

Section 6: Leachate Treatment and Disposal Feasibility Study

6.1 Introduction

Evaluate treatment alternatives

Available leachate treatment alternatives should be evaluated. Methods that reflect site-specific conditions, and a full consideration of cross-media impacts should be selected for the facility.

Preferred methods

Preferred treatment methods are those that reduce the leachate contaminants rather than simply transferring the environmental problem to another medium. New landfills, and municipal solid waste landfills with significant expansions built after October 9, 1993, may need to complete a supplemental information form to help identify and prevent the transfer of pollutants from one medium to another.

How to respond

Submit a Feasibility Study Report that documents the analysis of treatment and disposal alternatives, including any assumptions. The Report should be stamped by the Profession Engineer who conducted the study.

Analysis of treatment options

Evaluate leachate treatment and disposal alternatives as follows:

- estimate leachate generation rates based on the latest Help Model analyses and/or actual leachate volume measurements from existing landfill cells
- determine the chemical and physical characteristics of the leachate and predict variations in leachate characteristics over time. For lateral expansion of existing facilities, sample and analyze leachate from an adjacent cell. For new facilities, obtain data from the nearest existing facility with a comparable physio-climatic setting and incoming waste stream
- identify final disposal alternatives and evaluate their feasibility in terms of cost effectiveness, environmental impact, technological constraints, regulatory requirements, and compatibility with other elements of the landfill design and operation
- define leachate treatment (effluent) requirements for the disposal alternatives and overall design criteria
- select a treatment process or processes which will achieve desired treatment performance for each disposal alternative
- estimate the capital and operation and maintenance costs of each alternative treatment and disposal method
- select the best alternative treatment and disposal system with regard to cost, reliability, flexibility and any other appropriate considerations

The study should be conducted by a Professional Engineer with current Oregon registration.

Selection of method

Leachate characteristics and treatability may be affected by landfill expansion and by partial or final closure. Therefore, the proposed treatment methods should be highly adaptable to accommodate variable chemical and hydraulic loading. The proposed system should consist of one or a combination of treatment options.

Treatability studies

If possible, selection of a process to treat leachate should be based upon treatability studies (laboratory or pilot scale) using the actual leachate. This is recommended for several reasons:

- Published leachate treatment performance data are rare. In the absence of treatability studies, inferences must be drawn from laboratory experimental studies, and industrial and municipal water and wastewater treatment experience.
 - Lacking previous experience or treatability data, there is no guarantee that high levels of treatment can be achieved.
 - It is likely that a combination of several unit processes will be needed to deal with the leachate. Arriving at the optimum system is unlikely without treatability studies.
 - The complex leachate may not behave like other wastewaters, thus affecting design and operating criteria (e.g., chemical dosage requirements), and invalidating extrapolations from other experiences. Leachate composition also varies with age of the landfill.
 - Capital investment, and especially operation and maintenance costs, are likely to be greater per unit volume treated than for municipal or industrial wastewater. However, costs will be difficult to estimate without treatment experience. Investment in a costly, unproven system that may not meet the required treatment objectives is imprudent.
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Alternative evaluation

In spite of these considerations, treatability studies may not be possible at all sites. Representative leachate samples may be unavailable at new landfill sites or arid area sites. In such cases, use a more theoretical approach that relies on published data or data from another similar facility.

In this section

This section describes alternative treatment methods for landfill leachate, including:

- discharge to privately or publicly-owned treatment works
 - land application
 - on-site treatment with discharge to surface water
 - re-application or re-injection to lined cell
 - evaporation or impoundment, and
 - other alternatives
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6.2 Discharge to Privately or Publicly-Owned Treatment Works

The option This alternative is subject to any pretreatment and/or wastewater connection requirements of the authority operating the treatment works. Discharges to publicly-owned treatment works (POTW) are not directly regulated by the Department.

Reference: "Management Plan Requirements for Leachate Disposal to Publicly-Owned Treatment Works," March 19, 1993

Examples of use

This method is currently practiced by several landfill in the Northwest, including:

- St. Johns Landfill, Portland, Oregon. Contact: Metro Solid Waste
 - Cedar Hills Landfill, King County, Washington. Contact: King County Solid Waste Department
 - Cathcart Landfill, Snohomish County, Washington. Contact: Snohomish County Solid Waste Department
 - Kent Highlands Landfill, Kent, Washington. Contact: City of Seattle
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6.3 Land Application

The option This alternative is subject to possible pretreatment requirements.

Reference: "Standards for Leachate Spray Irrigation Management," October 28, 1992

Examples of use

This method is currently practiced by several landfills in Oregon, including:

- Coffin Butte Landfill, Benton County. Contact: Valley Landfills, Corvallis, Oregon
 - Riverbend Landfill, Yamhill County. Contact: Sanifill of Oregon
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6.4 On-site Treatment with Discharge to Surface Water

The option This alternative is subject to effluent limitations as defined in a National Pollutant Discharge Elimination System (NPDES) permit. Application for a permit should be completed and submitted to the Department's Water Quality Division. If Total Maximum Daily Loads have been established or proposed for the receiving waters, additional requirements may be mandated above and beyond the NPDES permit.

Treatment processes Generally, there are eight unit treatment processes applicable to leachate treatment:

- biological treatment
 - aerobic
 - anaerobic
- chemical precipitation
- ion exchange
- reverse osmosis
- carbon absorption
- stripping
- chemical oxidation
- wet oxidation

The applicability of each of these processes depends largely on the age of the leachate and the location and design of the landfill.

Examples of use This method is currently practiced by Roseburg Landfill in Douglas County. Contact: Douglas County of Public Works

6.5 Re-application or Re-injection to Lined Cell

The option This alternative is permissible under the conditions of U.S. EPA's Solid Waste Disposal Facility Criteria 40 CFR Part 258. Only those cells where the composite liner and leachate collection system are equivalent to the minimum standards as described in 40 CFR 258.40(a)(2) can this form of leachate treatment be employed.

Minimum standards Re-application of leachate is prohibited unless the landfill cell has at least the equivalent of each of the following three elements:

- upper component: a composite liner with 30-mil FML [60-mil HDPE], installed in direct and uniform contact with the compacted soil component
- lower component: a two-foot or thicker layer of compacted soil with a hydraulic conductivity no greater than 10^{-7} cm/sec
- leachate collection: a collection system capable of maintaining less than a 12 inch [30-cm] depth of leachate head

Considerations The following considerations should be addressed:

- hydrogeology of the landfill site and the surrounding area within a 1/4-mile radius of the site
- climatic/meteorological data
- design details of the recirculation system
- monitoring of leachate levels in the landfill
- detailed contingency plans for leachate control, in the event that the leachate head levels cannot be maintained at less than a 12 inch [30-cm] depth
- metals accumulation in cover soils (if leachate is surface applied), and
- surface runoff and erosion control (if leachate is surface applied)

Examples of use This method is practiced in limited use at Finley Buttes Landfill in Morrow County, Oregon.

6.6 Evaporation/Impoundment

The option This alternative is subject to the same requirements as an application for a Water Pollution Control Facility (WPCF) permit. A lagoon, impoundment structure, or evaporation pond with a discharge to surface water is subject to a NPDES permit.

Inclusion in other documents The Site Development Plan and detailed design plans and specifications should include:

- the rationale for selecting the proposed evaporation/impoundment technique
- water balance calculations
- pilot and bench tests, as appropriate, and
- alternative methods for residuals handling

Examples of use This method is currently practiced at Columbia Ridge Landfill and Recycling Center in Gilliam County, Oregon.

6.7 Other Alternatives

Options The Department will consider other treatment options, such as incineration, moisture source for composting if supporting information demonstrates consistency with DEQ regulations and water quality criteria.

6.8 Additional Resources

References “Management Plan Requirements for Leachate Disposal to Publicly-Owned Treatment Works,” DEQ, March 19, 1993

“Standards for Leachate Spray Irrigation Management,” DEQ, October 28, 1992
