wide variety of important manufactures, including ammonia, nitric acid, TNT, and fertilizers.

NPDES: National Pollutant Discharge Elimination System.

Odor: The property or quality of a thing that stimulates or is perceived by the sense of smell.

On-farm composting: The biological conversion of agricultural manures and crop residues into a humus-like material primarily used as a soil amendment.

Operator: The designated individual(s) in substantial control of process operations at a compost facility.

Ordinance: A statute or regulation, especially one enacted by a local government.

Pathogens: Organisms or microorganisms including helminths, bacteria, molds, fungi, viruses, and protozoa capable of producing an infection or disease in a susceptible host. Measures to control pathogens include effective industrial hygiene and worker hygiene practices, effective design, and operation of biodegradation of pathogen nutrients and for adequate and uniform aeration and temperature/time to assure pathogen destruction and process and product monitoring for quality control.

Performance standards: The criteria for performance of solid waste handling facilities (WAC 173-304-100); the requirements in a regulation describing the end result desired by the regulator, but not including specific details on construction, design, or operation to reach the desired outcome.

Pile porosity: The area (pore space) around individual compost particles.

Pollutant: An organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the Administrator of the U.S. EPA, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms or offspring of the organisms.

Post-consumer (food waste): Cooked and/or processed food waste, including meats and greases, (e.g., plate scrapings from restaurants).

POTW: Publicly Owned Treatment Works.

Pre-consumer (food waste): Meat free uncooked and/or unprocessed vegetable and fruit trimmings, (e.g., trimmings from grocery store, food preparation from bakeries and restaurants).

Process to Further Reduce Pathogens (PFRP): The process management protocol prescribed by the U.S. EPA to reduce pathogens in sewage sludge and sludge compost by means of a defined time-temperature relationship during processing. The Process to Further Reduce Pathogens is found in "Standards for the Use and Disposal of Sewage Sludge" 40 Code of Federal Regulations (CFR) Part 503, dated February 19, 1993, Appendix B to Part 503-Pathogen Treatment Process, item B, page 9404.

Putrescible (waste): Solid waste which contains material capable of being decomposed by microorganisms (WAC 173-304-100); biologically decomposable material including residual food from residences, institutions, or commercial facilities; unused portions of fruit, animal, or vegetable material resulting from food production; normally associated with nuisance odor formation and vector attraction.

Remedial: Supplying a remedy. Intended to correct or improve deficient skills in a specific subject:

Run-off: Means any rainwater, leachate or other liquid which drains over land from any part of the facility, (WAC 173-304-100). Water originating from rainfall and other precipitation that is found in drainage facilities, rivers, streams, springs, seeps, ponds, lakes and wetlands as well as shallow ground water. (reference: Stormwater Management Manual for the Puget Sound Basin, The Technical Manual, DOE, Feb 1992, 91-75)

Screening: The sifting of compost through a screen to remove large particles and improve consistency and quality of the end product.

SEPA: State Environmental Policy Act.

Septage: Liquid or solid material removed from domestic septic tanks, cess pools, or similar treatment works that receive only domestic sewage, and that has had a sufficiently long residency time to be considered largely stabilized. (Class I domestic septage, WAC 173-308-080)

Note: in Chapter 173-308 WAC, Biosolids Management, septage is divided into three classes. Class I, Class II, Class III, depending on whether or not the septage originates from a domestic septage tank (Class I), holding tanks e.g. pit toilets, portable toilets (Class II), septage containing commercial or industrial septage which is domestic in nature (Class III). Please refer to the rule for a complete definition..

Sewage sludge (SS): Solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works. (WAC 173-308-080)

Sewage sludge means a semisolid substance consisting of settled sewage solids combined with varying amounts of water and dissolved materials, generated from a wastewater treatment system, that does not meet the requirements of Chapter 70.95J (Chapter 70.95J RCW)

Siting: To situate or locate on a site.

Soil amendments: Soil supplement which physically stabilizes the soil, improves resistance to erosion, increases permeability to air and water, improves texture and resistance of the surface to crusting, eases cultivation, or otherwise improves soil physical quality. Does not include commercial fertilizers, agricultural liming materials, unmanipulated animal manures, unmanipulated vegetable manures, and pesticides.

Solid waste: All putrescible and non-putrescible solid and semisolid wastes, including but not limited to garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, and recyclable materials. (Chapter 70.95 RCW)

Note: Sewage sludge and septage is now regulated under Chapter 173-308 WAC.

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

Solid waste management plan: A plan developed by local government to manage solid wastes which includes descriptions of existing facilities and collection systems, plans for developing new facilities, comprehensive waste reduction and recycling programs, cost analyses, long range projections for solid waste management needs, and programs for surveillance and control. Please see RCW 70.95.090 for a complete list of requirements in the plan.

Stormwater: Rainfall and snow melt runoff.

Subgrade: The layer of earthen materials upon which the pavement of a road, compost pad, or leachate collection pond is laid.

Suspended solids: Particles in leachate or wastewater that are large enough to settle out of solution or be filtered out.

Topography: 1. Detailed, precise description of a place or region. 2. Graphic representation of the surface features of a place or region on a map, indicating their relative positions and elevations.

Transfer station: A permanent, fixed, supplemental collection and transportation facility used by persons and route collection vehicles to deposit collected solid waste from off site into a larger transfer vehicle for transport to a solid waste handling facility.

Vector: A living animal, insect or other arthropod which transmits an infectious disease from one organism to another. (WAC 173-304-100)

Vermicomposting: The process by which live worms convert organic residues into worm castings dark, fertile, granular excrement of a worm. Castings are rich in plant nutrients.

VOC: Volatile organic compounds.

Windrow system: A system in which composting mixture is placed in elongated piles called windrows. Windrows are aerated naturally by a chimney effect, by mechanically turning the piles with a machine such as a fronted loader or specially designed equipment, and/or by forced aeration.

Wood waste: Solid waste consisting of wood pieces or particles generated as a by-product or waste from the manufacturing of wood products, handling and storage of raw materials and trees and stumps. This includes but is not limited to untreated manufacturing wood, used wooden pallets and grates, post-consumer wood wastes, sawdust, chips, shavings, bark, hog fuel, and log sort yard waste, but does not include wood pieces or particles containing chemical preservatives such as creosote, pentachlorophenol, or copper-chrome-arsenate. For the purposes of this handbook, no treated, coated, or painted wood of any kind should be considered wood waste.

Yard debris: Means vegetative matter resulting from landscaping maintenance or land clearing operations and includes materials such as tree and shrub trimmings, grass clippings, weeds, trees and tree stumps.

Zero discharge: Containment of all leachate from a facility, or the prevention of the production of leachate.

Appendix 1
Checklist for Planning New Facilities

This appendix is meant to summarize the general process you will go through to bring your idea of composting to reality.

To develop your project, we recommend the steps outlined below. Please note: the steps you follow may not necessarily occur in the order presented. Often they will happen simultaneously. Many steps list references to other chapters or sections of the handbook that contain more detail. The detail required at each step of project development largely depends on the location of your facility.

- ❑ **Formulate the idea.**

  Outline the elements of the project (use Chapter 4 - Planning and Siting).

  - What is the scale of the project? Is it municipal, private, or agricultural?
  - How will the project be funded?
  - What materials will be composted?
  - What technology do you envision using?
  - What will you do with the end product?

- ❑ **Identify possible locations.**
  - What is the general location in which you are hoping to locate the facility?
  - From what geographic areas will you likely receive feedstocks?
  - What are the county authorities/jurisdictions and state regions under which you will likely be operating?
  - What are the available leachate disposal options?

- ❑ **Make contacts.**

  Contact the local jurisdictional health department (see Appendix 4).

  - Find out what the permitting requirements are for the kind of composting you want to do in your local area.
  - Find out how the health department coordinates regulatory activities with the local planning agency, local air quality authority, and Department of Ecology.

Contact the Water Quality Program, Department of Ecology in your region (see Appendix 4).

- Contact the servicing POTW if leachate is to be discharged there.

Contact your local planning board/agency (see Appendix 4).

- Find out how land use requirements coincide with health department requirements.
- Find out if composting is allowed in your chosen site (or list of possible sites) according to local zoning codes.
- Find out what kind of land use permits (if any) are required.
- Find out if the local Solid Waste Management Plan includes provisions for composting.

Contact your local air pollution control authority (or Department of Ecology - see Chapter 2)

- Find out what the requirements are for registering your compost facility.
- Find out how the air authority coordinates regulatory activities with the health department.
- Find out how odor compliance is determined.

❑ **Develop project details.**

- Evaluate and choose site - CAREFULLY!
- Evaluate and choose technology.
- Evaluate facility design in terms of covered vs. non-covered facility.
- Develop site plan including water pollution control.
- Develop operations plan.
- Develop odor management plan.
- Develop public relations plan.

❑ **Move forward with permitting process.**

Appendix 2
References by Chapter

Chapter 1

Interim Guidelines for Compost Quality. Publication #94-38. Department of Ecology. 1994.

Chapter 2

"Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems", publication #93-36. Department of Ecology.

"Guidance Document for Applying for Ecology's General Permit to Discharge Stormwater Associated with Industrial Activity", September 1996. Department of Ecology.

"Implementation Guidance for the Ground Water Quality Standards," publication #96-02. Department of Ecology.

"Stormwater Management Manual for the Puget Sound Basin", publication #91-75. Department of Ecology.

Chapter 3

Rink, Robert ed. 1992. On-Farm Composting Handbook. Northeast Regional Agricultural Engineering Service.

Natural Resources Conservation Service. Field Office Technical Guide (Section 4)

Chapter 4

Epstein, Eliot. 1994. Composting and Bioaerosols. In: Composting Source Separated Organics. Staff of BioCycle, Journal of Composting and Recycling (ed.). Emmaus, Pennsylvania. The JG Press, Inc. pp. 242-249

Millner, P.D. et. al. 1994. Bioaerosols Associated with Composting Facilities. Compost Science and Utilization. 2(4):8-57.

Stinnett, Debra Siniard. 1996. "Eight Steps to Country Composting," World Wastes. March 1996. pg 37.

"Guidance Document for Applying for Ecology's General Permit to Discharge Stormwater Associated with Industrial Activity", September 1996. Department of Ecology.

"Stormwater Management Manual for the Puget Sound Basin", publication #91-75. Department of Ecology.

Chapter 5

"Municipal-Scale Composting: A Decision Makers Guide to Technology Selection." The United States Conference of Mayors. Draft September 25, 1996.

"Compost Facility Operating Guide." First Edition. The Composting Council. 1994.

"Supplement to the Compost Facility Operating Guide." The Composting Council. Draft November 26, 1996.

Washington State Standard Specifications for Road, Bridge, and Municipal Construction. Washington State Dept. of Transportation. M 41.-10.

Eshbach, Ovid W., Bryon D. Tapley, Thurman R. Poston. 1990. Eshbach's Hand book of Engineering Fundamentals. Fourth edition. Wiley.

Standard Specifications for Portland Cement, AASHTO M85. American Association of State Highway and Transportation Officials (AASHTO).

Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities. Publication # EPA/600/U/R-93/182. US EPA, Washington DC

Chapter 6

"Supplement to the Compost Facility Operating Guide." The Composting Council. Draft November 26, 1996.

Chapter 7

"Information on the Colbert Compost Facility." Spokane County Air Pollution Control Authority. May 1996.

"Odor Policy." Policy draft presented at the Composting Council Annual Meeting, November 1996.

Appendix 3
References by Topic

Compost Operator Training

Michigan Compost Operator Training: PO Box 10240, Lansing, MI 48901-0240
Training's held on an annual basis. Mirc@voyager.net
Sponsored by the Michigan Recycling Coalition at (517) 371-7073

Louisiana State University, Agricultural Center, PO Box 25100, Baton Rouge, LA 70894-5100. For more information contact Bill Carney at (504) 388-6998 or e-mail at bcarney@agctr.lsu.edu

University of Georgia, Department of Biological and Agricultural Engineering, Driftmier engineering Center, Athens GA 30602. For more information contact: KC Das or Cathy Felton at (706) 542-3086 or email at feltonc@bae.uga.edu

Compost Operator Training Program, Sheremeta Environmental Consultants LLC, 3319 Oregon Pl, Bellingham, WA 98226. For more information contact: Ollie Sheremeta at (360) 739-1780 or email: oleyman@aol.com

Philip Leege, Standards and Practices Committee, The U.S. Composting Council, for more information: (513) 871-0866 or Phil Legee 650 Athens Rd., Cincinnati, OH 45226-1114

Compost Process

“Municipal-Scale Composting: A Decision Makers Guide to Technology Selection.”The United States Conference of Mayors. Draft September 25, 1996.

“Compost Facility Operating Guide.” First Edition. The Composting Council. 1994.

“Supplement to the Compost Facility Operating Guide.” The Composting Council. Draft November 26, 1996..

Stinnett, Debra Siniard. 1996. “Eight Steps to Country Composting,” World Wastes. March 1996.

Rink, Robert ed. 1992. On-Farm Composting Handbook. Northeast Regional Agricultural Engineering Service. .

Interim Guidelines for Compost Quality. Publication #94-38. Department of Ecology. 1994.

Odor

Epstein, Eliot. 1994. Composting and Bioaerosols. In: Composting Source Separated Organics. Staff of BioCycle, Journal of Composting and Recycling (ed.). Emmaus, Pennsylvania. The JG Press, Inc. pp. 242-249.

Millner, P.D. et. al. 1994. Bioaerosols Associated with Composting Facilities. Compost Science and Utilization. 2(4):8-57.

"Odor Policy." Policy draft presented at the Composting Council Annual Meeting, November 1996.

Mushroom Production

British Columbia, Ministry of Agriculture, Fisheries and Food

Elders Limited: Horticultural and Development Corporation (HRDC)
Level 6, 7 Merriwa St, Gordon, NSW 2072
www.elders.com.au/Elders/merch/hortic/hrdc/

Vermicomposting

Down to Earthworms, 2249 Valleyview Dr., Kamloops, BC. Canada V2C4C8

The Authority, Wellington Worm Composters, 33 Hall St. Wellington, 6002, New Zealand

Water Quality

"Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems", publication #93-36. Department of Ecology.

"Guidance Document for Applying for Ecology's General Permit to Discharge Stormwater Associated with Industrial Activity", September 1996. Department of Ecology.

"Implementation Guidance for the Ground Water Quality Standards," publication #96-02. Department of Ecology.

"Stormwater Management Manual for the Puget Sound Basin", publication #91-75. Department of Ecology.

"Guidance Document for Applying for Ecology's General Permit to Discharge Stormwater Associated with Industrial Activity", September 1996. Department of Ecology.

"Stormwater Management Manual for the Puget Sound Basin", publication #91-75. Department of Ecology.

Appendix 4
Contacts and Sources for More Information

Compost Operator Training - Sponsoring Organizations

Michigan Compost Operator Training: PO Box 10240, Lansing, MI 48901-0240
Training's held on an annual basis. Mirc@voyager.net
Sponsored by the Michigan Recycling Coalition at (517) 371-7073

Louisiana State University, Agricultural Center, PO Box 25100, Baton Rouge, LA 70894-5100. For more information contact Bill Carney at (504) 388-6998 or e-mail at bcarney@agctr.lsu.edu

University of Georgia, Department of Biological and Agricultural Engineering, Driftmier engineering Center, Athens GA 30602. For more information contact: KC Das or Cathy Felton at (706) 542-3086 or email at feltonc@bae.uga.edu

Compost Operator Training Program, Sherameta Environmental Consultants LLC, 3319 Oregon Pl, Bellingham, WA 98226. For more information contact: Ollie Sherameta at (360) 739-1780 or email: oleyman@aol.com

Philip Leege, Standards and Practices Committee, The U.S. Composting Council, for more information: (513) 871-0866 or Phil Legee 650 Athens Rd., Cincinnatti, OH 45226-1114

Washington Organic Recycling Council, PO Box 7514, Olympia, WA 98507-7514. Sponsor for periodic training course. Message phone: (360) 754-5162

Conservation Districts

CONSERVATION DISTRICTS	ADDRESS	E-MAIL/PHONE/FAX
Adams	402 East Main Ritzville 99169-1338	e-mail: ADAMCD@ritzville.org (509) 659-1553 Fax: (509) 659-1553
Asotin County	725 6th Street, Suite 102 Clarkston 99403-2001	e-mail: accd@valint.net (509) 758-8012 Fax: (509) 758-7533
Benton	24106 North Bunn Road Prosser 99350	(509) 786-9230 Fax: (509) 786-9370
Central Klickitat	1107 South Columbus Avenue Goldendale 98620-9296	(509) 773-5823 or (509) 773-6273 Fax: (509) 773-6046
Chelan County	301 Yakima Street, Room 307 Wenatchee 98801-2996	(509) 664-0265 Fax: (509) 664-0255
Clallam	111 East 3rd, Room 2A Port Angeles 98362-3018	(360) 452-1912 Fax: (360) 452-5088
Clark County	11104 Northeast 149th Street, Building C, Suite 400, Brush Prairie 98606-9518	(360) 696-7631 Fax: (360) 696-7515
Columbia	US Post Office Building 202 S. Second Street Dayton 99328-1327	e-mail: ccd@bmi.net (509) 382-4773 Fax: (509) 382-4273
Cowlitz	2125 - 8th Avenue Longview 98632	(360) 425-1880 Fax: (360) 578-0811
Eastern Klickitat	1107 South Columbus Avenue Goldendale 98620-9296	(509) 773-5823 Fax: (509) 773-6046
Ferry	84 East Delaware Street P.O. Box 1045 Republic 99166-1045	e-mail: fcd@juno.com (509) 775-3473 Fax: (509) 775-3170
Foster Creek	103 North Baker Street P.O. Box 428 Waterville 98858-0428	e-mail: mmazzola@juno.com (509) 745-8362 Fax: (509) 745-8758
Franklin	1620 Road 44 North Pasco 99301-2667	(509) 545-8546 Fax: (509) 547-2007
Grays Harbor	330 Pioneer Avenue West Montesano 98563-4499	(360) 249-5980 Fax: (360) 249-6961
Jefferson County	205 West Patison Street Port Hadlock 98339-9751	(360) 385-4105 Fax: (360) 379-5617
King	935 Powell Avenue Southwest Renton 98055-2908	(425) 226-4867 Fax: (206) 764-6677
Kitsap	817 Sidney Avenue Port Orchard 98366-2460	(360) 876-7171 Fax: (360) 876-7172
Kittitas County	607 East Mountain View Avenue Ellensburg 98926-3863	(509) 925-8590 Fax: (509) 925-8591
Lewis County	1554 Bishop Road Chehalis 98532	(360) 748-0083 Fax: (360) 740-9745
Lincoln County	1310 Morgan Street P.O. Box 46 Davenport 99122-0046	(509) 725-4181 or (509) 725-1345 Fax: (509) 725-4515
Mason	Southeast 1051 Highway 3, Suite G Shelton 98584	(360) 427-9436 Fax: (360) 427-4396

CONSERVATION DISTRICTS	ADDRESS	E-MAIL/PHONE/FAX
Moses Lake	1775 Southeast Highway 17 Moses Lake 98837-9326	(509) 765-5333 Fax: (509) 765-7665
North Yakima	1606 Perry Street, Suite F Yakima 988902-5769	(509) 454-5736 Fax: (509) 454-5739
Okanogan	1251 South 2nd Avenue, Room 101 Okanogan 98840	(509) 725-4181 or (509) 422-2750 Fax: (509) 422-0532
Othello	449 East Cedar Boulevard Othello 99344-0323	e-mail: bmittle@televar.com (509) 488-2802 Fax: (509) 488-6080
Pacific	1216 Robert Bush Drive P.O. Box 968 South Bend 98586-0968	(360) 875-9424 Fax: (360) 875-9304
Palouse	325 Northwest State Street Pullman 99163	e-mail: pcd@pullman.com (509) 332-4101 Fax: (509) 332-4101
Palouse-Rock Lake	North 3 Front Street P.O. Box 438 St. John 99171-0438	e-mail: prlcd@ieway.com (509) 648-3680 Fax: (509) 648-3772
Pend Oreille	100 North Washington Avenue P.O. Box 280 Newport 99156-0280	e-mail: pocd@povn.com (509) 447-5370 Fax: (509) 447-0371
Pierce County	Puyallup Executive Park 1011 East Main, Suite 106 Puyallup 98372	(253) 845-9770 Fax: (253) 845-4569
Pine Creek	805 South Vista Point Drive, Suite 2 Colfax 99111-9565	(509) 397-4636 (509) 285-6868 Fax: (509) 397-4953
Pomeroy	USDA Building 804 Main Street P.O. Box 468 Pomeroy 99347-0468	e-mail: habitatman@aol.com (509) 843-1998 Fax: (509) 843-3747
San Juan County	350 Court Street, #10 Friday Harbor 98250-7910	(360) 378-6621 Fax: (360) 378-6691
Skagit	2021 East College Way, Suite 218 Mt. Vernon 98273-2373	e-mail: skagitcd@supernal.net (360) 428-4313 Fax: (360) 424-6172
Snohomish	528 - 91st Avenue, Suite C Everett 98205-1535	e-mail: scdstaff@snohomishcd.org (425) 335-5634 Fax: (425) 335-5024
South Douglas	103 North Baker Street P.O. Box 246 Waterville 98858-0246	(509) 745-8362 or (509) 745-8210
South Yakima	1116 Yakima Valley Highway Sunnyside 98944-1555 Location: 200 Cheyne Zillah 98953	Sunnyside: (509) 837-7911 Fax: (509) 837-8290 Zillah: 829-3003 Fax: (509) 829-3349
Spokane County	North 222 Havana Spokane 99202-4724	(509) 353-2120 Fax: (509) 353-2102

CONSERVATION DISTRICTS	ADDRESS	E-MAIL/PHONE/FAX
Stevens County	232 Williams Lake Road Colville 99114-2629	e-mail: sccd@plix.com (509) 685-0937 FAX: (509) 684-1982
Thurston	6128 Capitol Boulevard Olympia 98501-5217	(360) 754-3588 Fax: (360) 753-8085
Underwood	Park Center Building 170 Northwest Lincoln Street P.O. Box 96 White Salmon 9867-0096	(509) 493-1936
Upper Grant	2145 Basin Street Southwest, Suite B Ephrata 98823-9617	(509) 754-0195 Fax: (509) 754-4705
Wahkiakum	957 Steamboat Slough Road Skamokawa 98647 P.O. Box 67 Cathlamet 98612-0067	(360) 795-8240 Fax: (360) 795-8242
Walla Walla County	1501 Business One Circle, Suite 101 Walla Walla 99362-9526	e-mail: consvdist@wwics.com (509) 522-6340 Fax: (509) 525-2811
Warden	P.O. Box 177 Warden 98857-0177	(509) 349-2207
Whatcom	6975 Hannegan Road Lynden 98264-9620	e-mail: WHATCOM.CD@worldnet.att.net (360) 354-2035 Fax: (360) 354-4678
Whidbey Island	P.O. Box 490 Coupeville 98239-0490	(360) 678-4708 Fax: (360) 678-2271
Whitman	805 South Vista Point Drive, Suite 2 Colfax 99111-9565	e-mail: wcd@colfax.com (509) 397-4636 Fax: (509) 397-4953

County Planning Agencies

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Adams	Dave Anderson Building and Planning Department 165 North 1st Avenue Othello, WA 99344	(509) 488-9441
Asotin	Karst Riggers Building and Planning Department PO Box 610 Asotin, WA 99402	(509) 243-2020 Fax (509) 243-2019
Benton	Terry Marden Planning Department PO Box 910 Prosser, WA 99350-0110	(509) 786-5612 Fax (360) 786-5629
Chelan	Planning Department 411 Washington St. Wenatchee, WA 98801	(509) 664-5225 Fax (509) 664-5475
Clallam	Tim Woolett Department of Community Development Planning Division PO Box 863 Port Angeles, WA 98362-0149	(360) 417-2239 Fax (360) 417-2443
Clark	Land Use Information 1408 Franklin St Vancouver, WA 98666-9810	(360) 699-2375 ext. 4489 Fax (360) 699-2011
Columbia	Kim Lyonnias Department of Building/Planning 341 East Main Street Dayton, WA 99328	(509) 382-4676 Fax (509) 382-3125
Cowlitz	Larry Fraizer Department of Building/Planning 207 4th Avenue North Kelso, WA 98626	(360) 577-3052 Fax (360) 414-5550
Douglas	Ed Loidhamer Transportation and Land Services 470 9th St. NE E. Wenatchee, WA 98802	(509) 884-7173 Fax (509) 884-9447
Ferry	Lynnette Fritts Department of Planning PO Box 305 Republic, WA 99166	(509) 775-5209 Fax (509) 775-5240
Franklin	Richard German Planning Department 1016 North 4th Pasco, WA 99301	(509) 545-3521 Fax (509) 546-3369
Garfield	County Engineer PO Box 160 Pomeroy, WA 99347	(509) 843-1301 FAX (509) 843-1410
Grant	Larry Angell, Planning Department PO Box 37 Courthouse Ephrata, WA 98823	(509) 754-2011, ext. 321 Fax (509) 754-6080
Grays Harbor	Bob Witzl Building and Planning Department 100 West Broadway, Suite 31 Montesano, WA 98563	(360) 249-4222, ext. 436 Fax (360) 249-3203

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Island	Siri Klovstadt Health Department PO Box 500 Coupville, WA 98239	(360) 679-7339 Fax (360) 679-7306
Jefferson	Land Use Permit Center 621 Sheridan Street Port Townsend, WA 98368	(360) 379-4450 Fax (360) 379-4451
King	Marilyn E. Cox Land Use Services 900 Oaksdale Ave. SW Renton, WA 98055	marilyn.cox@metrokc.gov (206) 296-7154 Fax: (206) 296-7051
Kitsap	Jim Svensson Land Use Planning 614 Division, Mailstop #36 Port Orchard, WA 98366	(360) 876-7155 Fax (360) 895-4925
Kittitas	David Taylor Planning Department County Courthouse, Rm. 182 Ellensburg, WA 98926	(509) 962-7697 Fax (509) 962-7697
Klickitat	Curt Dreyer Planning Department 228 West Main Street, MSCH17 Goldendale, WA 98620	(509) 773-5703 Fax (509) 773-6206
Lewis	Geoff Thomas Planning Department 350 North Market Boulevard Chehalis, WA 98532-2626	E-mail: Gothomas@wise.co.lewis.wa.us (360) 740-2773 Fax (360) 740-1245
Lincoln	Mike Sallis Public Works Department Route 1, Box 368 Davenport, WA 99122	(509) 725-7041 Fax (509) 725-4467
Mason	Grace Miller Department of Community Development PO Box 578 Shelton, WA 98584	(360) 427-9670, ext. 360 Fax (360) 427-8425
Okanogan	Rusty Bonser Department of Planning & Development PO Box 1009 Okanogan, WA 98840	(509) 422-7120 Fax (509) 422-7106
Pacific	Mike DeSimone Department of Community Development PO Box 26 South Bend, WA 98586-0026	(360) 642-9382 Fax (360) 875-9304
Pend Oreille	Gary Fergen, Planning Department PO Box 5066 Newport WA 99156	509 447-4821 Fax 509 447-5890
Pierce	Sally Sharrard, Senior Planner Pierce County Solid Waste Division 9116 Gravelly Lake Dr SW Tacoma, WA 98499-3190	(253) 798-4050 Fax (253) 798-4637
San Juan	Grant Beck Building and Land Use Permitting Permit Center P.O. Box 947, Friday Harbor, WA 98250	(360) 378-2354 Fax (360) 378-3922

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Skagit	Gary Christensen Planning and Permit Center County Administration Bldg., Room 204 700 south 2nd Street Mt. Vernon, WA 98273	(360) 336-9410, ext. 5624 Fax (360) 336-9416
Skamania	Mark Mazeski Planning Department PO Box 790 Stevenson, WA 98648	(509) 427-9458 fax (509) 427-4839
Snohomish	Hi Bronson Planning and Development Services Mailstop 604 3000 Rockerfeller Ave. Everett, WA 98201-4046	(425) 388-3311 ext. 2339 (425) 388-3072
Spokane	Division of Building and Planning West 1026 Broadway Spokane, WA 99260-0050	(509) 456-3675 Fax (509) 456-2243
Stevens	Terry Davis Public Works 185 East Hawthorne Avenue Colville, WA 99114	(509) 684-4548 Fax (509) 684-7557
Thurston	Mike Kain Planning Department 2000 Lakeridge Drive SW Olympia, WA 98502	(360) 786-5471 Fax (360) 754-2939
Wahkiakum	Chuck Beyer Building Section 64 Main Street PO Box 97 Cathlamet, WA 98612	(360) 795-3067 Fax (360) 795-0342
Walla Walla	Laurie Klicker Regional Planning Department 310 West Poplar Walla Walla, WA 99362	(509) 527-3285 Fax (509) 527-1892
Whatcom	Planning Development Department 5280 Northwest Rd Bellingham, WA 98226	Fax (360) 738-2525 (360) 676-6907
Whitman	Mark Bordsen Public Works PO Box 430 Colfax, WA 99111	(509) 397-6212 Fax (509) 397-6210
Yakima	Dean Patterson Land Use Planning Division County Planning, Room 417 County Courthouse Yakima, WA 98901	(509) 574-2230 Fax (509) 574-2231

Jurisdictional Health Departments

Health Departments Contact List

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Adams	Michelle Fuson Adams County Environmental Health District 103 W Main Ritzville WA 99169	(509) 659-0090 Fax: (509) 659-4109
Asotin	Ronald Neu, Director Asotin County 431 Elm Clarkston WA 99403-2694	(509) 758-3344 Fax: (509) 758-8454
Benton	Mike Peloquin, SW Coordinator Benton-Franklin Health District 800 W Canal Drive Kennewick WA 99336-3564	(509) 546-2916 Fax: (509) 546-2987
Chelan	Dave Prosch Chelan-Douglas Health District 411 Washington St Wenatchee WA 98801	(509) 664-2624 Fax: (509) 748-5310
Clallam	Tania Busch-Weak Clallam County Community Development 223 E 4th St Port Angeles WA 98362-3024	(360) 452-7831 Fax: (360) 452-0470
Clark	Gary Bickett, Envirn. Health Spec. Southwest Washington Health District PO Box 1870 Vancouver WA 98668-1870	(360) 695-9215 Fax: (360) 696-8424
Columbia	Al Schoenhuth Columbia County Health District 221 E Washington, Suite 101 PH Dayton WA 99328-1317	(509) 382-3048 Fax: (509) 382-2942
Cowlitz	Randall Olsen Cowlitz-Wahkiakum Health District PO Box 458 Longview WA 98632-0046	(360) 414-5599 Fax: (360) 425-7531
Ferry	James Matsuyama, Director Northeast Tri-County Health District PO Box 270 Colville WA 99114-0270	(509) 684-2262 Fax: (509) 684-8310
Garfield	Ronald Neu, Director Garfield County Health District PO Box 130 Pomeroy WA 99347-0130	(509) 843-3412 Fax: (509) 843-1224
Grant	Kevin Barry, Director Grant County Health District County Courthouse, PO Box37 Ephrata WA 98823	(509) 754-2011 Fax: (509) 754-0941
Grays Harbor	Doug George, Dir. Environ. Health Grays Harbor Human Services PO Box 391 Montesano WA 98563	(360) 249-4413 Fax: (360) 249-5669

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Island	Joye Bonvouloir, Env. Health Director Island County Health Department PO Box 5000 Coupville WA 98239-5000	(360) 679-7350 Fax: (360) 679-3449
Jefferson	Larry Fay, Environ. Health Dir Jefferson County Health Department 615 Sheridan Port Townsend WA 98368-2476	(360) 385-9444 Fax: (360) 385-9401
King	Greg Bishop Seattle-King County Health District 201 Smith Tower Seattle WA 98104-2320	(206) 296-4785 Fax: (206) 296-0189
Kitsap	Scott Daniels Bremerton-Kitsap Health District PO Box 1076 Poulsbo, WA 98370-0500	360/692-3611
Kittitas	John Wolpers Kittitas County Health Department 507 N Nanum St Ellensburg WA 98926-2898	(509) 962-7698 Fax: (509) 952-7581
Klickitat	Gary Bickett Southwest Washington Health District PO Box 1870 Vancouver WA 98668	
Lewis	Gary Goode Director, Environmental Services Lewis County Public Services PO Box 706 Chehalis WA 98532-2626	(360) 740-1277 Fax: (360) 748-1245
Lincoln	Ed Dzedzy, Director Lincoln County Health Department PO Box 105 Davenport WA 99122	(509) 725-2501 Fax: (509) 725-4104
Mason	Andrea Unger Mason County Health Department 303 North 4th, PO Box 1666 Shelton WA 98584-3147	(360) 427-9670 Fax: (360) 427-7798
Okanogan	Jacqueline Bellinger Okanogan County Health District PO Box 231 Okanogan WA 98840-0231	(509) 422-7140 Fax: (509) 422-3523
Pacific	Scott Berbells Pacific County Health Dept PO Box 68 South Bend WA 98586-0026	(360) 875-9356 Fax: (360) 875-9377
Pierce	Robert McElroy Tacoma-Pierce County Health De pt 3629 South D St Tacoma WA 98408-6897	(253) 798-6555 Fax: (253) 798-6498
San Juan	John Manning, Director San Juan Health Department PO Box 607 Friday Harbor WA 98250-0607	(360) 378-4474 Fax: (360) 378-3922

COUNTY	ADDRESS	E-MAIL/PHONE/FAX
Skagit	Ken Willis, Env. Health Sup. Skagit County Health District County Admin Bldg #301 Mt Vernon WA 98273	(360) 336-9380 Fax: (360) 336-9401
Snohomish	Jeff Defenbach, Env. Health Sup. Snohomish Health District 3020 Rucker Ave Everett WA 98201-1870	(206) 339-5250 Fax: (206) 339-5216
Spokane	David Swink Spokane County Health District W 1101 College Ave Spokane WA 99201-2095	(509) 324-1590 Fax: (598) 324-1567
Thurston	John Libby, Environ. Health Spec Thurston County Public Health & Social Services 2000 Lakeridge Dr SW Olympia WA 98502-6045	(360) 786-5456 Fax: (360) 754-2954
Wahkiakum	Ann Ozmart Wahkiakum County Health Department 64 Main St Cathlamet WA 98612	(360) 795-6207
Walla Walla	David Eaton, Director Walla Walla County-City Health Dept PO Box 1753 Walla Walla WA 99362-1753	(509) 527-3290 Fax: (509) 527-3214
Whatcom	Regina Delahunt, Director Whatcom County Health Department PO Box 935 Bellingham WA 98227-0935	(360) 676-6724 Fax: (360) 676-7646
Whitman	John Skyles, Director Whitman County Health Department N 310 Main St Colfax WA 99111-1850	(509) 397-6280 Fax: (509) 396-3546
Yakima	Art McEwen Yakima County Health District 104 N 1st St Yakima WA 98901-2667	(509) 575-4268 Fax: (509) 575-7969

World Wide Web Sites

The following list represents a sampling of World Wide Web sites containing information about composting and compost.

Department of Ecology	http://www.wa.gov/ecology/swfa/swhome.html
Cornell Composting	http://www.cals.cornell.edu/dept/compost/
Environmental Guidelines for Mushroom Producers	http://waffle.nal.usda.gov/agdb/envgmush.html
An information resource for composters	http://www.dbcc.co.uk/
Cyber -Worm Links	http://www.wormdigest.org/lin/lin.html
British Columbia Ministry of Environment, Land and Parks	http://www.env.gov.bc.ca/
Production and Use of Compost Regulation	http://www.env.gov.bc.ca/epd/cpr/regs/pauocreg.html
The Compost Connection for Washington Agriculture	http://csanr.wsu.edu/compost/newsletter/compcon3.html
The Compost Resource Page	http://www.oldgrowth.org/compost/
The Composting Council	http://members.tripod.com/~compost/index.html
The Composting Council of Canada	http://www.compost.org/
Composting UK: An Information Resource for Composters	http://www.dbcc.co.uk/
Woods End Research Laboratory	http://www.maine.com/woodsend/

Here are World Wide Web sties for Air Pollution Control agencies in Washington State.

Olympic Air Pollution Control Authority	http://www.wln.com/~oapca
Northwest Air Pollution Control Authority	http://www.pacificrim.net/~nwapa
Southwest Air Pollution Control Authority	http://www.swapca.org
Yakima Regional Clean Air Authority	E-mail: info@yrcca.org
Spokane County Air Pollution Control Authority	http://www.scapca.org
Puget Sound Air Pollution Control Authority	http://www.psapca.org
Benton County Clean Air Authority	http://www.cbvcp.com/bccaa
Department of Ecology Air Quality Program	http://www.wa.gov/ecology/air/airhome.html

Department of Ecology Contacts

Permit Assistance Center	(360) 407-7037
Stormwater Unit	(360) 407-6458
Solid Waste & Financial Assistance Program	
Headquarters	(360) 407-6095
Northwest Regional Office	(425) 649-7029
Southwest Regional Office	(360) 407-6380
Eastern Regional Office	(509) 456-2947
Central Regional Office	(509) 454-7653
Water Quality Program	
Headquarters	(360) 407-6502
Northwest Regional Office	(425) 649-7105
Southwest Regional Office	(360) 407-6270
Eastern Regional Office	(509) 456-6379
Central Regional Office	(509) 457-7105

Appendix 5
Selected Sections of the Minimum Functional Standards for Solid Waste Handling, Chapter 173-304 WAC

This appendix contains unedited language from Chapter 173-304 WAC, the Minimum Functional Standards for Solid Waste Handling. The sections included have requirements pertaining to compost facilities. The entire regulation is available on the World Wide Web at http://www.wa.gov/ecology/swfa/swhome.html

WAC 173-304-300 WASTE RECYCLING FACILITY STANDARDS.

(1) Applicability.

(a) These standards apply to facilities engaged in recycling or utilization of solid waste on the land, including but not limited to:

(i) Noncontainerized composting in piles;

(ii) Utilization of sewage sludge, septage and other organic wastes on land for beneficial use;

(iii) Accumulation of wastes in piles for recycling or utilization.

(b) These standards do not apply to:

(i) Single family residences and single family farms engaged in composting of their own wastes;

(ii) Facilities engaged in the recycling of solid waste containing garbage, such as garbage composting, which are subject to WAC 173-304-400, Solid waste handling facility standards;

(iii) Facilities engaged in the storage of tires which are subject to WAC 173-304-400, Solid waste handling facility standards;

(iv) Problem wastes as defined in WAC 173-304-100;

(v) Facilities engaged in recycling of solid waste stored in surface impoundments which are subject to WAC 173-304-400, Solid waste handling facility standards; and

(vi) Woodwaste or hog fuel piles to be used as fuel or raw materials stored temporarily in piles being actively used so long as the criteria of WAC 173-304-300 (3)(c)(i) are met.

(c) These standards do not apply to any facility that recycles or utilizes solid wastes in containers, tanks, vessels, or in any enclosed building, including buy-back recycling centers.

(2) Effective dates. All existing facilities recycling solid waste not in conformance with this section shall be placed upon a compliance schedule under WAC 173-304-600(1) to assure compliance within two years of the effective date of this regulation.

(3) Waste recycling requirements.

(a) All applicable solid waste recycling facilities shall apply for and obtain a solid waste permit under WAC 173-304- 600, permits.

(b) Applicable waste recycling facilities shall submit annual reports to the jurisdictional health department and the department by March 1 of the following year for which the data is collected on forms supplied by the department. The annual reports shall include quantities and types of waste recycled for purposes of determining progress towards achieving the goals of waste reduction, waste recycling, and treatment in accordance with RCW 70.95.010(4). Such facilities may request and be assured of confidentiality for their reports in accordance with chapter 42.17 RCW and RCW 43.21A.160.

(c) All facilities storing solid waste in outdoor piles or surface impoundments for the purpose of waste recycling shall be considered to be storing or disposing of solid waste if:

(i) At least fifty percent of the material has not been shown to have been recycled in the past three years and any material has been on-site more than five years; or

(ii) Ground water or surface water, air, and/or land contamination has occurred or will likely occur under current conditions of storage or in case of fire, or flood.

Upon such a determination by the jurisdictional health department that (c)(i) or (ii) of this subsection are met, the jurisdictional health department may require a permit application and issuance of a permit under WAC 173-304-600 of these rules.

(d) Waste recycling facilities shall allow jurisdictional health department and department representatives entry for inspection purposes and to determine compliance with these rules at reasonable times.

(e) All applicable waste recycling facilities shall not conflict with the county comprehensive solid waste management plan required by WAC 173-304-011 of these rules.

(f) All waste recycling facilities shall comply with applicable local, state and federal laws and regulations, including but not limited to environmental regulations and laws.

(4) Sewage sludge utilization requirements.

In addition to the requirements of subsection (3) of this section, all facilities utilizing sewage sludge, including septage shall comply with the department's Municipal and Domestic Sludge Utilization Guidelines WDOE 82-11, dated September 1982 or as hereafter amended. Facilities utilizing sewage sludge on the land in a manner not consistent with nor meeting the requirement of the guidelines are required to meet the landspreading disposal standards of WAC 173-304-450.

(5) Woodwaste and other organic sludge utilization requirements.

(a) Facilities utilizing woodwaste not otherwise excluded under WAC 173-304-015, shall comply with these recycling standards. Applying woodwaste and other primarily organic sludges such as pulp and paper mill treatment sludges to the land shall be in a manner consistent with the Municipal and Domestic Sludge Utilization Guidelines WDOE 82-11 dated September 1982 or as hereafter amended. Only agricultural or silvicultural sites where such sludges are demonstrated to have soil conditioning or fertilizer value shall be acceptable, provided that the woodwaste and other primarily organic sludges are applied as a soil conditioner or fertilizer in accordance with accepted agricultural and silvicultural practice. Facilities utilizing woodwaste or other primarily organic sludges on the land in a manner not consistent with nor meeting the requirement of the guidelines are required to meet the landspreading disposal standards of WAC 173-304-450.

(b) Facilities utilizing woodwaste or other primarily organic sludges shall also comply with the standards of subsection (3) of this section.

[Statutory Authority: Chapter 43.21A RCW. 85-22-013 (Order 85-18), §173-304-300, filed 10/28/85.]

WAC 173-304-400 SOLID WASTE HANDLING FACILITY STANDARDS.

(1) Applicability. The standards of WAC 173-304-405 through 173-304-490 are the solid waste handling facility standards and apply to all solid waste handling facilities, except for:

(a) Waste recycling facilities, whose standards are spelled out in WAC 173-304-300;

(b) On- site containerized storage, collection and transportation facilities which are spelled out in WAC 173-304-200;

(c) Single family residences and single family farms whose year round occupants engage in solid waste handling of the single family's solid waste on-site;

(d) Problem wastes as defined in WAC 173-304-100;

(e) Solid waste handling facilities that have engaged in closure and closed before the effective date of this regulation; and

(f) Domestic wastewater facilities and industrial wastewater facilities otherwise regulated by federal, state, or local water pollution permits except for any portion that utilizes or engages in landspreading disposal sludges or solid residues directly on the land.

(2) Standards for permits. The standards of WAC 173-304-405 through 173-304- 490 shall be used as the basis for permitting as required in WAC 173-304-600.

(3) Effective dates.

(a) All existing facilities not in conformance with the following sections of the facility standards shall be placed upon compliance schedules under WAC 173-304-600

(1)(c) to assure full compliance within eighteen months of the effective date of this regulation for:

(i) The general facility standards, WAC 173-304-405;

(ii) The transfer stations, baling and compaction standards, WAC 173-304-410;

(iii) Ground water monitoring required in WAC 173-304- 490;

(iv) The landfill operating and maintenance standards, WAC 173-304-460(4);

(v) The tire pile standards of WAC 173-304-420(4); and

(vi) The landspreading disposal standards of WAC 173-304-450(5).

(b) All applicable solid waste facilities shall be in compliance with the general closure and post-closure standards of WAC 173-304-407 and the financial assurance standards of WAC 173-304-467 and 173-304-468 by twelve months after the effective date of WAC 173-304-407, 173-304-467, and 173-304-468, except for owners or operators of existing facilities that have a closure plan approved by the jurisdictional health department in a solid waste permit issued before the effective date of these amendments and are closing before November 27, 1989. Existing solid waste facilities shall be placed upon compliance schedules under WAC 173-304-600 (1)(c) to assure compliance by the effective date of this subsection.

(c) All existing solid waste facilities not in conformance with facility standards other than those in (a) and (b) of this subsection shall be placed upon compliance schedules under WAC 173-304-600 (1)(c) to assure full compliance within four years of the effective date of this regulation.

(d) All new and expanded facilities other than those in (b) of this subsection shall meet the facility standards of WAC 173-304-405 to 173-304- 490 after the effective date of this regulation.

[Statutory Authority: RCW 70.95.215. 88-20-066 (Order 88- 28), §173-304-400, filed 10/4/88. Statutory Authority: Chapter 43.21A RCW. 85-22-013 (Order 85-18), §173-304-400, filed 10/28/85.]

WAC 173-304-405 GENERAL FACILITY REQUIREMENTS.

(1) Applicability. All applicable solid waste handling facilities shall meet the requirements of this section.

(2) Plan of operation. Each owner or operator shall develop, keep and abide by a plan of operation approved as part of the permitting process in WAC 173-304-600. The plan shall describe the facilities' operation and shall convey to site operating personnel the concept of operation intended by the designer. The plan of operation shall be available for inspection at the request of the jurisdictional health officer. The facility must be operated in accordance with the plan or the plan must be so modified with the approval of the jurisdictional health department. Owners or operators of drop boxes may develop a generic plan of operation applicable to all such drop boxes, owned or operated.

Each plan of operation shall include:

(a) How solid wastes are to be handled on-site during its active life;

(b) How inspections and monitoring are conducted and their frequency;

(c) Actions to take if there is a fire or explosion;

(d) Actions to take if leaks are detected;

(e) Corrective action programs to take if ground water is contaminated;

(f) Actions to take for other releases (e.g. failure of run-off containment system);

(g) How equipment such as leachate collection and gas collection equipment are to be maintained;

(h) A safety plan or procedure; and

(i) Other such details as required by the jurisdictional health department.

(3) Recordkeeping. Each owner or operator shall maintain daily operating records on the weights (or volumes), number of vehicles entering and, if available, the types of wastes received. Major deviations from the plan of operation shall also be noted on the operating record.

(4) Reporting. Each owner or operator shall prepare and submit a copy of an annual report to the jurisdictional health department and the department by March 1 of each year. The annual report shall cover facility activities

during the previous year and must include the following information:

(a) Name and address of the facility;

(b) Calendar year covered by the report;

(c) Annual quantity, in tons, or volume, in cubic yards, and estimated in-place density in pounds per cubic yard of solid waste handled, by type of solid waste if available, for each type of treatment, storage, or disposal facility, including applicable recycling facilities; and

(d) Results of ground water monitoring required in WAC 173-304-490.

(5) Inspections. The owner or operator shall inspect the facility to prevent malfunctions and deterioration, operator errors and discharges which may cause or lead to the release of wastes to the environment or a threat to human health. The owner or operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment. The owner or operator shall keep an inspection log or summary including at least the date and time of inspection, the printed name and the handwritten signature of the inspector, a notation of observations made and the date and nature of any repairs or corrective action. The log or summary must be kept at the facility or other convenient location if permanent office facilities are not on-site, for at least three years from the date of inspection. Inspection records shall be available to the jurisdictional health department upon request.

(6) Recording with county auditor. Maps and a statement of fact concerning the location of the disposal site shall be recorded as part of the deed with the county auditor not later than three months after closure. Records and plans specifying solid waste amounts, location and periods of operation shall be submitted to the local zoning authority or the authority with jurisdiction over land use and be made available for inspection.

(7) State and local requirements. All solid waste disposal facilities shall comply with all state and local requirements such as zoning land use, fire protection, water pollution prevention, air pollution prevention, nuisance and aesthetics.

[Statutory Authority: RCW 70.95.215. 88-20-066 (Order 88-28), §173-304-405, filed 10/4/88. Statutory Authority: Chapter 43.21A RCW. 85-22-013 (Order 85-18), §173-304-405, filed 10/28/85.]

WAC 173-304-420 PILES USED FOR STORAGE AND TREATMENT--FACILITY STANDARDS.

(1) Applicability.

(a) This section is applicable to solid wastes stored or treated in piles as defined in WAC 173-304-100 where putrescible wastes (other than garbage) are in place for more than three weeks, other wastes not intended for recycling are in place for more than three months, and garbage is in place for more than three days. These standards are also applicable to composting or storing of garbage and sludge in piles, and to tire piles where more than eight hundred tires are stored at one facility.

(b) Other solid wastes stored or treated in piles prior to waste recycling including compost piles of vegetative waste, piles of woodwaste used for fuel or raw materials are subject to WAC 173-304-300.

(c) Waste piles stored in fully enclosed buildings are not subject to these standards, provided that no liquids or sludges with free liquids are added to the pile.

(d) Inert wastes and demolition wastes are not subject to these standards.

(2) Requirements. All owners and operators shall:

(a) Comply with the requirements of the General facility requirements, WAC 173-304-405;

(b) Design piles located in a one hundred year flood plain to:

(i) Comply with local flood plain management ordinances and chapter 508-60 WAC, Administration of flood control zones; and

(ii) To avoid washout or restriction of flow; and

(c) Remove all solid wastes from the pile at closure to another permitted facility.

(3) Requirements for putrescible wastes or wastes likely to produce leachate.

(a) Waste piles shall be placed upon a

surface such as sealed concrete, asphalt, clay or an artificial liner underlying the pile, to prevent subsurface soil and potential ground water contamination and to allow collection of run-off and leachate. The liner shall be designed of sufficient thickness and strength to withstand stresses imposed by pile handling vehicles and the pile itself;

(b) Run-off systems shall be installed, designed and maintained to handle a twenty-four hour, twenty-five year storm event;

(c) Waste piles having a capacity of greater than ten thousand cubic yards shall have either:

(i) A ground water monitoring system that complies with WAC 173-304-490; or

(ii) A leachate detection, collection and treatment system.

For purposes of this subsection, capacity refers to the total capacity of all putrescible or leachate- generating piles at one facility (i.e., two, five thousand cubic yard piles will subject the facility to the requirements of this subsection).

(d) Run-on prevention systems shall be designed and maintained to handle the maximum flow from a twenty-five year storm event; and

(e) A jurisdictional health department may require that the entire base or liner shall be inspected for wear and integrity and repaired or replaced by removing stored wastes or otherwise providing inspection access to the base or liner; the request shall be in writing and cite the reasons including valid ground water monitoring or leachate detection data leading the jurisdictional health department to request such an inspection, repair or replacement.

(4) Requirements for tire piles. Owners or operators shall:

(a) Control access to the tire pile by fencing;

(b) Limit the tire pile to a maximum of one- half acre in size;

(c) Limit the height of the tire pile to twenty feet;

(d) Provide for a thirty foot fire lane between tire piles; and

(e) Provide on-site fire control equipment.

[Statutory Authority: Chapter 43.21A RCW. 85-22-013 (Order 85-18), §173-304-420, filed 10/28/85.]

WAC 173-304-600 PERMIT REQUIREMENTS FOR SOLID WASTE FACILITIES.

(1) Applicability.

(a) All facilities which are subject to the standards of WAC 173-304-130, 173-304-300, and 173-304-400 are required to obtain permits. Permits are not required for single family residences and single family farms dumping or depositing solid waste resulting from their own activities on to or under the surface of land owned or leased by them when such action does not create a nuisance, violate statutes, ordinances, or regulations, including this regulation.

(2) Procedures for permits.

(a) Any owner or operator subject to the permit requirements who intends to operate a facility must apply for a permit with the jurisdictional health department. Filing shall not be complete until two copies of the application have been signed by the owner and operator and received by the jurisdictional health department, and the applicant has filed an environmental checklist required under the State Environmental Policy Act rules, chapter 197-11 WAC.

(b) Applications for a permit must contain the information set forth in subsection (3) of this section.

(c) Once the jurisdictional health department determines that an application for a permit is factually complete, it shall refer one copy to the appropriate regional office of the department for review and comment.

(d) The jurisdictional health department shall investigate every application to determine whether the facilities meet all applicable laws and regulations, conforms with the approved comprehensive solid waste handling plan and complies with all zoning requirements.

(e) The jurisdictional health department may establish reasonable fees for permits and renewal of permits. All permit fees collected by the health department shall be deposited in the county treasury in the account from which the

health department's operating expenses are paid.

(f) The department shall report to the jurisdictional health department its findings on each permit application within forty-five days of receipt of a complete application or inform the jurisdictional health department as to the status of the application. Additionally, the department shall recommend for or against the issuance of each permit by the jurisdictional health department.

(g) When the jurisdictional health department has evaluated all pertinent information, it may issue a permit. Every completed solid waste permit application shall be approved or disapproved within ninety days after its receipt by the jurisdictional health department or the applicant shall be informed as to the status of the application.

(h) Except for applications specified in subsection (3)(h) of this section every permit issued by a jurisdictional health department shall be on a format prescribed by the department and shall contain specific requirements necessary for the proper operation of the permitted site or facility including the requirement that final engineering plans and specifications be submitted for approval to the jurisdictional health department.

(i) All issued permits must be filed with the department no more than seven days after the date of issuance.

(j) The owner or operator of a facility shall apply for renewal of the facility's permit annually. The jurisdictional health department shall annually:

(i) Review the original application for compliance with these regulations and submit such additional information as spelled out in subsection (4) of this section;

(ii) Review information collected from inspections, complaints, or known changes in the operations;

(iii) Collect the renewal fee;

(iv) Renew the permit; and

(v) File the renewed permit with the department no more than seven days after the date of issuance. The department shall review and may appeal the renewal as set forth in RCW 70.95.185 and 70.95.190.

(3) Application contents for permits for new or expanded facilities.

(a) All permit applications except for inert waste, demolition waste, special purpose landfills, woodwaste landfill and recycling facilities applications, which are specified in (h) of this subsection, shall contain the following:

(i) A general description of the facility;

(ii) The types of waste to be handled at the facility;

(iii) The plan of operation required by WAC 173-304-405(2);

(iv) The form used to record weights or volumes required by WAC 173-304-405(3);

(v) An inspection schedule and inspection log required by WAC 173-304-405(5); and

(vi) Documentation to show that any domestic or industrial waste water treatment facility, such as a leachate treatment system, is being reviewed by the department under chapter 173-240 WAC.

(b) Application contents for permits for new or expanded landfill facilities. In addition to the requirements of (a) of this subsection, each landfill application for a permit must contain:

(i) A geohydrological assessment of the facility that addresses:

(A) Local/regional geology and hydrology, including faults, unstable slopes and subsidence areas on site;

(B) Evaluation of bedrock and soil types and properties;

(C) Depths to ground water and/or aquifer(s);

(D) Direction and flow rate of local ground water;

(E) Direction of regional ground water;

(F) Quantity, location and construction (where available) of private and public wells within a two thousand foot radius of site;

(G) Tabulation of all water rights for ground water and surface water within a two thousand foot radius of the site;

(H) Identification and description of all surface waters within a one-mile radius of the site;

(I) Background ground and surface water quality assessment, and for expanded facilities, identification of impacts of existing facilities of the applicant to date upon ground and surface waters from landfill leachate discharges;

(J) Calculation of a site water balance;

(K) Conceptual design of a ground water and surface water monitoring system, including proposed installation methods for these devices and where applicable a vadose zone monitoring plan;

(L) Land use in the area, including nearby residences; and

(M) Topography of the site and drainage patterns.

(ii) Preliminary engineering report/plans and specifications that address:

(A) How the facility will meet the locational standards of WAC 173- 304-130;

(B) Relationship of facility to county solid waste comprehensive plan and the basis for calculating the facility's life;

(C) The design of bottom and side liners;

(D) Identification of borrow sources for daily and final cover, and soil liners;

(E) Interim/final leachate collection, treatment, and disposal;

(F) Landfill gas control and monitoring;

(G) Trench design, fill methods, elevation of final cover and bottom liner, and equipment requirements; and

(H) Closure/post-closure design, construction, maintenance, and land use.

(iii) An operation plan that addresses:

(A) Operation and maintenance of leachate collection, treatment, and disposal systems;

(B) Operation and maintenance of landfill gas control systems;

(C) Monitoring plans for ground water, surface water, and landfill gases to include sampling technique, frequency, handling, and analyses requirements;

(D) Safety and emergency accident/fire plans;

(E) Routine filling, grading, cover, and housekeeping;

(F) Record system to address records on weights (or volumes), number of vehicles and the types of waste received;

(G) Vector control plans; and

(H) Noise control.

(iv) Closure plan to address:

(A) Estimate of closure season/year;

(B) Capacity of site in volume and tonnage;

(C) Maintenance of active fill versus completed, final covered acreage;

(D) Estimated closure construction timing and notification procedures;

(E) Inspection by regulatory agencies.

(v) Post-closure plan to address:

(A) Estimated time period for post-closure activities;

(B) Site monitoring of landfill gas, ground water, and surface water;

(C) Deed clause changes, land use, and zoning restrictions;

(D) Maintenance activities to maintain cover and run-off systems; and

(E) Identification of final closure costs including cost calculations and the funding mechanism.

(c) Application contents for new or expanded transfer stations, drop box facilities, and baling and compaction systems requiring a permit. In addition to the requirements of (a) of this subsection, each applicable application for a permit must contain preliminary engineering report/plans and specifications that address:

(i) The proposed facility's zoning status;

(ii) The relationship to the county solid waste comprehensive plan and the area to be served by the facility; and

(iii) The facility design to address how the facility shall meet requirements of WAC 173-304-410, including closure.

(e) Application contents for new or expanded piles requiring a permit. In addition to the requirements of (a) of this subsection, each application for a permit must contain:

(i) Preliminary engineering reports/plans and specifications that address:

(A) How the proposed facility will meet the locational standards of WAC 173-304- 130;

(B) The relationship of the facility to the county solid waste comprehensive plan and zoning;

(C) The design of the liner or sealed surface upon which the liner rests, including an analysis of the liners ability to withstand the stress;

(D) The design of the run-on and run-off system;

(E) The design to avoid washout when the pile is located in a one hundred year

floodplain; and

(F) Maximum elevation and boundaries of the waste pile.

(ii) An operation plan that addresses:

(A) Methods of adding or removing wastes from the pile and equipment used;

(B) Inspection of the liner for integrity; and

(C) Safety and emergency plans.

(iii) A closure plan to address:

(A) Estimate of closure year and cost;

(B) Methods of removing wastes, liners and any contaminated soils, and location of final disposal;

(C) Closure timing and notification procedures; and

(D) Final inspection by regulatory agencies.

(h) Application contents for new or expanded inert waste and demolition waste, special purpose landfill, woodwaste landfills, and recycling facilities.

Applications for permits subject to the standards of WAC 173-304-300, 173-304-460(5), 173-304-461, and 173-304-462 shall be on forms whose content shall be specified by the jurisdictional health department.

(4) Application contents for existing facilities renewing permits. All owners or operators of existing facilities shall renew permits or application forms specified in subsection (3) of this section. Previous information submitted to the jurisdictional health department may be referred to on the application forms. Changes in operating methods or other changes must be noted on the application in order to be authorized by permit.

(5) Inspections. As a minimum, annual inspections of all permitted solid waste facilities shall be performed by the jurisdictional health department. Any duly authorized officer, employee, or representative of the jurisdictional health officer or his designee having jurisdiction may enter and inspect any property, premises or place at any reasonable time for the purpose of determining compliance with this chapter, and relevant laws and regulations. Findings shall be noted and kept on file. A copy of the inspection report or annual summary shall be furnished to the site operator.

[Statutory Authority: RCW 70.95.215. 88-20-066 (Order 88-28), §173-304-600, filed 10/4/88. Statutory Authority: Chapter 43.21A RCW. 85-22-013 (Order 85-18), §173-304-600, filed 10/28/85.]

Appendix 6
Checklist for Biosolids Compost Facility Permit Review

Biosolids compost facilities, which are not part of a wastewater treatment facility, may be permitted under a local solid waste permit if both the health department and Ecology agree (in writing) that the requirements in Chapter 173-308 WAC are met.

This checklist can be used to evaluate a proposed biosolids compost facility permit (under solid waste regulations) and determine whether or not it meets the requirements in WAC 173-308, *Biosolids Management*.

The checklist includes guidance in Figure 1 that outlines the processing requirements for pathogen reduction and vector attraction reduction.

Biosolids Compost Quality

The proposal/permit application should include descriptions of the following elements of biosolids compost quality:

- ❑ Example data from prospective biosolids feedstock sources (or a clearly stated intent to accept only biosolids meeting Table 3 pollutant concentrations).
- ❑ Description of how the finished compost will meet the requirements to be considered Class A for pathogens. (The requirements include process monitoring and testing for pathogens. See Figure 1.)
- ❑ Description of how the composting process will meet vector attraction reduction requirements. The description should include how process parameters will be documented. See Figure 1.)
- ❑ A contingency plan for material that does not achieve Class A for pathogens or vector attraction reduction requirements.
- ❑ Whether or not the compost product is expected to meet the pollution concentration limits in Table 1.
- ❑ Whether or not the compost product is expected to meet the pollution concentration limits in Table 3.
- ❑ Whether or not the compost product is expected to meet the requirements to be Exceptional Quality biosolids. To be exceptional quality, the product must meet the pollutant concentration limits in Table 3, Class A pathogen reduction, and vector attraction reduction.[31]
- ❑ Description of how the proposed end use agrees with the compost quality.

[31] Ecology **discourages** the production and marketing of compost other than EQ compost. If you are considering producing biosolids compost that is not EQ compost, you should get clear regulatory concurrence from Ecology and any delegated health department before doing so.

Obtaining and providing information (WAC 173-308-120)

Information exchange is an important aspect of a good biosolids management program and is necessary for compliance with the biosolids management rule. The list below outlines basic requirements that need to be reflected in a permit application.

Information requirements between biosolids generator (source) and composter

Information needed by the generator	**Information needed by the composter**
Information about the composting process: ❑ Will the process achieve Class A for pathogens? ❑ Will the process meet vector attraction reduction? ❑ Will the composter document the process appropriately (through monitoring, sampling, analysis and recordkeeping)? ❑ Is treatment appropriate for proposed end use? ❑ Does the composter have the appropriate permits?	Information about the biosolids feedstock: ❑ Pathogen classification (i.e. Class A, Class B or unprocessed) ❑ Status of vector attraction reduction (Please note: in most cases Class A pathogen reduction must be achieved at the same time or before vector attraction reduction.) ❑ Indication of metals concentration (this information is best accomplished through contracts with the generator)

Information between composter and end user

❑ Will the composter provide the end user with information to determine appropriate rates of application?

Sampling and analysis

❑ Does the proposal include a sampling and analysis plan?

❑ Does the plan specify the analysis methods in WAC 173-308-140?

❑ Does the plan meet the minimum sampling frequency in WAC 173-308-150? (Please note: more frequent sampling may be required.)

❑ Does the sampling plan provide for representative analysis of the final product?

❑ Does the plan specify pathogen testing at the appropriate time in the process (i.e. when compost is prepared for sale or giveaway)?

❑ Does the plan include procedures for collecting samples that will be analyzed for pollutants, pathogens, and appropriate nutrients? (Please note: samples for pathogen analysis require special handling to prevent contamination.)

Record Keeping

Does the proposal ensure that records will be kept of the following items?

- ❑ Amount of biosolids (recorded as feedstock in dry tons) that is sold or given away by the composter in bulk form or in a bag or other container for application to the land; (WAC 173-308-290(2)(g))
- ❑ Analysis data showing pollutant concentrations of finished product; (WAC 173-308-290(3)(a))
- ❑ Monitoring data (and composting process description) showing that time/temperature requirements for pathogen reduction were met; (WAC 173-308-290(3)(b)
- ❑ Analysis data showing pathogen testing occurred on finished product at the appropriate time; (WAC 173-308-290(3)(b)
- ❑ Process monitoring data (and composting process description) showing that vector attraction reduction requirements were met; (WAC 173-308-290(3)(c)
- ❑ Certification statement under WAC 173-308-290(3)(d)(i), (applicable to production of EQ biosolids compost).

Reporting

Reporting requirements for biosolids compost facilities are not specified in the biosolids regulation. Reporting requirements will be developed as permit coverage is approved for individual facilities.

Reporting requirements in the solid waste regulation, WAC 173-304-405(4), must be followed.

Figure 1. Biosolids Compost Processing Requirements (Chapter 173-308 WAC)

If you compost using this technology:	This regulatory requirement:	Must include these operating conditions:
Windrow technology	Process to Further Reduce Pathogens (PFRP)	• Maintain windrow temperatures at 55°C or higher • Compost for 15 days or longer at 55°C or more • Turn windrows at least 5 times within 15 days • Perform PFRP operating conditions before or at the same time as VAR • EPA guidance suggests generally 3 weeks to meet specified conditions
	Vector Attraction Reduction (VAR)	• Maintain windrow temperature over 40°C • Compost for 14 days or longer at over 40°C • Average temp must be higher than 45°C
Aerated static pile (ASP) or within vessel	Process to Further Reduce Pathogens (PFRP)	• Maintain biosolids at 55°C or higher • Compost for 3 days • Insulate aerated static piles for duration of PFRP • Perform PFRP operating conditions before or at the same time as VAR • EPA guidance suggests ASP generally requires 3 weeks, within vessel requires 10 days
	Vector Attraction Reduction (VAR)	• Maintain pile temperature over 40°C • Compost for 14 days or longer at over 40°C • Average temperature must be higher than 45°C