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SOLID WASTE ASSOCIATION OF NORTH AMERICA

LANDFILL LEACHATE COLLECTION SYSTEM MAINTENANCE REQUIREMENTS

Prepared the SWANA Landfill Management Technical Division

I. POLICY

SWANA supports the incorporation and implementation of leachate collection system maintenance requirements into facility operation plans. Landfills are designed and constructed to effectively collect and remove landfill leachate from the base liner system to maintain less than 30-cm of leachate depth over the liner system per RCRA Subtitle D (40 CFR 258.40(a)(2)) and state regulations. Federal and most state solid waste regulations do not specify how the leachate collection system should be operated and maintained to achieve this design criteria. The performance of Subtitle D landfills to protect underlying groundwater quality is reliant on the base liner system to preclude the release of leachate from any defects. While composite liner systems provide significant restrictions to leachate migration, elevated leachate levels above a liner affect the ability of the system to perform as designed.

With the public scrutiny that the landfill industry faces for siting and operation of facilities, and its vital role in protecting the environment and public health from established and emerging contaminants in the solid waste stream, proper operation and maintenance of the leachate collection system is one of the most important functions for the landfill owner and operator. To effectively operate and maintain the collection system, landfill operators should incorporate these fundamental principles in developing their system design and operating plans.

1. Provide cleanouts on collection system and forcemain piping to allow camera inspection and routine maintenance to remove potential clogging and restore function.

2. Prior to operation of a new leachate collection system, perform a camera inspection of the leachate collection system to confirm that future access for maintenance and inspection is not impeded from obstructions or restrictions in the lines.

3. Record the daily pump run and cycle time, daily and cumulative pump hours and volume discharged at each pump station or collection point.

4. Record monthly the pressure in forcemain discharge pipe with pump running at each pump station and review trends for required pump and forcemain maintenance.

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5. On a quarterly basis compare average daily pump run and cycle times, leachate generation rates, and precipitation data to estimated rates and historical trends for indications of effects on collection or sump function.

6. On a quarterly basis review leachate sump operation including time for sump evacuation and recharge and compare to historical trends for sump performance.

7. Annually confirm presence for head on liner at the leachate sump with the pumps off and in the leachate collection piping through insertion of pressure transducers in clean out riser pipes.

8. Conduct routine camera inspection of leachate collection piping and pipe cleaning, as necessary, through jetting or chemical cleaning. The frequency of the inspection and cleaning should be determined based on the site-specific conditions and the operator's experience. SWANA recognizes that the frequency of camera inspection once every two years is a good baseline for consideration.
9. If secondary or leak detection system is present, routinely check head on the sump and pump out leachate at regular intervals.

II. DISCUSSION

A. Background

The Resource Conservation and Recovery Act (RCRA), Subtitle D Criteria for Municipal Solid Waste Landfills establishes that the leachate collection system shall be designed and constructed to maintain less than 30 cm of leachate head over the liner. There are no prescriptive requirements for operation, maintenance or recordkeeping of the leachate collection and removal system in the federal regulations. Most state and provincial solid waste regulations also do not include any specific monitoring or maintenance requirements.

Many Subtitle D landfills have experienced challenges with leachate collection system operations and maintenance. Leachate pumps can be prone to clogging and require frequent maintenance and replacement. Pressure transducers and automated pump control panel operation require experienced staff, maintenance, and repairs. Poorly functioning leachate removal systems contribute to development of saturated waste conditions near the base liner that have shown to be a cause for the formulation of chemical and/or biological precipitation and / or other semi-solid materials that clog leachate collection system components or restrict the free movement of leachate within the waste to the collection system and sumps.

B. Considerations

Considerations for incorporating prescriptive monitoring and maintenance activities include:

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- In addition to assuring that the base liner system is of quality construction and competent, the leachate collection system function is the most essential element to ensure regulatory compliance is maintained and that operations are minimizing risk for leakage and impacts to groundwater quality and human health and the environment.

- The ability of the leachate collection and removal system to effectively manage and remove leachate is a significant part of the performance standard for the landfill design criteria and regulatory approvals. The design assumes that the system will continue to function as designed, remove leachate, and prevent building head on the liner system throughout the life of the landfill.

- Landfill owners invest significant resources in the design of the landfill grading plans, the layout and sizing the collection system piping and gravel trenches, sump size, and pumping system.

- Landfill staff, knowledgeable in the leachate collection system design, operation, and maintenance are essential. How this knowledge is relayed to current and future responsible staff should be considered. A written plan for maintenance including schedule and recordkeeping requirements, along with site-specific training requirements, can assist with this transfer of knowledge.

- Below are items that should be included in a leachate collection system maintenance plan:

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1. How long should the pump be running daily, based on environmental conditions?	• Are hour meters and daily run times recorded and reviewed for trending? • Are the number of pump starts or duration of each pump cycle being recorded and reviewed for trending?
2. What is a reasonable time for each sump to refill?	• Dramatic increase in fill time may be indicative of restrictions to flow into the sump.
3. What flow rate range should I expect to see?	• Are daily volumes pumped being recorded and compared to hours of pump operation for signs of change? • What is the percentage change that may indicate an issue?
4. What should the forcemain line pressure be when pumping and how do other pumps operating on the same forcemain affect pressure and flow?	• This was determined during design and can be confirmed during initial operations and tracked for increased pressure that could indicate restrictions to forcemain flo w
5. Are air release valves and leak detection manholes inspecte d routinely?	• Malfunctioning valves or flow into leak detection manholes would require immediate investigation and repair to prevent spills or system malfunction.
6. How often are the pump screens cleaned?	• The frequency will vary depending on manufacturer and site-specific leachate conditions
7. How often is pump station preventive maintenance to be performed?	• Routine maintenance based on site specific conditions is key to maintaining system function and compliance

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8. Is regular jetting or chemical cleaning of leachate collection lines and forcemains scheduled to periodically remove buildup?	• Are the leachate collection lines inspected with cameras to identify any problem areas?
9. How often is the SCADA communication and alarm responses checked?	• Confirmation of cessation of pump operation under alarm conditions is necessary for maintaining compliance protection of the environment
10. Have you confirmed the operation of the transducers in the sump?	• Installing transducers down sump riser or cleanouts periodically can confirm operation or pump mounted transducers relied upon to maintain compliance
11. Are other site-specific conditions inspected frequently?	

Incorporation of a supervisory control and data acquisition (SCADA) system as part of the facility design or as a retrofit to the leachate management system can assist with having a better understanding of the system function, automatic shutdown for downstream alarm conditions, manage discharge rates, provide ability to trend performance of pumps and even track electrical amperage for signs of trouble. SCADA is an added layer of supervision and can lead to dramatic improvements to system recordkeeping and performance, and should be a consideration for landfill owners, but not a requirement.

C. **Current Approaches**

A review of state regulations of each state and province for operation and maintenance of leachate collection results found that very few have any formal inspections, maintenance or reporting requirements. The regulatory programs that SWANA considers having best practices identified are highlighted below.

Virginia

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The State of Virginia developed Submission Instructions No. 7 in 2012 for the development of a Leachate Management Plan to be submitted with solid waste permit applications under *9 VAC 20-81*-130*,.L., 140.A.6., and 210* for new or modified disposal facilities. The instructions include the information to be provided on leachate generation rates and design of drainage layer, collection piping and the filter material surrounding the pipe, and required submission of information on the capability of the leachate collection system to maintain less than 30 cm of leachate above the liner system. In 2017 in response to recurring leachate management issues observed by compliance staff, Virginia Department of Environmental Quality formed a work group that developed the 2020 Guidance Memo: LPR-SW-2020-01: Managing Leachate in Compliance with the Virginia Solid Waste Management Rules, Virginia Department of Environmental Quality.

This guidance document provides comprehensive assessment of the impacts of routine preventative maintenance can have on maintaining compliance, but also what is required for instances of non-compliance and for management of leachate seeps. The guidance document also recommends the landfill Operations Manual should identify monitoring, maintenance, backup equipment, types of records maintained, and other site-specific instructions for maintaining the leachate collection system, including but not limited to the:

- Schedule and frequency for inspecting and servicing pumps and associated equipment (motors, gaskets, bearings, impellers, alarms, flow meters, control panel, etc.).
- Schedule and frequency for cleaning out leachate lines as needed to maintain proper functionality of the system.
- Methods for documenting equipment maintenance (such as leachate line clean-outs).
- Methods for monitoring (i.e. estimating or measuring) and recording leachate head over the liner and leachate head exceedances.
- Instructions for leachate operations in advance of a storm event; and Frequency and method for recording leachate volumes generated and disposed (pump or flow meter readings, etc.).

California

Under 27 CCR § 20340, the State of California requires that the leachate collection and removal system be designed and operated to function without clogging through the scheduled closure of the Unit and during the post-closure maintenance period. The systems shall be assessed at least annually to demonstrate proper operation. The results of the tests shall be compared with earlier tests made under comparable conditions. It also requires that the leachate production rate, for a landfill equipped with a leachate collection and removal system that the facility record and report the total volume of leachate collected each month since the previous monitoring report.

Florida

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Under 62-701.500 Landfill Operation Requirements, the State of Florida requires that 1) leachate levels be monitored and that 2) quantities of leachate collected by the leachate collection and removal system shall be recorded in gallons per day before on-site treatment or transport off-site, and shall be included with the operating record, and that 3) new leachate collection systems shall be water pressure cleaned or inspected by video recording after construction but prior to initial placement of wastes and 4) existing leachate collection systems shall be water pressure cleaned or inspected by video recording at least once every five years and 5) that the results of the collection system cleanings or inspections shall be available to the Department upon request.

Louisianna

Per LAC 33:VII. Section 711, the State of Louisianna requires that the landfill Operational Plans address the measuring protocol, frequency, and recordkeeping used to monitor leachate head and how the leachate will be removed and transported to the treatment facility; and the actions to be taken when monitoring indicates leachate head exceeds the standard. It stipulates that the leachate pumps shall be tested at least weekly, maintained, and operated to ensure compliance and that testing results are documented in the Operating record and repairs for nonfunctioning leachate pumps and/or not maintaining liquid head below the 1-foot leachate head standard shall be initiated and completed within seven days. It also requires that leachate head shall be monitored and recorded at least every normal operating day and at least every seven days for cells that have received final cover and specifies that if head exceedance is detected that exceeds the 1 foot elevation of the lowest point in the leachate collection lines, that corrective actions must be taken in accordance with the provisions of the approved Operational Plans.

Maine

Per Chapter 401 of the Maine Solid Waste Management Regulations, the state of Maine requires that the Submission for the design of the Landfill Leachate Management System include: a maintenance, inspections, and testing plan for the leachate conveyance, storage and pretreatment and/or treatment systems, a proposal to monitor and/or evaluate the performance of the leachate collection and transport systems, including monitoring for leaks, and a proposal to monitor and control the depth of leachate in the storage structure, including identification for each season of the normal range of operating depth in the structure. Additionally, inspection requirements include that the leachate collection, detection, and transport systems must be inspected on at least an annual basis and if select waste is used as a protective system, the leachate collection system must also be inspected after the first lift of select waste is placed on top of the collection system.

North Carolina

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Per 15A NCAC 13B.1626(12), the state of North Carolina requires that the owner or operator of a MSWLF unit designed with a leachate collection system shall establish and maintain a leachate management plan that includes the following: (a) periodic maintenance of the leachate collection system; (b) maintaining records for the amounts of leachate generated; (c) semi-annual leachate quality sampling; (d) approval documentation for final leachate disposal; and (e) a contingency plan for extreme operational conditions.

SWANA Landfill Technical Division

The Landfill Liquids and Leachate Committee of the SWANA Landfill Technical Division has developed the Best Practices for Leachate Collection in Landfills White Paper that outlines practical strategies that landfill managers and operators can apply to preserve the performance of their leachate collection systems. The white paper also includes recommendations for leachate collection system design, and considerations for detecting and mitigating leachate collection system fouling and factors that affect leachate transmission to the collection system.

D. References

Solid Waste Permitting Submission Instruction No. 7, Leachate Management Plan for Solid Waste Management Facilities (LPR-SW-SI-07), Virginia Department of Environmental Quality, February 2012. https://townhall.virginia.gov/L/GetFile.cfm?File=C:\TownHall\docroot\GuidanceDocs\440\GDoc_DEQ_4939_v2.pdf

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Florida Solid Waste Management Rules, 62-701.500 Landfill Operation Requirements. https://flrules.org/gateway/RuleNo.asp?id=62-701.500

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Maine Solid Waste Management Regulations, Chapter 401, Solid Waste Management Rules: Landfill Siting, Desing and Operation.
Waste Management Rules, Maine Department of Environmental Protection
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North Carolina Solid Waste Management Regulations, 15A NCAC 13B .1626 Operation Requirements for MSWLF Facilities. http://reports.oah.state.nc.us/ncac/title%2015a%20-%20environmental%20quality/chapter%2013%20-%20solid%20waste%20management/subchapter%20b/subchapter%20b%20rules.pdf

SWANA Landfill Technical Division, Best Practices for Leachate Collection in Landfills, 2026.