OPERATION, MAINTENANCE, AND MONITORING PLAN

VOLUME 3

Leachate Management Systems

Prepared for:

Bridgeton Landfill, LLC
13570 St. Charles Rock Rd.
Bridgeton, MO 63044

Prepared by:

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CEC PROJECT NO. 131-178

September 2013

Note: This Volume of the OM&M Plan is a work-in-progress and will require future revisions as significant expansions and revisions are made to the leachate management system over the next several months.

Operation, Maintenance, and Monitoring Plan
Volume 3 – Leachate Management Systems
Bridgeton Landfill
September 13, 2013

The material and data in this report was compiled and/or prepared under the responsible charge, supervision, and direction of the undersigned.

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_____

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DOCUMENTS INCORPORATED BY REFERENCE

1) Leachate Tank and Transport Disposal/Leachate Management, May 30, 2013 by Civil & Environmental Consultants
   - Operation and Maintenance Manual by Landmarc Environmental Systems
   - Interim Leachate Management Plan by Feezor Engineering

2) Bridgeton Landfill Leachate Tank and Transport Disposal/Leachate Management, July 25, 2013 by Civil & Environmental Consultants, Inc.
   - Updated Interim Leachate Management Plan by Feezor Engineering

3) Leachate Pre-Treatment System Plan, August 30, 2013 (Revised September 9, 2013) by Civil & Environmental Consultants

1.0 INTRODUCTION

1.1 Background

This document comprises Volume 3 of a three-volume Operation, Maintenance, and Monitoring Plan (OM&M Plan) for the Bridgeton Landfill, LLC (Bridgeton Landfill). The OM&M Plan consists of:

Volume 1 - General Requirements and Surface Systems
Volume 2 - Gas and Subsurface Control Systems
Volume 3 – Leachate Management Systems (this volume)

Volume 1 describes the history of the landfill as well as the OM&M Plan purpose, management structure, data collection and reporting, and procedures for Plan modifications.

Certain reactions (also called a subsurface smoldering event or SSE) are believed to be occurring within portions of the landfill. The effects of the reactions produce untypical and stressful conditions on the leachate management systems including:

- Elevated temperatures which require special construction materials,
- Thermal decomposition (pyrolysis) of waste resulting in much higher than typical levels of BOD, COD, volatile organic compounds, and certain dissolved metals in the leachate,
- Drying of waste which results in a steam/water vapor front moving out, up, and away from the reaction which then condenses in the cooler surrounding waste mass, and gas extraction wells, resulting in high liquid generation and obstruction of gas extraction well perforations,
- Higher-than-normal temperature adjacent to the reacting waste mass, causing conversion of liquid into steam and the potential for forceful ejection of liquid in some locations, and
- Settlement under and/or adjacent to reacting waste mass creating pinches, warps, and or breaks in the leachate management features.

Each of these conditions results in operational and maintenance challenges. It is not known how long the SSE will continue or how long these conditions will exist, but it is believed the elevated temperatures and atypical liquid conditions will be present for many years. Therefore, special operating and maintenance procedures are, and will be, necessary for the leachate management systems until conditions allow for resumption of typical procedures.

Currently, the SSE is contained to the South Quarry, and measures are being taken to prevent it from entering the North Quarry. As a result, the leachate removal conditions are very different in the (impacted) South Quarry and the (non-impacted) North Quarry.

1.2 Current Status of the Leachate Management System

As of this writing, the leachate management system is undergoing significant upgrades and modifications that have been required due to the increase in volume and increase in leachate "strength" that has occurred as a result of the SSE. Therefore, this volume of the OM&M Plan will be significantly expanded and revised over the next several months to accommodate new and upgraded systems.

Operation and maintenance procedures currently in use are primarily those presented in the following document:

- Leachate Tank and Transport Disposal/Leachate Management, May 30, 2013 by Civil & Environmental Consultants, Inc.
    - Operation and Maintenance Manual by Landmarc Environmental Systems
    - Interim Leachate Management Plan by Feezor Engineering

- Bridgeton Landfill Leachate Tank and Transport Disposal/Leachate Management, July 25, 2013 by Civil & Environmental Consultants, Inc.
    - Updated Interim Leachate Management Plan by Feezor Engineering

The facility is currently under construction toward the goal of the final leachate pretreatment procedures outlined in the following documents:

- Leachate Pre-Treatment System Plan, August 30, 2013 (Revised September 9, 2013) by Civil & Environmental Consultants
- Treatment Building Construction Plans for Bridgeton Landfill, August 30, 2013 by Civil & Environmental Consultants, Inc.

Both of the above-referenced documents are works in progress and subject to modification prior to finalization and implementation.

In addition, upgrades and improvements are being made to the leachate conveyance systems, the design of which is being performed by Weaver Boos.

1.3 Components of the Leachate Management System

The major present and future components of the leachate management system include:

Liquid Collection System

- Leachate Collection Sumps – Six deep landfill extraction sumps are required by the facility's operating permit (designated as LCS- #).
- Gas Extraction Well Dewatering - Many of the gas extraction wells at Bridgeton Landfill have been augmented with pumps to remove condensation and free liquid.
- Condensate Removal – Liquid that condenses from gas in the collection piping system is collected in condensate traps (designated as CT- #).
- Leachate Trench – A trench was installed in 2012 in the "amphitheater" area. Nine leachate sumps provide collection points for pumping leachate from this feature. The designation LS- # is used for the nine leachate sumps associated with the leachate trench.
- Subcap Collection – A series of drains has been installed under the flexible membrane liner (FML) cap at the landfill to collect subcap condensation and leachate outbreaks; these convey to a series of perimeter sumps at the perimeter of the South Quarry area (designated PS- #).

Liquid Conveyance System

- Lateral Conveyance Piping – Pressurized or gravity pipes which transmit liquid from a collection feature to a perimeter header force main or pump station.
- Pump Stations – Provide for local collection of liquid and introduction into the perimeter force main. These may be CT, LS, PS, or dedicated lift station features.
- Perimeter Force Main – Pressurized pipe which conveys collected liquid to the leachate pretreatment system.

Leachate Pretreatment and Discharge System

- Storage Tanks – Large steel tanks used for equalization, storage, and discharge control.
- Treatment Tanks – Large steel tanks used as an active component of the pretreatment system.
- Pretreatment Building and Equipment – Process equipment, used together with the storage tanks and pretreatment tanks, to pretreat liquid to standards acceptable to the Metropolitan Sewer District (MSD).

A schematic drawing showing these components is provided as Figure 1.

Since the leachate management systems need be modified to adjust to the conditions caused by the SSE, specific component quantities, ID numbers, etc. may not be referenced in this Volume 3 of the OM&M Plan. Instead, a current set of record documents and as-built drawings will be

maintained in the Environmental Manager's office at all times. In addition, this volume references other documents that will be kept on site including: a Health and Safety Plan (specifically designed for activities related to this OM&M Plan), equipment operating manuals, etc.

2.0 OPERATION

2.1 Liquid Collection System

2.1.1 Leachate Collection Sumps

Leachate Collection Sumps (LCS) are the primary leachate removal feature at the Bridgeton Landfill. In accordance with Operating Permit #118912, leachate levels in the six sumps must be maintained no more than 50 feet (North Quarry) or 30 feet (South Quarry) above the bottom of the sump.

Presence of the thermal event has made long-term successful operation of the sumps in the South Quarry area more challenging due to the accelerated settlement (which warps and displaces the sump casing) and elevated temperatures (which stresses the mechanical components of the sump and may produce a thick, tar-like substance that clogs well screens and pumps). Procedures for operating the leachate collection sumps are provided in Appendix A and Table 1.

2.1.2 Gas Extraction Well Dewatering

Efficiency for some gas extraction wells is enhanced by adding dedicated down-hole leachate pumps. Liquid pumped from these dual phase gas/leachate extraction wells is directed to the leachate collection system via a network of liquid transmission lines, which are connected to the perimeter leachate collection system. Operation and details regarding this system are provided in Volume 2 of this OM&M Plan.

2.1.3 Subcap Collection (South Quarry Area)

The subcap drains are a series of liquid infiltration drains installed beneath the FML cap areas. The drains convey collected liquid to the leachate collection system. These drains collect liquids that might be expressed onto the ground surface and from condensation which may occur below the temporary FML cap. Liquids collected by the subcap collection drains are passively conveyed by gravity to a series of perimeter sumps installed near the perimeter or toe of slope (designated with PS- prefix on Figure 1). Liquid collected in the LS features is introduced into the liquid collection system with pneumatic pumps as described in Section 2.2.2.

2.1.4 Condensate Removal

For purposes of this document, condensate will be considered liquid that forms in the Gas Collection and Control System (GCCS) lateral and header pipes due to temperature drop and condensation of liquid out of the gas stream. Condensate drains thorough the gas conveyance pipes by gravity and is collected near the perimeter of the landfill in condensate traps or sumps (designated with CT- # prefix on Figure 1). From there it is pumped into the perimeter force

main and comingled with leachate at the site. The condensate traps are operated as pump stations as described in Section 2.2.2.

2.2 Liquid Conveyance System

2.2.1 Lateral Conveyance Piping

Below-grade and above-grade leachate transmission pipes are used to convey leachate from sumps, dewatering wells, and subcap drains to a larger-diameter perimeter leachate collection pipe. The conveyance piping are passive features which do not require specific operating procedures. Inspection and maintenance are discussed in Section 3.2.1.

2.2.2 Pump and Lift Stations

As previously discussed, a new pump station is currently being redesigned together with a new perimeter force main; a comprehensive set of operating procedures for the new pump station will be provided prior to operation. In addition, any location in which a pump is placed to lift liquid out of a vessel and into the perimeter force main is included in this category (e.g. leachate sumps and condensate traps).

2.2.3 Perimeter Force Main

Below-grade and above-grade leachate perimeter force main are used to convey leachate from the pump stations to the leachate pretreatment area. The force mains are passive features which do not require specific operating procedures. Inspection and maintenance are discussed in Section 3.2.3.

2.3 Leachate Pretreatment System

As previously discussed, leachate treatment is currently in an interim management stage until the new systems have been implemented. At the present time, operation and maintenance of the leachate pretreatment system is described in the following documents:

1) Leachate Tank and Transport Disposal/Leachate Management, May 30, 2013 by Civil & Environmental Consultants
    - Operation and Maintenance Manual by Landmarc Environmental Systems
    - Interim Leachate Management Plan by Feezor Engineering

2) Bridgeton Landfill Leachate Tank and Transport Disposal/Leachate Management, July 25, 2013 by Civil & Environmental Consultants, Inc.
    - Updated Interim Leachate Management Plan by Feezor Engineering

3.0 MAINTENANCE

The leachate collection system has been designed and constructed to meet current state-of-the-practice operation, durability, and environmental security. However, it is a complex mechanical and electrical system having many components subject to severe environmental and chemical stresses in normal circumstances and which are exacerbated by the conditions caused by the SSE. These stresses include:

- Harsh weather conditions
- Continuous operation
- High liquid temperatures
- Corrosive liquids
- Aggressive compounds detrimental to most seals and gaskets
- Potentially explosive vapors
- High dissolved organic solids and biological anaerobes
- High dissolved mineral content

Even the most robust systems operating in these conditions require consistent maintenance to provide satisfactory operation and performance. The nature of some of the conditions noted is unique to the SSE in the South Quarry area, and as such, Bridgeton Landfill has evolved maintenance regimens not normally required at a typical MSW landfill.

3.1 Liquid Collection System

3.1.1 Leachate Collection Sumps

Inspections and maintenance required for the LCS sumps are provided on Table 1. A form to be completed for the inspections is provided as Appendix B.

3.1.2 Gas Extraction Well Dewatering

Inspection and maintenance details regarding this system are provided in Volume 2 of this OM&M Plan.

3.1.3 Subcap Collection

Inspection and maintenance procedures for the subcap drains are provided in Appendix C and Table 1.

3.1.4 Condensate Removal

Inspections and maintenance required for the condensate traps (CT- #) are provided on Table 1. A form to be completed for the inspections is provided as Appendix E.

3.2 Liquid Conveyance System

3.2.1 Lateral Conveyance Piping

Maintenance procedures for solid single-wall and double-walled leachate transmission pipes are provided in Appendix D.

3.2.2 Pump Stations

Perform the maintenance tasks identified in Appendix E at the frequencies presented in Table 1.

3.2.3 Perimeter Force Main

Maintenance procedures for solid single-wall and double-walled perimeter force main pipes are provided in Appendix D.

3.3 Leachate Pretreatment System

As previously discussed, leachate treatment is currently in an interim management stage until the new systems have been implemented. At the present time, operation and maintenance of the leachate pretreatment system is described in the following documents which are incorporated into this volume of the OM&M Plan by reference:

1) Leachate Tank and Transport Disposal/Leachate Management, May 30, 2013 by Civil & Environmental Consultants
    - Operation and Maintenance Manual by Landmarc Environmental Systems
    - Interim Leachate Management Plan by Feezor Engineering

2) Bridgeton Landfill Leachate Tank and Transport Disposal/Leachate Management, July 25, 2013 by Civil & Environmental Consultants, Inc.
    - Updated Interim Leachate Management Plan by Feezor Engineering

TABLES

Table 1 – Inspections and Maintenance for the Leachate Management Systems

Item or Conditions to Be Inspected	Approximate Inspection Frequency	Inspection and Correction Procedure	Location of Inspection Form
Leachate Collection Sump (LCS) Wellheads	Weekly	Inspect and maintain wellheads to ensure consistent and reliable operation including, fittings, joints, corrosion, riser pipe.	Appendix B
Leachate Collection Sump (LCS) Flow Meters	Weekly	Check flow meter reading, and transducer reading. Check total flow vs. historic average. If inconsistent, and evidence that pump is running, repair or replace flow meter.	Appendix B
Subcap Leachate Collectors	Weekly	Observe and document any liquid bulging at toe of cap or collecting in pool under cap.	Appendix C
Subcap Leachate Collectors	As Needed	Jet clean accessible subcap leachate collectors.	Appendix C
Perimeter Leachate Transmission Pipes	As Needed	Jet clean accessible subcap leachate collectors.	Appendix D
Pump Stations: Condensate Traps (CT), Perimeter Sumps (PS) and Leachate Sumps (LS)	Monthly	Inspect and exercise valves, inspect and make sure floats operate freely, observe pumping cycle to verify correct off/on cycling.	Appendix E
Leachate Storage/Treatment Tanks	Various	Inspect and repair as described in Appendix F.	Appendix F

Note: Additional features will be added as design and installations are finalized.

FIGURES

EXISTING DETENTION BASIN

NORTH DETENTION BASIN

LCS-6B

LCS-5A

LCS-1D

LCS-3C

LCS-2D

LCS-4B

NORTH QUARRY

SOUTH QUARRY

EAST DETENTION BASIN

BOENKER LANE

MAINT. BLDG

TRANSFER STATION

LEACHATE PRETREATMENT AREAS

316,000 GAL. LEACHATE AST

96,000 GAL. LEACHATE AST

MSD INLET FOR APPROVED WASTEWATER

LEGEND

- SOLID WASTE PERMIT BOUNDARY
- FML CAP BOUNDARY
- PERIMETER GRAVITY LEACHATE HEADER
- LEACHATE TRANSMISSION PIPE
- TOE LINE OF CAP DRAINAGE
- LCS-3C — LEACHATE COLLECTION SUMP
- LS-9 — LEACHATE TRENCH LIFT STATION
- PS-21 — SUBCAP DRAIN PUMP STATION
- CT-8 — CONDENSATE TRAP

NOTES

1. PRELIMINARY SURVEY INFORMATION OF SUMPS AND LINES PROVIDED BY WEAVER BOOS CONSULTANTS.
2. LEACHATE CONVEYANCE AND PRETREATMENT SYSTEMS ARE UNDERGOING SIGNIFICANT UPGRADES. THIS FIGURE WILL BE REVISED AS NEEDED.

NORTH

SCALE IN FEET

0 200 400

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BRIDGETON LANDFILL OPERATION, MAINTENANCE, & MONITORING PLAN VOLUME 3

LEACHATE MANAGEMENT SYSTEMS SCHEMATIC

DRAWN BY:	MSP	CHECKED BY:	MRB	APPROVED BY:	IAC	FIGURE NO.:	1
DATE:	AUG. 2013	DWG SCALE:	1"=200'	PROJECT NO:	131-178		

APPENDIX A

LEACHATE COLLECTION SUMP OPERATING PROCEDURES

APPENDIX A

Leachate Collection Sump Operation Procedures

Leachate Collection Sumps (LCS) are each programmed to operate using dedicated 3-phase electrical pumps, transducers and variable frequency drives (VFDs).

- Individual pumps are sized based on sump depth and historical leachate volume. Pump manufacturer information and LCS as-built documentation will be retained in the site file system in a binder "Leachate Collection Sumps."
- VFDs shall be programmed to pump liquid to a specified set-point (either 30' above quarry floor or 50' above quarry floor as required by Operating permit No. 118912) and hold that level by regulating pump speed and operation as the sump recharges.
- Operate LCS pumps 24 hours per day, with automated temporary shutdown periods when pumping rate exceeds liquid recharge.
- Use Appendix B form for documenting operational problems or issues.

APPENDIX B

LEACHATE COLLECTION SUMP OPERATING FORM

APPENDIX B

BRIDGETON LANDFILL

LEACHATE COLLECTION SUMP INSPECTION FORM

Date of Inspection: _____

Name of Inspector: _____

Inspection Item	Item Tracking Number(s)
Weekly	
Fittings	
Joints	
Corrosion	
Riser Vertically	
Absence of Flow	
Flow Meter Performance	
Flow Meter Reading	
Transducer Reading	
Control Room Climate Control System	

Note: See attached Leachate Collection Sump Inspection Item Tracking Form (one per item indicated on the above form).

Inspection Items		
Sump ID	Date	Time
LCS-1D		
LCS-2C		
LCS-3C		
LCS-4B		
LCS-5A		
LCS-6B		

BRIDGETON LANDFILL

LEACHATE COLLECTION SUMP INSPECTION
ITEM TRACKING FORM

Tracking No._____ (e.g. MMDDYY-____)

Inspector's Name: _____

Inspection Item Noted:

Description: _____

Location: _____

Other: _____

Follow-up Technician's Name: _____

Incident Resolution Description: _____

_____

_____

Date of Resolution: _____

_____

Follow-Up Technician's Signature

APPENDIX C

SUBCAP LEACHATE COLLECTOR INSPECTION FORM

APPENDIX C

BRIDGETON LANDFILL

SUB-CAP LEACHATE COLLECTOR INSPECTION FORM

Date of Inspection: _____

Name of Inspector: _____

Inspection Item	Item Tracking Number(s)
Weekly	
Liquid at toe of slope	
Liquid pool under cap	
Annually	
Jet clean sub-cap collectors	

Note: See attached Sub-cap Leachate Collection Inspection Item Tracking Form (one per item indicated on the above form).

BRIDGETON LANDFILL

SUB-CAP LEACHATE COLLECTOR TRACKING FORM

Tracking No._____ (e.g. MMDDYY-____)

Inspector's Name: _____

Inspection Item Noted:

Description: _____

Location: _____

Other: _____

Follow-up Technician's Name: _____

Incident Resolution Description: _____

_____

_____

Date of Resolution: _____

_____

Follow-Up Technician's Signature

APPENDIX D

TRANSMISSION PIPE MAINTENANCE PROCEDURES

APPENDIX D

Leachate Transmission Pipe Maintenance Procedures

The intent of pipe cleaning is to remove foreign materials from the lines and restore the pipe to near the original carrying capacity. It is recognized that there are some conditions such as broken or damaged pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions occur, the operator will contact the Environmental Manager before proceeding.

Choose the right nozzle for the job. This decision is based on several different factors such as amount of flow, pipe type, pipe size, and condition of the lines. The operator must also pick the appropriate fins to mount the nozzle onto. The operator, or helper, will prop down enough rodder hose slack to be able to place the nozzle in the mouth of the pipe with the tiger tail at the top of the pipe to keep from tearing the rodder hose. Turn the water pressure on efficient enough to shoot the nozzle in until the end of the leader hose is showing in the mouth of the pipe. At this time, clear the footage counter and set it to zero so the footage can be measured properly.

In general, a 15 degree nozzle is used for high grade, long lines and when penetrating blockages. A 30 degree nozzle is best for cleaning due to the juts of water hitting the wall more directly and closer to the nozzle.

Allow hose to feed itself through the line at a moderate pace. It may be best to feed hose about 30 feet and return, then 50 feet and return and 25 feet and return until end of run, if line is tightly packed. Continue to jet the line until nothing but clear water comes through the line while bringing the nozzle back to the starting position.

When reaching the end of the run, pull the hose back by reversing direction of the control valve lever. If the line is clean, minimum water pressure is needed. When the nozzle returns to the point of entry, lower pressure completely by reducing engine RPM using the throttle control on reel frame. Disengage the auxiliary motor and return the tubes to the racks and place the boom back into transport position.

Recommended jet-rodding frequency shall be as follows:

Perimeter Collection Pipes	Annually
Leachate Collection Sump Pipes	Semi-Annually
Subcap Drains	Annually
Gas Extraction Well Transmission Pipes	N/A (replace sections of pipe if believed to be obstructed)

During construction, upgrade, or modification periods, it may not be possible to strictly meet the recommended schedule.

APPENDIX D

Specific precautions are provided below:

Precaution	Procedure
1	Provide containment by constructing temporary berms and deploying plastic sheeting if back flow is expected.
2	When jetting down gradient, verify receiving structure and control valves are in ready position to receive jet flow.
3	Vacuum the expressed liquids as they discharge.
4	Vacuum up remaining liquid expressed from cleanout.
5	Excavate impacted soil and place in landfill working face.

In addition to keeping the pipes open, an important function of the jet-rodding process is to verify the pipes are open throughout their entire length. The operator will note the maximum distance attained and record it in the form next to the known, constructed length. An example of the records to be kept is attached (form that has been used historically for jet-rodding the cell floor leachate collection lines at the site). If a large disparity between attained length and constructed length is observed, the Environmental Manager will be notified for further direction.

APPENDIX E

PUMP STATION MAINTENANCE PROCEDURES
(To Be Provided After Fall 2013 Improvements)

APPENDIX F

LEACHATE STORAGE/TREATMENT TANK MAINTENANCE PROCEDURES

(Procedures To Be Modified And Supplemented As Additional Tanks Are Constructed And Utilized)

APPENDIX F

Bridgeton Landfill

96,000 Gallon Leachate Tank System

Standard Operating Procedure

July 2012
Rev. September 2013

Bridgeton, Missouri
13570 St. Charles Rock Road
Bridgeton, Missouri 63044
Telephone: (314) 744-8190
Facsimile: (314) 739-2588

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ATTACHMENTS

1.0 INTRODUCTION

This document is the site Standard Operating Procedure (SOP) for operation and maintenance of the leachate tank system at the Bridgeton Landfill, 13570 St. Charles Rock Road, Bridgeton, Missouri 63044. This SOP has been developed by the Bridgeton Landfill for use by onsite personnel involved with the leachate tank system operation and preventative maintenance. The purpose of this document is to establish a set timeframe for inspection, operation, maintenance, repair, and regeneration of each of the components of the facilities leachate storage, recirculation, and extraction tank to sustain permissible discharge effluent of the facility.

1.1 Tank Background and Goal

Leachate is permitted to be discharged to the Metropolitan St. Louis Sewer District (MSD) under Wastewater Discharge Permit No. 0511559802-2. To assist the facility in ensuring that effluent leachate constituent concentrations are below permitted limitations, and that excessive levels of methane and hydrogen sulfide are not released into the MSD sanitary sewer system the facility has implemented a number of engineering controls.

The Bridgeton Landfill utilizes an 96,000-gallon capacity Aquastore, glass-lined liquid collection tank to contain, recirculate, atomize, and subsequently extract toxic gases entrained in the leachate produced within the facility prior to discharging. The tank has a series of valves that can be actuated to regulate various activities within. Dependent on valve position the tank liquid level and discharge rate can be controlled, the leachate can be stirred to free up any tank deposits from settling, or it can be run through the atomizer.

The leachate tank is also fitted with a 2” high-density polyethylene vacuum line. This line, operating courtesy of vacuum provided by the landfill’s gas control and collection system blower is designed to remove gases such as methane and hydrogen sulfide commonly found in leachate, as well as vapor-phase organic constituents.

As a redundancy the Bridgton Landfill leachate tank system employs a dual carbon-vessel filtration system to supplement any temporary loss of vacuum to the tank from the main extraction line. In the case of a gas collection and control system malfunction this system is able to perform the duties of gas removal from the tank until the issue can be corrected.

Each system, as explained in this SOP has a monitoring schedule and contingency plan to insure proper and sustained operation.

1.2 List of Leachate Tank Operations Personnel

The following table represents the Bridgeton Landfill Personnel responsible for leachate tank system operation. The table details each individual’s specific responsibilities regarding leachate tank operation and individual contact information:

Table 1-1 Leachate Tank System Operational Personnel

Title	Personnel	Phone numbers	
		Work	Mobile
Environmental Manager	**Brian Power**	**(314) 744-8165**	**(618) 410-0157**
Leachate Collection System Specialist	**Bryan Sehie**	**(314) 744-8190**	**(314) 443-0179**
Gas Control and Collection System Specialist	**Mike Lambrich**	**(314) 744-8175**	**(314) 683-3921**

2.0 LEACHATE TANK SYSTEM OPERATION AND MAINTENANCE

2.1 Tank Level Control Valve

The dimensions of the Aquastore leachate containment tank are 25 ft. in diameter by 29 ft. in height. The tank is equipped with two inlets, each of which deposit leachate from opposite sides of the landfill. The tank is also equipped with two outlets; a gravity drain, positioned near ground-level; and an anti-siphoning overflow drain near the top of the tank. Leachate is typically controlled through actuation of the bottom gravity drain through a butterfly valve on the outside of the tank. The top-located, anti-siphoning drain is designed to prevent tank overflow in the event that influent leachate volume surpasses gravity drain capability. Operation and maintenance duties and frequencies are as follows:

Operation:

- To optimize efficiency of the atomization and extraction unit in the system, a maximum tank liquid level between 6 ft. and 16 ft. shall be maintained. Maintaining this liquid level allows for sufficient headspace, and atomization time within the tank to promote ideal gas and vapor removal.
- The tank level indicator is located within the tank secondary containment wall, on the control panel.
- If the tank level is not within the optimal range, the gravity drain valve should be readjusted to the appropriate setting. If the tank level has accumulated above 16 ft., the drain valve control should be adjusted slightly to the right. If the tank level has dropped below 6 ft., then the drain valve control should be adjusted slightly to the left. If the tank level has lowered below 5 ft. in height the centrifugal recirculation pump should be restarted.
- Tank level monitoring is to take place once each week to ensure desired tank level is maintained.

Maintenance:

- Inspect all drainage valves, piping and flanges for leaks and excessive wear.
- Ensure that the tank level measurement display is functional.

2.2 Leachate Atomizer

The tank is outfitted with a centrifugal pump which quaffs leachate accumulation from the bottom of the tank and draws it upward through a 2” high-density polyethylene line to the roof of the tank where it is then forced, at a high rate of pressure, through a spray atomizer nozzle. The atomization process helps to strip the leachate of entrained gases and organic vapors such as methane and hydrogen sulfide by spraying the liquid high above the tank accumulation level in a 50 degree wide spray pattern. The atomization system is designed to run 24 hours a day 7 days a week, unless the tank circulation system is activated. Operation and maintenance duties and frequencies are as follows:

Operation:

- Check centrifugal pump to ensure that it is powered on. The start/stop buttons are located on the tank control panel inside the leachate system secondary containment wall.
- Inspect atomization discharge line valve to make sure that it is in the “on” position.

- Operational check of the leachate atomizer is to be performed once per week.

Maintenance:
- Inspect centrifugal pump for leaks, damage, and excessive wear.
- Inspect piping for leaks, and excessive wear.

2.3 Leachate Circulator

The leachate circulator serves the purpose of stirring the tank to break up any deposited sediment or build-up that has settled at the bottom of the tank and allow it to drain through the lower gravity-drain outlet. The leachate circulator is typically not in operation due to the operation of the atomizer. Being that the circulation system uses the same centrifugal pump to operate as the atomizer the two systems cannot run in tandem. To stir the tank the atomizer valve must be turned to the "off" position, and the circulator value must be moved to the "on" position. This will direct liquid to the circulator. Both valves must not remain closed for an extended period of time as this will cause a "dead-pan" scenario which may cause premature damage to the pump. The operation and maintenance duties and frequencies are as follows:

Operation:
- When operating the circulator, first completely open the circulation valve located at the inlet of the circulation piping near the tank centrifugal pump.
- Once the circulation valve is open completely close the atomizer valve.
- Reverse the process when finished.
- Check centrifugal pump to ensure that it is powered on. The start/stop buttons are located on the tank control panel inside the leachate system secondary containment wall.
- Do not operate the circulator for more than 24 hours so that the atomizer may be returned to service.
- This system should only be operated on an as-needed basis.

Maintenance:
- Inspect centrifugal pump for leaks, damage, and excessive wear.
- Inspect piping for leaks, and excessive wear.

2.4 Gas Extraction Vacuum Line

Gases present from the atomization of leachate are subsequently extracted through a 2" high-density polyethylene vacuum line located at the roof of the tank. The line is directed to the landfill's gas collection and control system network, where the captured gases are ultimately routed to the landfill flare and destroyed. The flare blower provides between 2" and 11" of vacuum at the tank for such gas removal. Similar to the gas collection system, the leachate system lines will develop condensate. As such, the leachate gas extraction system contains an underground sump which collects any accumulation of condensate in the line and pumps it back into the leachate collection system. This sump unit helps to return lost liquids to the leachate system and maintains a free flow of vacuum in the line by preventing it from "watering-in." The operation and maintenance frequency of the gas extraction vacuum line is as follows:

Operation:

- The gas extraction vacuum line is always in operation so long as the landfill gas collection and control system is also operational.
- A vacuum reading should be taken once each week to ensure that the system is flowing freely. The vacuum monitoring port is located on the vacuum line at eye-level just outside of the east section of the tank secondary containment wall.
- The pump in the condensate sump should be checked for operation once per week to ensure that any liquid accumulation is being removed from the system.
- In the event of a gas collection and control system malfunction, the carbon filtration system should be turned on.
- If necessary the vacuum to the tank can be shut off via the vacuum control valve located next to the vacuum monitoring port.

Maintenance:

- Inspect all vacuum lines and fittings shall be inspected for leaks and signs of damage or excessive wear.

2.5 Carbon Vessel Filtration System

As a redundancy to the gas extraction vacuum system, the Bridgeton Landfill has also implemented a carbon vessel filtration system. This system can apply vacuum to the tank and remove gases and vapor by drawing them out through a 6" PVC line in the tank's roof and directing them through a series of two granular activated-carbon vessels. The vessels are arranged in a lead-lag scenario were the primary (lead) vessel is designed to remove 100% of all incoming toxic gasses. Monitoring ports are installed prior to the influent of the lead vessel to collect data on gas composition as it enters the carbon media. A second sampling port is installed at the effluent of the lead vessel to monitor for any break-through. Airflow from the lead vessel effluent is subsequently directed to the second (lag) vessel as a redundancy to ensure that no possible break-through of gases to the atmosphere occurs. The effluent of the lag vessel is also monitored. The carbon filtration system has a vacuum pump that is independent of the gas collection and control system so that it can be operated in the event the latter system experiences a malfunction. This offers the ability to have uninterrupted gas and vapor removal at the leachate tank. When the carbon filtration system is in operation the operation and maintenance frequency is as follows:

Operation:

- In the event of a gas collection and control system malfunction the carbon filtration system shall be powered on. This can be done by positioning the carbon filtration system control lever to "on." The control lever is located on the panel, to the right of the main leachate tank control panel, inside the secondary containment area.
- During operation the three monitoring ports in the system should be read on a daily basis to ensure that hydrogen sulfide break-through at the lead vessel has not occurred. Monitoring for hydrogen sulfide will be performed using a 4-gas meter. In the event that hydrogen sulfide concentration at the effluent of the lead vessel reaches 5 ppm the carbon in the lead vessel shall be replaced.
- Replacement virgin granular activated-carbon is stored onsite. Once a 5 ppm hydrogen sulfide break-through is detected, spent carbon will be removed from the lead vessel using a drum-vacuum. The carbon will be containerized in 55-gallon

drums and marked for proper disposal. Virgin carbon will be placed in the vessel and operation can be restored.

- During operation of the system a daily condensate accumulation check must be performed to insure that there has not been any accumulation in the demister box. Due to the installation of a condensate knock-out pot this scenario is unlikely under daily monitoring.
- The effluent to the atmosphere will be monitoring using a 4-gas meter as well to ensure overall system performance. The lag vessel will receive a carbon replacement when effluent concentration reaches a level of 5 ppm hydrogen sulfide. Replacement virgin carbon for the lag vessel is also stored onsite.

Maintenance:

- Inspect all PVC, lines, piping, and valves in the carbon system network for leaks, damage, or excessive wear monthly.
- Inspect demister box to ensure lid is in place, seated, and free of damage monthly.
- Drain any condensate from the knock-pot as needed.
- Make sure that carbon filtration system vacuum pump is operational on a monthly schedule.

3.0 ADDITIONAL MEASURES

3.1 Bridgeton Landfill Discharge Junction Vault Monitoring

The Bridgeton Landfill has also installed an additional multi-gas monitoring port within the leachate discharge junction vault situated to the north of the leachate tank area. This vault is the last monitoring location of the leachate discharging from the landfill prior to entering the MSD pump station. The addition of this sampling port will allow the landfill to measure levels of methane and hydrogen sulfide in the leachate piping immediately prior to discharge. This sampling port will be monitored monthly to ensure that effluent leachate gas levels will not be excessive in the sanitary sewer system.

ATTACHMENT A

STORAGE TANK INSPECTION FORM

Bridgeton Landfill
Monthly Storage Tank Inspection

Date:_____

Inspected by:_____

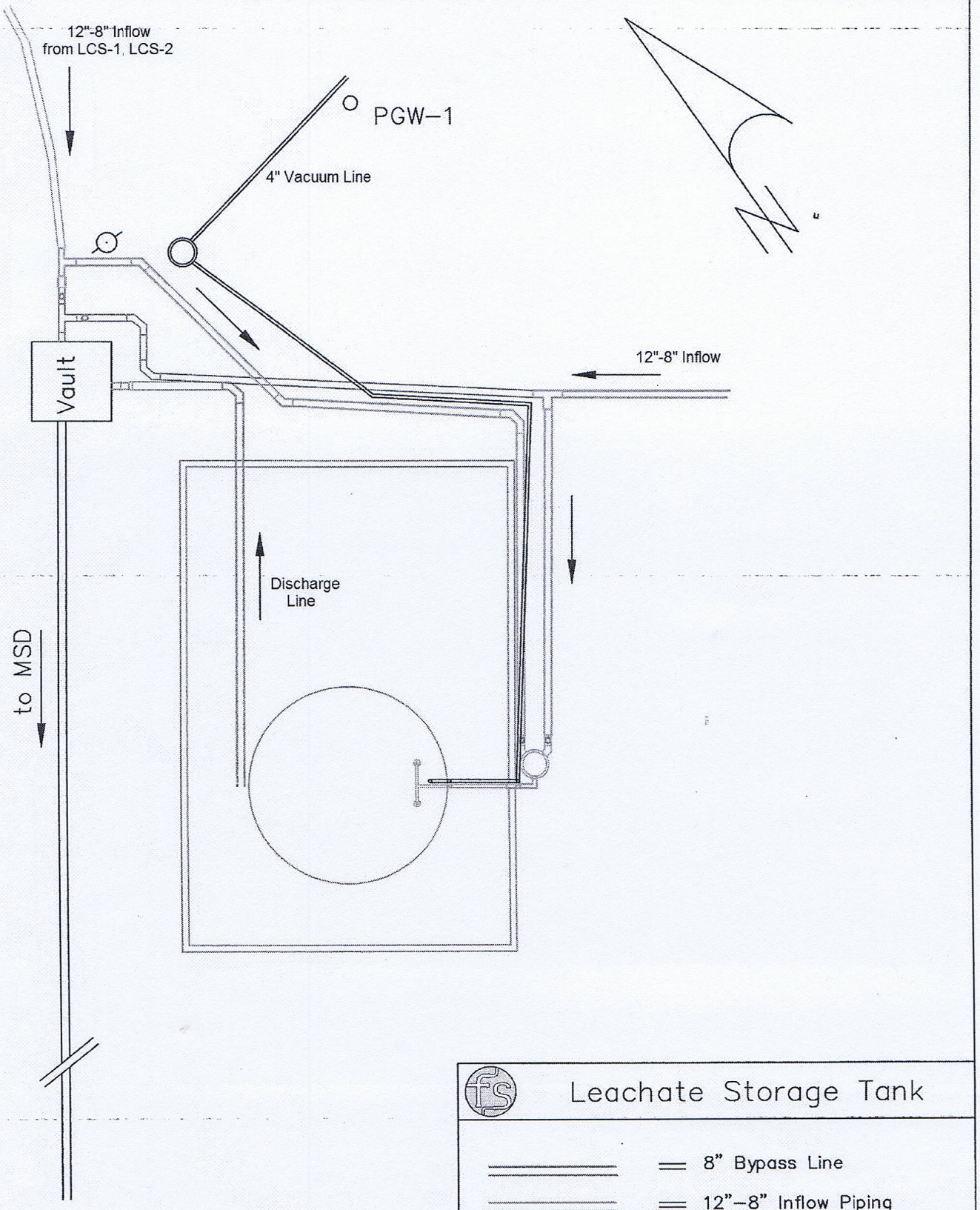
Tank inspections:	Leachate Tank	Comments
Rust	Yes ☐ No ☐	
Leaks (piping or valves)	Yes ☐ No ☐	
Cracks	Yes ☐ No ☐	
Pipe supports secure	Yes ☐ No ☐	
Signs and Labels legible	Yes ☐ No ☐	
Outdoor lighting working	Yes ☐ No ☐	
Ladder secure	Yes ☐ No ☐	
Heat trace ON	Yes ☐ No ☐	
PurAir System	Yes ☐ No ☐	
Trip Hazards	Yes ☐ No ☐	
House keeping	Yes ☐ No ☐	
Drains free of debris	Yes ☐ No ☐	
Leaks in pump area	Yes ☐ No ☐	
Cracks/Deterioration of Secondary Containment	Yes ☐ No ☐	
Stormwater within Secondary Containment	Yes ☐ No ☐	

Any changes to the flow valves should be recorded.
If pump or other system is noted to be malfunctioning or deficient, note observation in "Comments" section
Any leak, spill or alarm condition should be reported to O&M Manager
Corrections made to any malfunction noted on this page must be recorded on the back side of this form

ATTACHMENT B

TANK DIAGRAM

Bridgeton CF
7.6



Leachate Storage Tank

- 8" Bypass Line
- 12"–8" Inflow Piping
- 12"–8" Discharge piping
- Leachate Storage Facility
- 4" Vacuum Line