



Leachate Recirculation at Solid Waste Landfills

THIS POLICY DOES NOT HAVE THE FORCE OF LAW.

Purpose

DMWM recognizes that leachate recirculation can result in benefits; however it can also result in adverse impacts. The purpose of this document is to outline the concerns DMWM has with the adverse impacts that can result from leachate recirculation. This document addresses how proposals will be reviewed and the administrative mechanisms for authorizing leachate recirculation. Due to the site specific conditions and situations, and the different methods and designs to recirculate leachate, this document presents performance goals rather than design standards.

Applicability

This document is applicable to owners and operators of solid waste disposal facilities.

Background

Leachate recirculation is an option for managing leachate. Leachate recirculation is the process of reintroducing collected leachate back into the landfill. Benefits of leachate recirculation include: improvement of leachate quality, faster stabilization of the landfill, and enhancement of gas production. However, DMWM has concerns about potential problems that can be caused as a result of leachate recirculation. These include the possibility of contaminating surface water (outbreaks, overspray, leaks), creating nuisance conditions and the migration of landfill gas, increasing the leachate head at the bottom of the landfill (increasing the potential for leachate to leak out of the landfill and impact ground water), and decreasing the stability of the solid waste (saturated conditions). Therefore, this document was developed to present these concerns and to aid in development and review of leachate recirculation proposals.

There are different methods and designs to recirculate leachate. These methods include spraying the leachate onto the working face, digging ponds or trenches into the landfill and filling them with leachate (some designs include filling the ponds or trenches with an aggregate material), and installing subsurface leach fields or injection wells. One practice which is not considered leachate recirculation is the mixing of leachate with an absorbent material and disposing of the mixture in the landfill. The references cited at the end of the document are aids to understanding the theory and practice of leachate recirculation. Note that leachate recirculation by and large has been applied to municipal solid waste rather than industrial or residual solid waste.

The municipal, industrial, and residual solid waste landfill rules do not address the topic of leachate recirculation. Thus the rules do not state what information needs to be submitted with a proposal, nor what standards need to be met for approval. Therefore, there is a need to outline an evaluation procedure to apply consistently towards these proposals.

The underlying philosophy DMWM has applied to landfill regulation in general is that the generation of leachate must be minimized. Although leachate is being reintroduced into the landfill, there will actually be a reduction in the total leachate volume generated if microbial respiration is increased. Therefore this management option is not contrary to this philosophy. Proposals to add other liquids (including leachate from other landfills) are prohibited unless approved by the director. Such proposals will be reviewed without consideration as to whether leachate is recirculated at the facility (just because a facility recirculates leachate, doesn't mean that liquid wastes can be accepted for disposal). Approval to recirculate leachate is not an approval to dispose bulk liquids in the landfill.

¹ Note: This document was originally published on the date noted above. DMWM re-issued the document to make it consistent with current formatting and publication standards after evaluating the content and determining it is still relevant and appropriate. No substantive changes were made to the document.

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Another underlying philosophy DMWM has applied to landfill regulation, is that the risk of leachate migration must be minimized. Although the head on the liner is minimized by having a leachate collection system that is in good working order, it is important to note that the landfill is not designed for leachate storage or disposal. Leachate disposal or storage in the landfill can result in leachate outbreaks, an unstable waste mass and unstable slopes, increased potential for ground water contamination and gas migration. Therefore the preferred option for leachate disposal is treatment at a wastewater treatment facility and discharged in accordance with an NPDES permit.

Procedure

REVIEW OF PROPOSALS

Identified below are 7 concerns presented as performance goals. With each performance goal are aspects which were developed to identify how that performance goal could be met. Included with an aspect might be a comment on why the aspect is important. If a proposal meets the aspects, given the facility's specific conditions and situation and the proposed method and design to recirculate the leachate, DMWM's concerns will have been addressed and the performance goals met. If a proposal does not meet an aspect, then the applicant needs to provide additional information to address the concern.

Concern 1. The ground water will be protected and monitored.

- Aspect A. The facility meets the ground water aquifer protection siting criteria. Comment: If the facility has been approved since June 1, 1994, (or January 13, 1992 for residual solid waste landfills) the facility meets siting criteria (even if a variance was issued). If the facility PTI was issued before June 1, 1994 (or January 13, 1992 for residual solid waste landfills), the separation distance requirement should be satisfied.
- Aspect B. A ground water monitoring program that complies with applicable rules has been implemented. Comment: The facility will be monitored for a release of leachate.
- Aspect C. There is no known contamination from the area where leachate is to be recirculated. Comment: A release of leachate into the ground water has not been detected (neither the ground water quality assessment monitoring program nor the corrective measure program have been implemented or required to be implemented).

Concern 2. The leachate is being collected.

- Aspect A. The facility has a composite liner and leachate collection system (LCS), both meeting current requirements, in the area where leachate is to be recirculated. Comment: The liner keeps the leachate from migrating out of the landfill so that it can be collected by the LCS. For municipal solid waste facilities regulated under Subtitle D, note that USEPA Region V interprets 40 CFR Part 258.28 (a)(2) to exclude leachate recirculation from areas that do not have a liner or leachate collection system.
- Aspect B. The LCS is operating correctly. Comment: Approaches include checking the level (head) of leachate at the bottom of the landfill to confirm that 1 foot of head is not being exceeded anywhere on the liner, except in the sump, and checking the records to confirm that the LCS is not clogged (look at maintenance records that the LCS has been checked for crushing and clogging and repaired or cleaned out, look for sudden drops in leachate collected, compare amount of leachate collected to the estimated leachate generation calculations). Designs with a drainage layer with a permeability exceeding 1 cm/s should be adequate to address clogging from chemical precipitation. Designs with a filter fabric placed as a layer above the drainage layer and not wrapped around the collection pipe should sufficiently address biological clogging.

Concern 3. The recirculation of leachate will work.

- Aspect A. The waste is degradable. Comment: Leachate recirculation in degradable waste results in the benefits of improved leachate quality, faster stabilization of the landfill, and enhanced gas production. The recirculation of excess leachate, where additional leachate no longer provides any benefit, is viewed as leachate disposal in the landfill and is not an appropriate option for managing leachate.
- Aspect B. The LCS is designed to accommodate the leachate being generated and the leachate to be recirculated. Comment: Avoid the "bath tub effect". In addition, if too much leachate is added, then the landfill can become unstable, the LCS pipes can be crushed, the biological activity can stop, or outbreaks can occur. Factors to consider include:

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- (1) How much leachate is being collected? (establish baseline)
- (2) How much leachate can be recirculated?
 - (i) Existing level of leachate on the liner
 - (ii) The capacity of the pump(s) is not exceeded
 - (iii) The storage tank capacity is not exceeded
 - (iv) The LCS will be able to manage the increased volume
 - (v) How much can the waste absorb?
- (3) How much leachate is expected to be collected?
- (4) How long to reach equilibrium?
- (5) Weight of the saturated decomposed waste on the LCS pipes (pipes are able to withstand crushing)

Aspect C. Leachate is distributed uniformly. Comment: If the leachate is not distributed uniformly, differential settlement could occur.

Aspect D. The leachate is applied directly to or within the solid waste. Comment: Application onto cover will contaminate the cover material, raise concerns with the ability to infiltrate into the waste (frozen or saturated surface), and raise concerns with surface water contamination (slope, weather conditions).

Aspect E. There are no barriers in the landfill (daily/intermediate cover, type of waste). Comment: Barriers may result in leachate outbreaks.

Concern 4. The leachate and gas will be managed in compliance with operational rules. Note: Introduction of other bulk liquids is prohibited by rule without approval from the director.

Aspect A. There is a good compliance history, especially of leachate and landfill gas management and the control of leachate outbreaks. Comment: Leachate recirculation needs close attention to operating conditions to achieve the benefits and avoid the potential adverse impacts. A poor record of operations/compliance raises significant questions regarding the owner or operator's performance and reliability that should be considered in reviewing a leachate recirculation proposal.

Aspect B. There is active supervision and maintenance. Note: alarms may not be sufficient because they can't monitor outbreaks.

Aspect C. There is an adequate gas management system. Comment: Avoid gas buildup under the cap, odors, and gas migration.

Aspect D. The landfill is monitored. Comment: Monitor leachate levels and quantity to confirm that head on the liner does not become excessive. Monitor landfill gas quantity and leachate quality to gather data on how well leachate recirculation performs and when waste is no longer degradable (due to risk of a release from the landfill, do not want to continue adding leachate if there is no benefit). Monitor for the following:

- (1) leachate levels on the liner
- (2) leachate quantity
- (3) landfill gas quantity and quality
- (4) leachate quality [note that if at any time the leachate is evaluated to be hazardous, contact the Division of Hazardous Waste Management to determine if additional requirements or authorizations apply].

Aspect E. Leachate recirculation will not result in nuisance conditions or odors or leachate outbreaks. Comment: Surface application of leachate is more likely to generate nuisance and odor conditions. Barriers (daily and intermediate cover left in place) are more likely to result in leachate outbreaks.

Concern 5. The landfill will be stable

Aspect A. The cap is designed to withstand damage from settlement and landfill gas pressure buildup.

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Aspect B. The landfill slopes will be stable. Comment: Increasing the saturation of the waste will decrease the strength. May need to recalculate slope stability under saturated conditions.

Concern 6. There are sufficient funds for financial assurance

Aspect A. There are funds available to treat the leachate to be collected by the LCS. Comment: The cost estimate should be based on the cessation of leachate recirculation and the collection, treatment and disposal of the leachate. Note that due to saturating the landfill, more leachate may be collected than at a typical landfill.

Aspect B. There are funds available to decommission (remove) the leachate recirculation injection wells.

Leachate recirculation cannot continue indefinitely for a number of reasons. For example, the equipment can break down, or the landfill can become over saturated, thus causing leachate outbreaks, excessive head on the liner, or contamination of the ground water. Continued recirculation without deriving a benefit is viewed as disposal of leachate in the landfill which is not an acceptable management option for leachate treatment. Therefore, there needs to be a limit as to how long leachate can be recirculated at the landfill facility. The following concern addresses when to stop recirculating and is presented with options rather than aspects. If the proposal does not meet the recommendations or options, then the applicant needs to provide additional information.

Concern 7. Leachate is not being disposed in the landfill. Disposal of leachate in the landfill is not an acceptable leachate management option.

Option A. Stop recirculating leachate when there is no longer a benefit. Comment: There can be three benefits associated with leachate recirculation: an improvement in leachate quality, enhanced landfill gas generation, or stabilization of the landfill. The owner or operator may identify any or all of these benefits as a reason for recirculating leachate. Therefore, when recirculating no longer derives the identified benefit(s), recirculation should cease. The owner or operator will need to monitor the benefit (leachate quality, gas quality/quantity, landfill elevations) to determine when no further benefit is derived. The following presents some recommendations on sample parameters, frequencies, and how many samples are necessary for determining whether there is no longer a benefit.

- (1) leachate quality parameters: to be determined based on the type of waste and the leachate characteristics
- (2) frequency for leachate quality: already monitored annually, however to provide a larger basis for determining trends, more frequent monitoring may be desired (quarterly or monthly)
- (3) landfill gas parameters: methane content and quantity. A decrease in either can be an indication that degradation of the waste is nearing completion
- (4) frequency for landfill gas quality/quantity: to be determined based on whether the facility has a gas extraction system
- (5) landfill stabilization: base location of survey points on the geometry of the landfill, its size and depth
- (6) frequency for landfill stabilization: elevations are already surveyed annually, however to provide a larger basis for determining trends, more frequent surveys may be desired

Option B. Stop recirculating so excess leachate will drain out of the landfill before the end of the post-closure care period. Comment: To minimize the impact of leachate recirculation during the post-closure care period, the owner or operator should cease recirculating leachate before the end of the post-closure care period so that the leachate level will stabilize at a low level before the leachate collection system is turned off. If the leachate level has not stabilized, the owner or operator may be ordered to extend the post-closure care period.

Option C. Stop recirculating when the landfill has reached field capacity. Comment: The owner or operator can calculate how much leachate to add to the landfill to fully saturate the landfill. Once this amount has been added, leachate recirculation ceases.

Option D. Stop recirculating when a problem develops. Comment: If leachate recirculation results in outbreaks, nuisance conditions, excessive head on the liner, and/or ground water contamination, the owner or operator is obligated to take actions to control and abate the situation. Cessation of leachate recirculation should be included as a possible means to address the problem. The option of issuing orders to cease leachate

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recirculation is available to Ohio EPA or the health commissioner. Cessation of recirculation activities may be temporary or permanent, depending on the site specific circumstances.

To confirm that problems are not developing due to the recirculation of leachate, the owner or operator shall continue to inspect the operating site daily for leachate outbreaks and nuisances. During the post-closure care period of solid waste landfills, the owner or operator is required to inspect the facility quarterly. With leachate recirculation, more frequent inspections for outbreaks and nuisances may be needed. To confirm that excessive leachate head does not develop on the liner, leachate levels on the liner or in the sump should be monitored frequently (weekly). The ground water monitoring wells shall continue to be sampled to detect contamination.

APPROVAL MECHANISMS

For solid waste landfills, leachate recirculation may be authorized on a case by case basis through an alteration of the facility's existing PTI (or through a permit to modify the facility if the owner or operator so chooses). Each proposal or each approval should contain a condition that at any time a problem occurs, such as leachate outbreaks, nuisance conditions, excessive head on the liner, ground water contamination, slope failure, or gas migration, the owner or operator shall take action to control and abate the problem, including cessation of leachate recirculation, and that the health department or Ohio EPA can require the owner/operator to cease recirculating leachate.

The UIC program regulates the injection of fluids into the subsurface. If the owner or operator is proposing the use of an injection well to recirculate leachate, inventory information is required [see OAC 3745-34-14]. If a facility does not have a liner and leachate collection system that will prevent any recirculated leachate from leaving waste placement areas, the owner or operator must contact the Division of Drinking and Ground Waters, UIC program to see if a permit is needed and if injection is allowable.

Contact

If you have questions regarding this document or would like additional information, please contact:

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Northeast District Office DMWM Supervisor (330) 963-1200

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Disclaimer

This document is intended for guidance purposes only. Completion of the activities and procedures outlined in this document shall not release an owner or operator from any requirement or obligation for complying with Ohio Revised Code (ORC) Chapter 3734 or 3714 if appropriate, the OAC rules adopted thereunder, or any authorizing documents or orders issued thereunder, nor shall it prevent Ohio EPA from pursuing enforcement actions to require compliance with ORC Chapter 3734 or 3714, the OAC rules or any authorizing documents or orders issued thereunder.