Bristol Integrated Solid Waste Management Facility Odor Management and Control Plan

Bristol Integrated Solid Waste Management Facility
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1.0 INTRODUCTION

The City of Bristol (City) prepared an initial Odor Management Plan for the Integrated Solid Waste Management Facility (ISWMF, Facility, or Landfill) in conformance with VDEQ's Submission Instruction 13: Landfill Gas Management, Remediation, and Odor Plans for Solid Waste Disposal Facilities dated June 7, 2021. The implementation of this initial Odor Management Plan was required to occur in conjunction with waste placement activities in the Permit #588 disposal cell. The Facility committed to reviewing the Odor Management Plan annually, and as part of the annual review the Facility expanded upon the original plan, hereafter referred to as the Odor Management and Control Plan (OMCP or Plan). The 2024 annual review of the OMCP covers changes and updates to the Landfill Gas Collection and Control System (LFGCCS), current Best Management Practices (BMPs), strategies to optimize odor management and control based on the Expert Panel Report dated April 25, 2022, and current site conditions.

This OMCP describes the current practices and technologies utilized by the City and its contractors to minimize off-site odors and address odor complaints received by the Facility. The Plan discusses the current BMPs as well as available strategies under consideration to mitigate odors, including strategies for upgrading and maintaining the LFGCCS, and response procedures for fugitive LFG releases and odors associated with the operation of a sanitary landfill. The Facility is continuing to evaluate the findings and recommendations regarding odor management and control from the Expert Panel Report which are referenced and considered throughout the Plan.

The structure of the Plan is as follows:

- Section 2 is a description of odor sources and existing controls supplied by the LFGCCS.
- Section 3 describes existing strategies for controlling odors, including measures to increase the efficiency of the LFGCCS, and best available control technologies and practices.
- Section 4 describes odor monitoring procedures and hydrogen sulfide (H_2S) monitoring procedures, as well as associated remedial action procedures implemented at the facility.
- Section 5 describes the management of odor complaints, e.g., recordkeeping and reporting practices to log odor complaints and annual reporting.
- Section 6 describes the community outreach program initiated by the facility and other public relations efforts related to odors,
- Section 7 potential new endeavors that are under consideration by the Facility to improve odor mitigation efforts.

2.0 FACILITY DESCRIPTION

The ISWMF is now a closed solid waste facility owned and operated by the City of Bristol, Virginia, with three landfill units within its property boundary. The first landfill unit (Permit #221) received waste from 1977 to 1986 and is closed and capped. The second landfill unit (Permit #498) received waste from 1986 to 1998 and was mined until mid-2022 to recover airspace for potential future use as a construction and demolition debris (CDD) landfill. Mined materials were disposed of in Permit 588. Final Closure of the Permit #498 Landfill occurred on 5/15/24. The third landfill unit (Permit #588) is an inactive landfill within a former limestone rock quarry that commenced operation in March 1998 and ceased waste acceptance on September 9, 2022.

The Solid Waste Permit #588 for the quarry landfill allowed receipt of up to 1,600 tons of municipal solid waste per day prior to ceasing waste acceptance, with a total permitted volume of 7,800,000 cubic yards (yd^3). The quarry landfill received an average of 500 tons of municipal waste per day.

There are landfill gas collection systems installed in Permit #221, Permit #588, and Permit #498 Landfill.

2.1 BACKGROUND

The Facility began receiving odor complaints in late October 2020. Most of the initial complaints originated from neighborhoods located to the north of the Landfill or to the south and southwest of the Landfill in Tennessee. Previous actions taken in response to the odor complaints included:

- City personnel driving through nearby neighborhoods to assess odors with olfactory senses.
- City personnel monitoring offsite locations to screen for typical LFG constituents such as methane and hydrogen sulfide (starting in December 2020).
- Upgrades to the LFGCCS in the quarry landfill, including a new horizontal collector and LFG collection piping. SCS Field Services completed LFG System improvements in March 2021.
- Additional cover soils placed on inactive areas of the quarry landfill In January 2021, and the size of the working face minimized.
- City personnel collecting two air samples from locations with known odors on January 10, 2021. The samples were analyzed for volatile organic compounds (Method TO-15). No predominant odor-causing compounds were identified from this sampling event.
- LFG design construction and bidding documents for 21 additional LFG extraction wells in the quarry landfill were produced in the summer of 2021. Aptim completed LFG drilling of the 21 LFG vertical extraction wells proposed on the SCS documents in Fall 2021. The City retained SCS Field Services Construction to install above grade LFG collection piping and connect to the existing system, as well as install dewatering pumps in select wells and dewatering piping.
- Subsequent to ceased waste acceptance, Permit #588 received daily cover placement and verification of soil depth testing on 11 October 2022.
- Subsequent to soil cover placement activities, soil depth verification testing occurred on 4 May 2023 for Permit #498.
- SCS Field Services (FS) Construction commenced construction of the Sidewall Odor Mitigation System (SOMS) and LFG Collection System Expansion in December 2022, which became operational in June 2023.
- SCS-FS Construction began the LFGCCS Phase I Expansion in March 2023 with construction activities completed in October 2023.
- The Permit #498 Final Cover System construction activities began in October 2023 and were completed in May 2024 by Baker Construction Services.

2.2 POTENTIAL ODOR SOURCES

The ISWMF has multiple potential sources of malodorous emissions, however the primary source is assumed to be the inactive quarry landfill, where fugitive decomposition gases emitted from the buried waste materials emanate from the sidewalls and landfill surface. Other potential odor sources at the site include:

- LFG emissions resulting from inefficiencies in the LFG System
- Composting operations
- Wet wells (498/588)
- Leachate seeps
- Sewage/Leachate manholes
- Areas with ponding/standing liquids (498/588)
- Elevated landfill temperatures
- Wood waste grinding storage pile
- Construction activities involving drilling, trenching, or otherwise excavating into waste
- Exhaust from vehicle traffic

There are instances where malodorous emissions generated off-site may be mistakenly attributed to the Landfill. Examples of such off-site malodorous emissions include exhaust from vehicle traffic, highway construction, and waste hauling vehicles.

2.3 ODOR CONTROLS

The design, construction, operation, monitoring, and testing of the LFGCCS is regulated by the Facility's Stationary Source Air Permit and Title V Air Operating Permit. In addition, as required by Virginia's air quality and solid waste regulations, the Facility prepared and implemented an NSPS Design Plan and LFG Management Plan to capture and treat LFG.

The network of LFG extraction components (vertical wells, leachate cleanouts, and horizontal collectors) is a vital part of the functionality of the overall LFGCCS and contributes to controlling odors by collecting LFG generated within the waste mass by routing the LFG to one of the control devices. The control devices, which enable the system to control odors, are identified in routine reports and documentation submitted to VDEQ. These components include one temporary utility flare connected to a multi-stage centrifugal blower for extracting LFG from the landfill.

As of May 16, 2024, the LFG is combusted at the temporary 2,500 cfm Parnel utility blower/flare system. The existing 1,250 scfm Parnel blower/flare system serves as a backup. The temporary PEI flare and onsite power plant permanently ceased operation and the control equipment was removed from the Facility. The power plant went offline in August 2023 and the PEI flare shutdown on May 16, 2024. Combustion of the extracted LFG at the 2,500 cfm Parnel flare is the primary means of destroying malodorous compounds present in the LFG. The City is in the planning and engineering design phase of a permanent blower/flare system to appropriately combust the maximum LFG flows expected based on the data recorded over the past year.

3.0 STRATEGIES FOR CONTROLLING ODORS

The Remedial Action Plan to the Expert Panel Report was submitted to VDEQ in July 2022 to address the feasibility and prioritization of initiatives identified by the Expert Panel (Panel). The following are examples of the objectives recommended by the Panel that were implemented by the Facility:

- Landfill Gas Collection System Expansion and Improvements (Section 3.1)
- Sidewall Improvements/Odor Mitigation System (Section 3.3)
- Interim Cover (Section 3.5)
- On-site Benzene Treatment Facility (Section 3.8)

Expansion of Community Outreach (Section 6.0)This section discusses these (with the exception of community outreach) and various other strategies utilized by the Facility for effective control of malodorous emissions.

3.1 EFFECTIVE LANDFILL GAS COLLECTION AND CONTROL SYSTEM OPERATION

The Facility is required to meet all provisions of Virginia Rule 4-43.1, which incorporates the Emission Guidelines (EG) under Subpart Cf by reference, the revised National Emission Standard for Hazardous Air Pollutants (NESHAP) Rule under Subpart AAAA, and the Facility's Title V Operating Permit (#11184). The intent of the NESHAP standard is to protect the public health by requiring sources to control emissions of hazardous air pollutants (HAPs) to the level reflecting the maximum achievable control technology (MACT).

The Facility is required to conduct LFG extraction well monitoring on a monthly basis in accordance with 40 CFR 63.1960(a), 40 CFR 60.36f(a), and the Facility's Title V Permit (Condition 9.a). Records of the monitoring results are maintained at the facility for at least 5 years and submitted to VDEQ on a semi-annual basis in accordance with the Title V and NSR air permits. The Facility conducts monthly monitoring of the SOMS collectors pursuant to the guidelines established in the Consent Decree.

The geographical extent of monthly wellfield monitoring is regulated by the Facility's Title V Permit condition 2.b. In accordance with these conditions, the wells in all three landfills in the ISWMF are monitored monthly.

In addition, the Facility is required to conduct Surface Emissions Monitoring (SEM) using a TVA-2020 gas analyzer or equivalent on a quarterly basis. This monitoring is performed in accordance with the site-specific GCCS Design Plan, the facility's Title V Permit and NSR Permit conditions, as well as the requirements of 40 CFR 63.1960(c) and (d), 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. Records of the monitoring results are maintained at the facility for at least 5 years and are submitted to VDEQ on a semi-annual basis in accordance with the Title V and NSR air permits.

Furthermore, the Facility is required to follow the Work Practice Standard as set forth in 40 CFR 63.1960(e)(2). The intent of this standard is to limit downtime of the GCCS.

Operational standards for gas collection and control systems are explained in 40 CFR 63.1958(a), (b), and (c), 40 CFR 60.34f (a), (b), (c), 40 CFR 63.1960(a)(3) and (5), and 40 CFR 60.36f(a)(3) and (5). These existing LFG system management and monitoring programs, required by the facility's Title V and NSR air permits, are implemented as a strategy for efficient LFG collection and control and for reducing LFG fugitive emissions and occurrence of LFG odors off-site.

3.2 LIMIT WORKING FACE OPEN AREAS AND OTHER EXPOSED WASTE

Virginia regulation 9 VAC 20-81-140.B.1.a states that: "unless provided otherwise in the permit, solid waste shall be spread into two foot layers or less and compacted at the working face, which shall be confined to the smallest area practicable."

As of September 9, 2022, the ISWMF ceased waste acceptance at the Permit #588 Landfill. However, after the cessation of waste acceptance, construction activities have occurred including

drilling and excavation into the waste mass. Contractors spread waste overburden and cover exposed waste with adequate daily cover prior to the end of each working day.

3.3 SIDEWALL ODOR MITIGATION SYSTEM

Pursuant to the Expert Panel recommendation and Plan of Action report by SCS, the Facility designed and began installation of a sidewall odor mitigation system (SOMS) in December 2022. The SOMS consists of horizontal collector piping and wellheads connected to the existing LFG Collection System. The SOMS also includes liner and soil placed around the horizontal collector piping to mitigate odors along the perimeter sidewall of the Permit #588 Landfill. Construction of the SOMS and initial startup was completed in June 2023. The operations, maintenance, and monitoring of the SOMS is conducted by the Facility's O&M contractor. The SOMS System shall be operated on an as-needed basis, meaning that select SOMS wellheads may be shut off if no emissions or odors are reported. Otherwise, the SOMS wellheads must be operated to minimize LFG emissions and odors emanating from the sidewall areas. In addition, the City sprays the sidewall in select areas where emissions and odors are identified with an enhanced Posi-Shell with a heavy Portland cement mixture on an as needed basis.

3.4 LFG COLLECTION SYSTEM EXPANSION

Pursuant to the Expert Panel recommendation and Plan of Action report by SCS, the Facility designed and completed installation of the Phase I LFG Collection System expansion in October 2023. The Phase I LFG Collection System expansion included the drilling and installation of 18 near perimeter LFG vertical extraction wells in the Permit #588 Landfill, as well as 16 stainless steel deep interior LFG extraction wells. The Phase I LFG System expansion included additional LFG System collection header piping and valves, as well as dewatering infrastructure, such as airline, dewatering forcemain piping, and pumps. The operations, maintenance, and monitoring of the Phase I LFG System is conducted by the Facility's O&M contractor. The Facility's O&M contractor shall focus on dewatering efforts to extract liquids from greater depths, as well as landfill gas and heat associated at greater depths. The combined increase in landfill liquids and LFG extracted will improve and mitigate odors originating from deep within the waste mass. The Phase I LFG System shall be operated under the provisions of NSPS.

As part of the final capping project for the Permit #498 Landfill, LFGCCS infrastructure was added, including horizontal collectors with vertical caissons and drainage pits for liquids removal, LFG collection, and dewatering system piping. Installation of the LFG System and final closure capping construction of the Permit #498 Landfill was completed in May 2024. The expansion of the LFG Collection System in the Permit #498 Landfill will serve to mitigate LFG build-up under the final cap.

3.5 TIMELY PLACEMENT OF INTERIM/INTERMEDIATE COVER MATERIALS

Virginia regulation 9 VAC 20-81-140.B.1.d states, "Intermediate cover of at least six inches of additional compacted soil shall be applied and maintained whenever an additional lift of refuse is not to be applied within 30 days. Further, all areas with intermediate cover exposed shall be inspected as needed, but not less than weekly. Additional cover material shall be placed on all cracked, eroded, and uneven areas as required to maintain the integrity of the intermediate cover system."

Interim cover systems are temporary cover systems applied to a landfill area when landfilling operations will be temporarily suspended for an extended period (typically longer than one year). At the conclusion of the interim period, the interim cover system may be removed and landfilling operations resume or final cover is installed. For select areas of the landfill that satisfy all of the following criteria, the Facility will evaluate the potential for placement of interim cover as an odor mitigation strategy:

- Areas that have not achieved final elevations (i.e., areas that are at interim grades)
- Areas that are not anticipated to receive additional waste lifts for more than 12 months
- Areas that have been identified as a chronic source of odors
- Areas that have been impacted by construction activities

The specifications for the interim cover system will be developed based on the field conditions and may include a low-permeability soil layer, an exposed geomembrane, or other interim cover designed to control odors. Areas with interim cover shall be inspected as needed, but not less than weekly.

SCS plans to design an Ethylene-vinyl alcohol (EVOH) interim cover system in Permit #588 once waste settlement rates slow down to avoid damaging the EVOH via unequal settlement. SCS will prepare regular settlement assessments for VDEQ per the amended Consent Decree. EVOH deployment will commence, with VDEQ's concurrence, if the latest assessment shows acceptable settlement rates. The amended consent decree requires installation of the EVOH cover system by 1 December 2026.

3.6 COVER INTEGRITY MONITORING

The landfill is required to conduct cover integrity monitoring on a monthly frequency in accordance with the Title V Permit (Condition 9.a.iv). This cover integrity monitoring is performed on portions of the landfills having received final cover, intermediate cover, and daily cover (i.e, all areas of the waste footprint). However, areas with exposed intermediate cover are to be inspected no less than weekly per 9 VAC 20-81-140.B.1.d. Records of the monitoring results and subsequent cover repairs are maintained at the facility and are submitted to VDEQ on a semi-annual basis in accordance with the Facility's Title V and NSR air permits.

These existing monitoring and inspection programs required by the Facility's air permit are designed to reduce malodorous emissions. Surface emissions monitoring procedures also include cover inspection and facilitate remedial actions where excessive emissions are detected.

3.7 FINAL CAP INSTALLMENT

SCS prepared plans on the City's behalf for closing and installing final cover on Permit #498. The plans also included a comprehensive gas collection and control system, as mentioned in Section 3.4, and a comprehensive stormwater management plan. During the month of May 2024, final closure capping of the Permit #498 Landfill was completed.

The methods utilized in the design and construction of the Facility's final cap are explained in Section 10.5 of the Closure Plan, which is part of the Facility's Solid Waste Permit. Odors emitting from Permit #498 are expected to be mitigated once the final cap is installed. The Permit #221 Landfill is a closed and capped landfill.

3.8 AIR STRIPPER

In December 2023, the City installed and began operation of two Duplex PRM AST-643 Air Strippers to remove VOCs from landfill leachate and gradient control liquids as part of the existing leachate management system. After these air strippers were installed, the AS-1000 3-Tray Skid Mounted Air Stripper that SCS previously submitted exemption documentation for was removed from the site. The current air stripper unit is designed to remove 95% of VOCs from the leachate prior to discharge, and the air stripper is assumed to be ineffective at removing non-volatile NMOCs from the leachate. Landfill gas liquids are not treated by the air stripper. The temporary air stripper is equipped with vapor-phase treatment in the form of granular activated carbon (GAC) vessels, which are expected to capture the gaseous-phase VOCs and remove VOCs from the air stripper emissions to reduce odors caused by VOC emissions from the leachate.

4.0 ODOR MONITORING AND RESPONSE

This section discusses odor monitoring procedures, air monitoring procedures, remedial actions, and response procedures for addressing odor complaints at the Facility. For purposes of this Plan, the term "odor monitoring" refers to personnel using their olfactory senses to identify the character and intensity of odors, while the term "air monitoring" refers to sampling activities that measure VOC concentrations (or other chemical constituents) in ambient air. Both odor monitoring and air monitoring may occur at the landfill perimeter ("on-site") and/or in surrounding communities ("off-site").

4.1 ROUTINE ODOR MONITORING AND SAMPLING

Odor monitoring is conducted on-site by Landfill personnel during daily activities using olfactory senses. The Environmental & Safety Compliance Office (ESO) or designee is notified if detectable and objectionable odors are identified at the Facility or off-site so that response procedures can be implemented. The ESO checks the maintenance building, scale house, and Public Works building daily for air quality with a multi-gas meter. This odor monitoring is ongoing and an integral part of the overall odor mitigation program. As of May 2023, the City installed a permanent air monitoring station at the preestablished on-site 24-hour sampling location (see map in Appendix A) .

The City conducts routine monthly sampling at the Facility, comprised of a monthly 24-hour composite air sample collected in Summa canisters at a consistent location in the southwestern portion of the landfill property. Samples are sent to Pace Analytical lab for analysis using EPA Method TO-15. Additional on-site sampling may be conducted at the discretion of the City.

4.2 ODOR RESPONSE PROCEDURES

Odor complaint response procedures (from complaint receipt to investigation and monitoring/sampling) are detailed in the Odor Complaint Response Plan included as Appendix B.

Additionally, LFG system shutdowns (defined as periods of time where no part of the LFGCCS is operational) over 4 hours will trigger on-site odor monitoring as described in Section 4.1 and/or off-site monitoring and sampling with the same procedures used in the Odor Complaint Response Plan.

4.2.1 Remedial Actions

Once the odor complaint response is completed, the Facility then makes efforts to determine the source of the odor and, if possible, implement a corrective action. Staff responding to the complaint consult with other ISWMF personnel to see if operations (including construction activities) may have changed or equipment malfunctioned in the timeframe of the complaint. They proceed to conduct an inspection of the ISWMF to evaluate where odors may be present on site and ascertain if systems and equipment (such as the LFG collection system) are working correctly.

Depending on the source of the odor, the following are remedial actions that may be employed within a few days of an odor complaint:

- Install additional intermediate cover or increase the thickness of daily cover in the Permit 588 landfill.
- Perform minor repairs on the existing LFG collection system to increase vacuum within the landfill(s).
- Install additional well bore seals to minimize odors at LFG well pipe penetrations.
- Increase dewatering of the LFG extraction wells to increase LFG extraction within the landfill.
- Inspect areas with pooling of liquids and repair leachate seeps.
- Employ defoaming agent to mitigate odors associated with foam in landfill liquids
- Employ enhanced Posi-Shell in select areas of the sidewall.
- Close and/or seal manhole covers and access doors related to the leachate and gradient water collection and conveyance systems.
- Inspect wellhead extracting gas associated with landfill liquids from manhole.

City staff also complete follow-up and corrective measures portions of the air monitoring form and attach any follow-up correspondence.

5.0 RECORDKEEPING AND REPORTING

5.1 ODOR COMPLAINTS

Air monitoring forms, lab results, and other documentation shall be maintained on-site for a minimum of five years.

5.2 REPORTING

Previously, an odor complaint and monitoring/sampling summary report in letter format was prepared monthly and submitted to VDEQ no later than the 14th of the subsequent month. Due to the substantial decrease in odor complaints because of the Facility's diligent remedial efforts pursuant to the Expert Panel Plan of Action, the Facility requests VDEQ allow the odor complaint and monitoring/sampling summary reports revert to quarterly. As such, the Facility will continue monthly reports covering the 2nd Quarter 2024 with the final monthly report for June 2024 due by 7/14/24. The first quarterly report will cover 3rd Quarter 2024 and be due on the 15th day of the subsequent quarter (e.g. 10/15/24 for the 3rd Quarter report). The quarterly report will include the 24-hr sampling events for the quarter. The letter report includes:

- A summary of the complaints.
- A summary of each sampling event.
- A discussion of results from sampling events.
- Updates on ongoing construction and O&M activities.
- Recommendations for future actions.
- Attachments with the odor complaint records, field observation forms, and test results from the quarter.

At a minimum, the OMCP will be reviewed by ISWMF personnel on an annual basis to evaluate whether the procedures herein need to be updated. If revisions are made to the OMCP, then the title page shall be changed to reflect the new date of the OMCP, so that the latest version is more easily identifiable.

Each time revisions are made to the OMCP and after each annual review (regardless of whether revisions are made), the event will be logged and denoted with a revision date on the title page.

6.0 COMMUNITY OUTREACH

The City conducts regular public meetings regarding odor concerns to provide a forum for the community, and provides an online form to submit odor complaints (see Appendix C for screenshot from the City website).

7.0 ADDITIONAL STRATEGIES UNDER CONSIDERATION

The City is continuously evaluating the following new strategies to improve odor control and community relations, and will add any adopted strategies to the appropriate Sections 1-6 during Annual Reviews and/or add new strategies to this section as they develop. Strategies known to be used at other landfills, proposed actions from the 2022 Expert Panel, and emerging technologies are all included in this section.

7.1 OTHER POTENTIAL STRATEGIES

The City is currently evaluating other potential strategies to assist with the mitigation of odors. Some of these potential strategies include, but are not limited to, the following items:

7.1.1 Weather Station

The Facility installed a weather station to record wind speed/direction data specific to the site in 2022. Comparing the location of odor complaints with current weather data is an effective tool for determining weather-related and seasonal trends in odor dispersion, as well as determining whether the landfill is the likely source of the odor.

7.1.2 Air Dispersion Modeling

The Facility may consider conducting air dispersion modeling exercises to evaluate the estimated fugitive LFG emissions from the existing inactive waste disposal units, as well as the active disposal area (the quarry landfill). This voluntary exercise may be useful in assessing the magnitude and

direction of potential fugitive LFG emissions from the inactive landfills and enable the Facility to focus implementation of odor mitigation efforts on targeted areas of the Landfill.

Spatial complaint analysis can be incorporated into this exercise to compare complaint trends to the plumes generated by the dispersion model.

Appendix A

On-site Sampling Locations

P:\B11\100\B11145B\B11145B-14D\CAD\B11145B-14D-Airmonitoring\Figure2 - Sample Location map.dwg March 31, 2021 3:32:19 PM

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DESIGNED: AST
DRAWN: AST
CHECKED:
DATE: 03/31/2021

ODOR COMPLAINT RESPONSE PLAN

BRISTOL, VIRGINIA

SCALE: 1" = 250'

PROJECT: B11145B-14D

FIGURE
2

Appendix B

Odor Complaint Response Plan

BRISTOL ISWMF ODOR COMPLAINT RESPONSE PLAN

1 INTRODUCTION

In late October 2020, the City of Bristol Virginia began receiving odor complaints. To assess the City of Bristol's response to these odors, VDEQ (in an email dated January 28, 2021) requested that the Integrated Solid Waste Management Facility (ISWMF) provide an air monitoring plan.

In response to DEQ's request, a draft air monitoring plan was prepared to outline the procedures for monitoring and sampling ambient air as part of the City's ongoing efforts to respond to odor complaints. In an email dated February 18, 2021, VDEQ requested that the plan's name be changed to "Odor Complaint Response Plan" in addition to several other suggestions. The name was changed for the March 8, 2021 version of the Plan. This review and update is part of the 2024 Annual Review of the ISWMF's Odor Management and Control Plan.

Previous Monitoring Efforts

In December 2020 and January 2021, the City monitored ambient air in select offsite areas. Using a GEM 5000 and MSA ALT Air 4x hazardous gas meter, the City screened for methane, carbon monoxide, and hydrogen sulfide at those offsite locations.

On January 10, 2021, the City collected two grab samples of air in Summa canisters. Both samples were collected in locations that were experiencing odors at the time of collection; one sample was collected on Valley Drive near the entrance to the ISWMF and the other was taken at the corner of Maryland Avenue and Poplar Street (Tennessee). Both samples were analyzed for volatile organic compounds (VOCs) via EPA Method TO-15. Several organic compounds were detected, but none at hazardous levels or at levels that would indicate or cause an odor problem.

In May 2023, the City's consultant, Stantec, performed preliminary ambient air monitoring throughout the Facility and gathered information on the LFG Collection System from SCS. Stantec installed four automated ambient air monitoring stations in May 2023, using solar-powered MultiRAE Benzene Portable Multi-Gas Monitors, which transmit automated reports to a web-based server. These multi-gas meters monitored VOCs and, hydrogen sulfide at each station, and one station also monitored ammonia. The temporary MultiRAE monitors were replaced with Sentroid monitors custom built for the City in May 2024. The results of the ambient air monitoring stations are reported monthly through the City of Bristol's website.

Migration Potential

Odors are likely to migrate offsite via wind transmission and, due to various mechanisms such as temperature gradients, flow to low points in the terrain.

Prevailing winds in Bristol are generally to the east. Most of the area to the east of the ISWMF is forested. However, there are houses located to the northeast of the ISWMF along Pendergrass Road. These houses could potentially receive odors on windy days.

Four stream valleys adjacent to the ISWMF could provide low spots and corridors for off-site migration of the odors. One stream, a tributary of Beaver Creek, flows northwest to west of the ISWMF. This stream valley slopes down towards the Kingtown area of the City. A stream runs generally west from the ISWMF along the state line and slopes down toward the northern portion of the Fairmount area. Another stream runs southwest into Tennessee with this stream valley sloping down towards the King College and Fairmount areas. A fourth stream is located east of the ISWMF and flows southeast into Tennessee towards Middlebrook Lake. This Lake and the areas noted above all have the potential to receive odors from the ISWMF.

A site map is provided in Attachment 2 to illustrate the ISWMF and potential odor migration routes.

In addition to the typical migration mechanisms noted above, the ISWMF discharges their leachate and gradient water (groundwater that is pumped to maintain a separation from the landfill liner system) to a sanitary sewer. The sewer exits on the west side the ISWMF and then is conveyed to the Bristol, Tennessee wastewater treatment plant located approximately 14 miles southwest of the ISWMF. Constituents from the gradient water or leachate discharged to the sanitary sewer could volatilize and create odors around sewer manholes or unsealed pipes and access points.

Since December 2023, the City has operated two Duplex PRM AST-643 Air Strippers to remove VOCs from landfill leachate and gradient control liquids as part of the existing leachate management system. A series of frac tanks, activated carbon vessels, affiliated piping network, and blower assist in the VOC removal process from leachate within a common containment area adjacent to the Permit #588 Pump Station. Prior to the current leachate treatment system, the City operated an AS-1000 3-Tray Skid Mounted Air Stripper since Summer 2023.

2 RESPONSE PROCEDURES

The following response procedures will apply when odor complaints are submitted to the Facility. ISWMF staff are anticipated to conduct a desktop investigation for each complaint, and may conduct field monitoring and/or sampling on a case-by-case basis.

Frequency

Upon receipt of a complaint (via phone at 276-645-7380, email, or letter), Facility staff will document the following information on the Odor Complaint Monitoring Form (see Attachment 1 for an example form):

- Date
- Time
- Location
- Temperature
- Wind direction and speed

Odor complaints are primarily received and logged by the City of Bristol's Help Desk via an online form, which records the date, time, and location automatically and places them in a log for recordkeeping purposes. This log is submitted to VDEQ as part of a Monthly Odor Report. Beginning 3rd Quarter 2024, this log will be submitted to VDEQ Quarterly.

Odor monitoring and/or sampling may be conducted as noted below under two scenarios:

1. In response to an elevated number of odor complaints, defined as the receipt of 100 or more complaints received by the City via its online form or at the referenced phone number over the course of one week (Monday-Sunday).
   or
2. If the LFG collection system experiences a prolonged shutdown of the LFGCCS (4 hours or more), monitoring and/or sampling will be conducted on the ISWMF property only, downwind of where suspected odors may occur.

Monitoring, Sampling and Analysis

During a monitoring/sampling event, ISWMF staff (or a consultant representative) will smell for general odors, and ambient air will be monitored using a GEM 5000 (or Envision) and/or a RKI GX-6000 hazardous gas meter. During the screening measurements of percentage methane (by volume of air) and concentration of VOCs (ppm) will be collected along with percentage of oxygen, percentage of nitrogen, and concentration of carbon monoxide (ppm).

If ISWMF staff perceive that odors detected by smell are from the ISWMF and/or methane or VOCs are detected at a sampling location, then ISWMF staff may choose to collect a grab sample of ambient air using a Summa canister or Tedlar bag.

During the odor and/or air monitoring exercise, an air monitoring form will be completed. An example of the air monitoring form is provided in Attachment 2; this form or a similar form will be used to document sampling events. Information to include on the form will be:

- Sampling date
- Ambient temperature
- Barometric pressure (including a note whether the pressure was falling or rising during the timeframe of the monitoring)
- Weather conditions
- Person(s) conducting the monitoring
- Location of sampling (e.g., street address or intersection)
- Results of GEM or Envision monitoring
- Results of RKI monitoring
- Summa canister/tedlar bag collection information (such as CAS numbers, chemical names)
- Comments on odors detected by smell, observations of surrounding area that may affect odors (e.g., open burning)

Ambient air samples will be sent to a laboratory for analysis using EPA Method TO-15. This method determines the concentration of VOCs in air collected in specially-prepared canisters and analyzed by gas chromatography/mass spectrometry. At least a 14-day turnaround will be requested so that results will be available before the Monthly Report is prepared.

ATTACHMENT 1 – ODOR COMPLAINT MONITORING FORM

Odor Complaint Monitoring Form
City of Bristol, Virginia
Integrated Solid Waste Management Facility

						GEM 5000			MSA Alt Air 4X				Draeger Tube	Summa Canister
Date	Time	Location	Temp (F)	Wind Dir.	Wind Sp. (mph)	CH4 %	O2 %	Bal. %	O2 %	LEL %	CO ppm	H2S ppm	Ammonia ppm	Collected (Y/N)

ATTACHMENT 2 – AIR MONITORING FORM

BRISTOL ISWMF AIR MONITORING FORM

Sampling Date: _____ Weather Conditions (wind speed, direction etc.): _____

Ambient Temperature (°F): _____

Barometric Pressure (in. WC): _____ Personnel: _____

Sampling Location	Time	GEM readings					MSA ALT 4X readings	
		% CH_4	% LEL	% CO_2	% O_2	% Balance	CO (ppm)	H_2S (ppm)

Appendix C

Online Odor Complaint Form

By signing in or creating an account, some fields will auto-populate with your information and your submitted forms will be saved and accessible to you.

Solid Waste Facility Concerns & Odor Report

Sign in to Save Progress

The City of Bristol, VA Solid Waste Facility/ Landfill Feedback Form

Please provide instructional information regarding the city's landfill and its effects on the neighboring communities. Through constructive feedback the city can better address the issues at hand concerning the city landfill. Thank you for your assistance!

Contact Information

First Name*

Last Name*

Address1*

Address2

City*

State*

Zip*

Phone Number*

Email Address*

Date and Time of the Odor concern

mm/dd/yyyy

hh:mm am/pm

Description of Complaint

Type of Odor:

Odor Intensity: (based on a scale of 1 through 5)

-- Select One --

Weather conditions when Odor was detected:

Weather Conditions at the time odors were detected (based on weather monitoring station or internet resources):

The following information isn't mandatory but certainly helps the City isolate and react to issues.

National Weather Service

https://www.weather.gov/ilm/observations

National Weather service info. Enter your zip code at the top left search box labeled "Local Forecast"

Wind Direction

-- Select One --

Wind Speed

Rainfall

-- Select One --

Barometric Pressure

Humidity

Temperature

Location of Problem

Have odors been noticed at this location in the past?

-- Select One --

If so, When?

Brief Description of Other Concern or Information.

☑ Receive an email copy of this form.

Email address

This field is not part of the form submission.

Submit **Submit and Print**

* indicates a required field

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