April
Monthly Compliance Report

Solid Waste Permit No. 588
Bristol Integrated Solid Waste Management Facility
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02218208.05-18 | May 10, 2023

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INTRODUCTION

On behalf of the City of Bristol, Virginia (City), SCS Engineers has prepared this report to the Virginia Department of Environmental Quality (VDEQ) in accordance with item 8.iii in Appendix A of the Consent Decree between the City and VDEQ. This report provides updates regarding the progress towards completion of the items outlined in Appendix A of the Consent Decree between the City and VDEQ. The following sections outline progress during the month of April 2023 related to Solid Waste Permit (SWP) No. 588.

1.0 GAS COLLECTION

The following sections describe the steps the City, in collaboration with its consultants and contractors, has taken to improve the operation, monitoring, and performance of the facility's landfill gas collection and control system (GCCS).

1.1 SURFACE AND LEACHATE COLLECTION EMISSIONS

1.1.1 Surface Emissions

1.1.1.1 Quarterly SEM

The First Quarter 2023 surface emissions monitoring event was conducted on March 15, 2023. Results from that monitoring event are documented in the March compliance report. No quarterly monitoring event was conducted in April. SCS anticipates conducting the Second Quarterly Monitoring event for the SWP 588 landfill in June 2023.

1.1.1.2 Weekly SEM

In addition to the standard regulatory quarterly surface emissions monitoring, SCS performed additional surface emissions monitoring on April 4, 2023, April 13, 2023, April 20, 2023, and April 27, 2023. These Weekly Surface Emissions Monitoring (SEM) Events were performed in accordance item 1.i in Appendix A of the Consent Decree between the City and VDEQ.

The monitoring in April generally conforms to the requirements of 40 CFR 63.1960(c) and (d), and 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. The landfill gas (LFG) collection system is required to operate such that the methane concentration is less than 500 ppm above background at the landfill surface.

The surface emission monitoring route included the entire waste footprint of the Permit No. 588 landfill. Sampling was conducted with a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) at 30-meter intervals and where visual observations indicated the potential for elevated concentrations of LFG, such as distressed vegetation and surface cover cracks. In addition, in accordance with 40 CFR 63.1958(d)(ii)(2) and 40 CFR 60.34f(d), monitoring was conducted at all surface cover penetrations within the waste footprint.

SCS submitted letters to VDEQ outlining the results of the April monitoring events on April 12, 2023, April 19, 2023, April 26, 2023, and May 3, 2023. Copies of those submittals are included in Appendix A. Table 1 summarizes the results of the four monitoring events in April.

Table 1. Summary of April Surface Emissions Monitoring

Description	April 4, 2023	April 13, 2023	April 20, 2023	April 27, 2023
Number of Points Sampled	147	147	160	158
Number of Points in Serpentine Route	100	100	104	100
Number of Points at Surface Cover Penetrations	47	47	56	58
Number of Exceedances	1	3	5	4
Number of Serpentine Exceedances	1	1	1	1
Number of Pipe Penetration Exceedances	0	2	4	3

Due to a variety of factors, an increase in surface emissions was detected during the April 2023 monitoring events. Three separate serpentine exceedances were detected in April. These were likely the result of the ongoing construction of the Sidewall Odor Mitigation System, which has temporarily required excavations into the cover soil and waste. At the time this report was prepared, additional collection from newly installed vertical extraction wells and/or the addition of soil has returned two of the three locations to compliance. A retest will be performed at the one remaining location in the first week of May.

In addition, exceedances were detected at the pipe penetration of eight vertical extraction wells. Six of these points were located at recently installed vertical wells 84, 89, 90, 94, 95, and 100. These wells have not yet been equipped with supplemental emissions reducing equipment, such as liquids extraction pumps and wellbore seals. Those components will be added once the expansion is complete. The remaining two exceedances, at vertical wells at 59 and 38, were corrected via repairs and/or upgrades to the gas collection system in the vicinity of the two wells.

1.1.2 Leachate Collection Emissions

SCS Field Services (SCS-FS) visited the Bristol Landfill on April 3, 2023 and April 19, 2023, and performed monitoring of the leachate, witness zone, and gradient control clean-outs at the northern and southern ends of the landfill. The results of that monitoring are included in Appendix B. The monitoring data for the clean-outs at the southern end of the landfill are listed as LC01 – LC10. The monitoring data for the clean-outs at the northern end of the landfill are listed as NC01 – NC10. Table 2 presents the cleanout pipe identification labeling convention, which is based on site records and review of correspondence.

Table 2. Cleanout Pipe Identification

Northern Cleanouts		Southern Cleanouts	
ID #	Description	ID #	Description
NC01	Leachate East	LC01	Gradient West
NC02	Leachate Center	LC02	Gradient East
NC03	Leachate West	LC03	Leachate Center
NC04	Witness East	LC04	Witness East

Northern Cleanouts		Southern Cleanouts	
ID #	Description	ID #	Description
NC05	Witness Center	LC05	Leachate West
NC06	Witness West	LC06	Gradient Center West
NC07	Gradient East	LC07	Leachate East
NC08	Gradient Center East	LC08	Gradient Center East
NC09	Gradient Center West	LC09	Leachate West
NC10	Gradient West	LC10	Witness Center

1.2 EXISTING GAS EXTRACTION SYSTEM PERFORMANCE

SCS and SCS-FS have been coordinating with the City to improve the performance of the existing gas system. Specific actions taken to maintain and improve the system are detailed in SCS-FS's summary report for the month of April.

1.3 REMOTE MONITORING SYSTEM

In the fall of 2022, SCS Remote Monitoring & Control (SCS-RMC) installed 25 industrial internet of things (IIoT) temperature sensors in the landfill gas well-heads. The purpose of the sensors is to record and transmit well-head gas temperatures via a cellular connection to a database managed by SCS-RMC. As decribed in previous monthly compliance reports for the SWP No. 588 Landfill the system is currently undergoing commissioning.

The City is providing average temperatures recorded by the sensors to VDEQ on a daily basis via e-mail. In addition, SCS prepares a semi-monthly report with analysis of this data. The semi-monthly reports for April are included in Appendix C.

1.4 LARGE-DIAMETER DUAL-PHASE EXTRACTION WELLS

SCS completed design work on an expansion of the existing GCCS during the month of December. The proposed expansion includes at least 5 large diameter dual-phase extraction wells. SCS submitted the design to VDEQ prior to December 31, 2022. The City commenced solicitation of contractor's bids for this project by advertising for bids and received one bid for the project from SCS Field Services Construction (SCS-CONS). On January 26, 2023 the City awarded the project to SCS-CONS.

During the month of April work on the expansion of the GCCS focused on the construction of perimeter gas collection system described on Section 2.1. The City and SCS-CONS were awaiting the delivery of stainless steel casings required for the construction of the large diameter dual-phase extraction wells. The stainless steel casing were delivered to the site on April 26, 2023. Casings being stored on-site are shown in Figure 1.

Figure 1. Stainless Steel Well Casings in Storage at the ISWMF

1.5 VDEQ CONCURRENCE ON WELLS

As described in previous monthly compliance reports, the City engaged with VDEQ in discussions about the proposed approach for landfill GCCS improvements and expansions. Upon completion of the landfill gas collection system, SCS will submit updated as-built drawings depicting the completed system to VDEQ. The City intends to delay installation of temporary or final cover systems until the City and VDEQ agree that the GCCS is sufficient.

2.0 SIDEWALL ODOR MITIGATION

The City initiated design and construction work to address fugitive emissions emanating from the quarry sidewalls. Specific aspects of the proposed design features are decribed in the following sections.

2.1 PERIMETER GAS COLLECTION SYSTEM

SCS's design of the GCCS expansion described in Section 1.4 included perimeter LFG wells. These wells will be placed closer to the sidewall to intercept landfill gas that potentially could migrate to the quarry wall. These wells will supplement the sidewall odor mitigation system described in section 2.2. The City completed bidding and contracting of construction for the perimeter LFG wells as part of the large diameter dual extraction well installation described in Section 1.4.

Figure 2. Landfill Gas Extraction Well Drilling Operations

As described in the March Monthly Compliance Report for the SWP No. 588 Landfill, 5 perimeter vertical landfill gas wells were installed. Between April 1, 2023 and April 15, 2023 SCS-CONS installed the remaining 13 vertical landfill gas extraction wells that comprised the perimeter gas collection system portion of the landfill GCCS expansion. Drilling of one of the wells is shown in Figure 2 Between April 18, 2023 and April 27, 2023, all 18 wells were equipped with a wellhead and connected to lateral piping that created a connection to the rest of the landfill GCCS. Vacuum was applied to all 18 wells which enabled the recovery of LFG from the wells. One of these wells connected to lateral piping is shown in Figure 3.

Figure 3. Landfill Gas Extraction Well EW-84 Connected to Lateral Piping

SCS submitted a letter to VDEQ documenting completion of the Perimeter Gas Collection System on May 1, 2023. A copy of that letter is included in Appendix G. As described in Section 1.1.1.2 the wells will be equipped with supplemental equipment to improve performance and reduce emissions, such as liquids extraction pumps and wellbore seals at a later date.

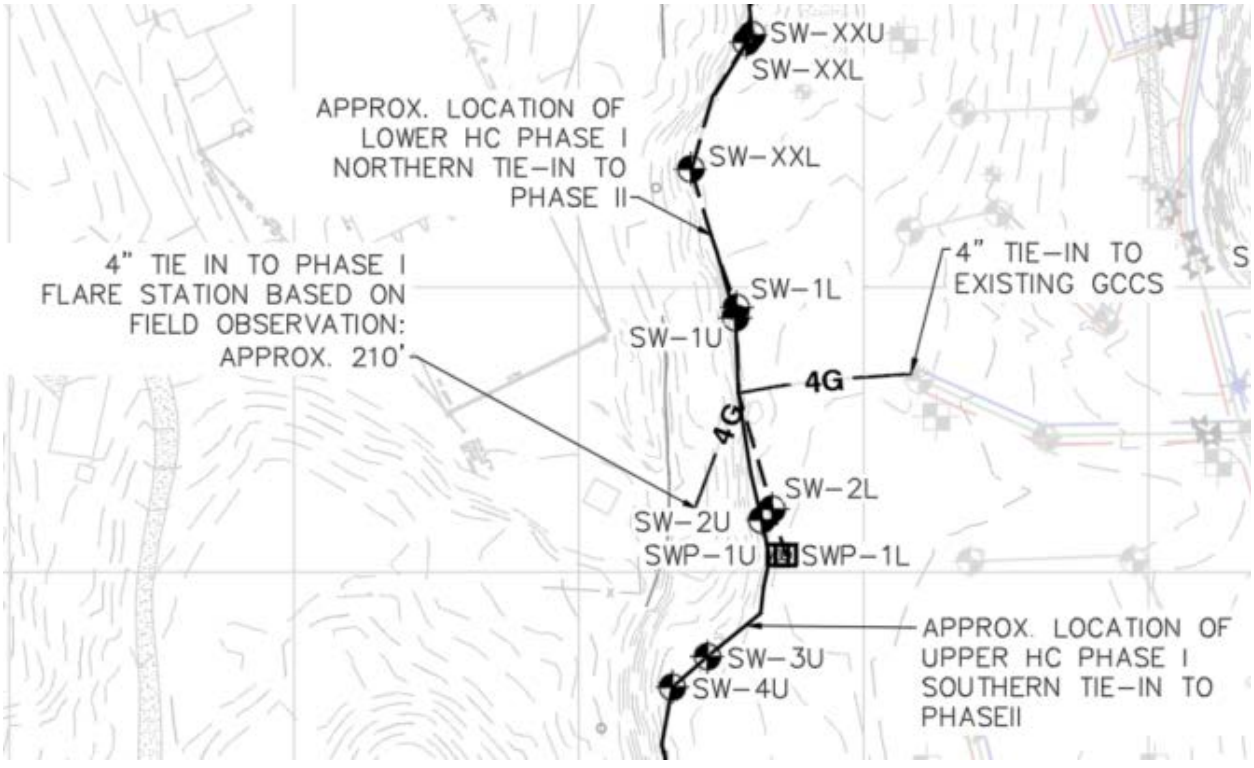
2.2 SIDEWALL ODOR MITIGATION SYSTEM

On behalf of the City and in an effort to capture emissions from the quarry sidewall, SCS designed a sidewall odor mitigation system (SOMS) during the month of October 2022. On October 20, 2022 SCS provided an overview of the proposed system to VDEQ staff. The design of this system was prepared and submitted to VDEQ on November 1, 2022. A project manual detailing the specifications of the system was developed concurrently with the design of the system.

2.3 PILOT SYSTEM CONSTRUCTION

SCS-CONS completed substantial construction of Phase 1 of the SOMS during the month of February 2023, began monitoring Phase 1 connected Horizontal Collector (HC) wellheads during the month of March, and continued weekly wellhead monitoring during the month of April 2023. Phase 1 is considered the pilot system portion of the SOMS. SCS submitted a design engineer certification to VDEQ on February 10, 2023 that documented the substantial completion of Phase 1 of the SOMS. Figure 4 shows the Phase 1 as-built, which includes the locations of the HC wellheads and HC sumps installed in Phase I, as well as the 4" header connection to the existing LFGCCS. The lower collector installed as part of Phase II was tied-in to the north end of the Phase I lower collector, and the upper collector installed as part of Phase II was tied-in to the south end of the Phase I upper collector.

Figure 4. SOMS Phase I Approximate As-Built



Phase 1 was initially connected to an auxiliary flare located near the system. HC wellhead measurements of gas quality continued to be taken on a weekly basis during the month of April 2023. A summary of those measurements is shown in Table 3.

Table 3. Sidewall HC Wellhead Gas Quality Measurements

Device ID	Date/Time	CH_4 (%)	CO_2 (%)	O_2 (%)
SW1L	4/4/2023 10:01:20 AM	11.2	31.2	9.1
SW1L	4/11/2023 10:13:18 AM	12.9	34.7	8.5
SW1L	4/17/2023 2:01:22 PM	13.2	29.6	9.7
SW1L	4/24/2023 9:15:48 AM	17.1	40.6	7.6
SW1U	4/4/2023 10:04:30 AM	1.7	8.1	19.3
SW1U	4/11/2023 10:16:19 AM	4.8	16.6	17.3
SW1U	4/17/2023 2:04:05 PM	0.3	0.9	20.6
SW1U	4/24/2023 9:19:21 AM	2.6	9.1	18.1
SW2L	4/4/2023 10:07:29 AM	32.1	49.7	2.8
SW2L	4/11/2023 10:19:17 AM	28.7	48.1	4.2
SW2L	4/18/2023 11:03:07 AM	30.8	53.1	2.0
SW2L	4/24/2023 9:22:39 AM	24.5	50.4	3.9
SW2U	4/4/2023 10:09:55 AM	16.4	42.6	8.6
SW2U	4/11/2023 10:21:44 AM	9.9	28.9	14.1
SW2U	4/18/2023 11:00:23 AM	17.3	44.8	7.9
SW2U	4/27/2023 4:03:08 PM	2.8	9.8	17.2

Sidewall wellhead lower collector 1 (SW1L) is connected to the horizontal collector placed in waste inside the landfill liner close to the northern limit of Phase 1. Measurements of gas composition taken at SW1L indicate that methane levels are low, but that landfill gas continues to be captured by the system. Sidewall wellhead upper collector 1 (SW1U) is connected to the horizontal collector placed outside of the liner and waste. SW1U is close to the northern limit of Phase 1. Measurements of gas composition taken at SW1U indicate that ambient air is being pulled in at this location. This is expected for the proximity of this section of the horizontal collector to the Phase 1 temporary termination.

Sidewall wellhead lower collector 2 (SW2L) is connected to the horizontal collector placed in waste inside the landfill liner close to the center of Phase 1. Measurements of gas composition taken at SW1L indicate that methane levels are lower than typical of landfill gas collection systems, but the presence of methane in addition to high carbon dioxide levels indicate that landfill gas is being captured by the system. Sidewall wellhead upper collector 2 (SW2U) is connected to the horizontal collector placed outside of the liner and waste and is close to the center of Phase 1. Measurements of gas composition taken at SW2U indicate that methane levels are low, but that landfill gas is being captured by the system. On April 26, 2023, SCS-CON completed the southern tie-in of the pilot system upper collector via HDPE pipe welding process.

Collection landfill gas by both the upper and lower collectors indicates that the system is capturing fugitive emissions. Based on this data, Phase 2 is being constructed utilizing the same general configuration. SCS-FS will continue to monitor Phase 1 of the system during the month of May 2023.

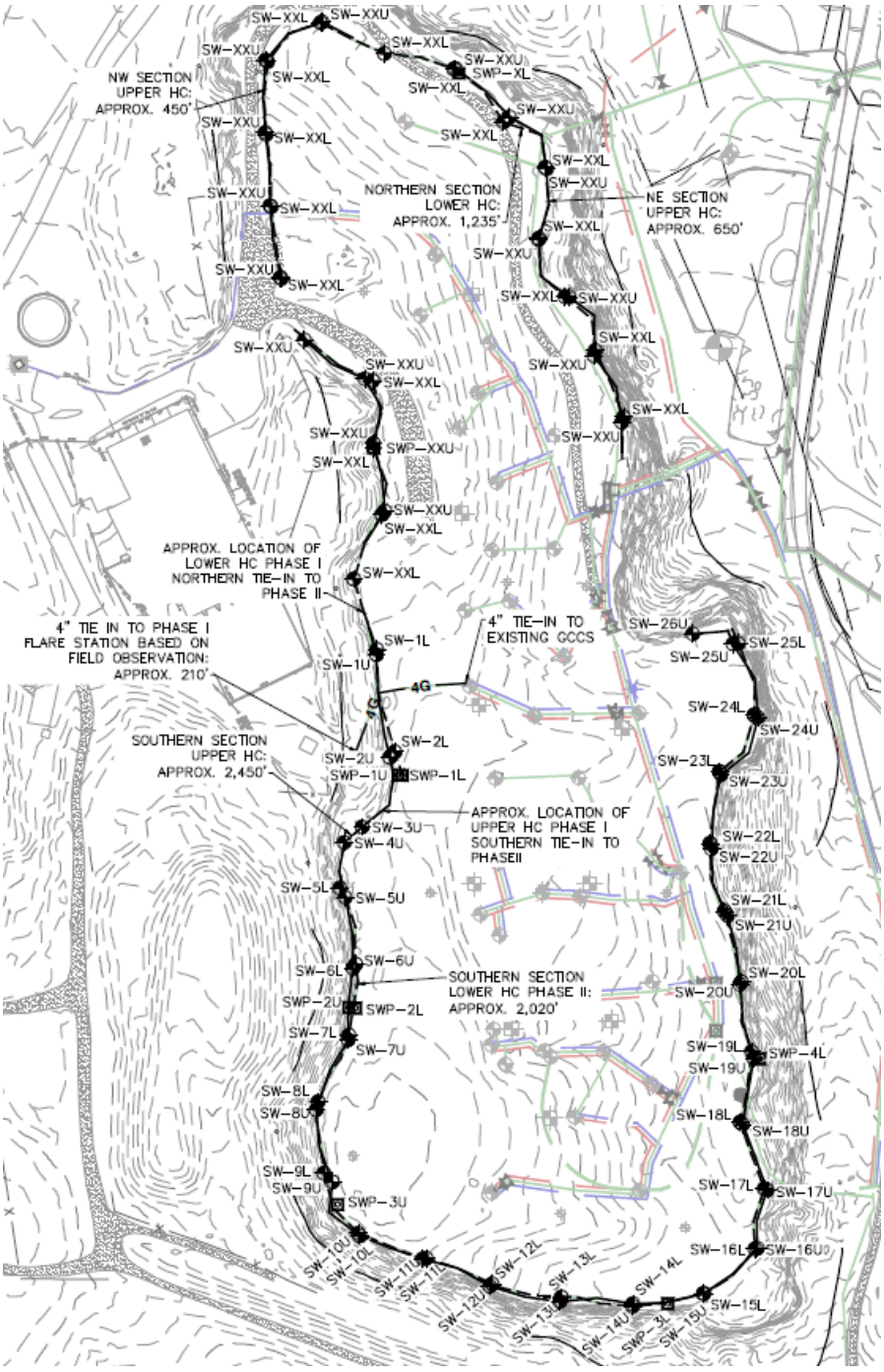
2.4 FULL SYSTEM CONSTRUCTION

SCS-CONS continued construction of Phase 2 of the SOMS. Lower horizontal collector placement has been completed along the west sidewall south of Phase 1, the south sidewall, the southern portion of the east sidewall, the northeastern sidewall, and toward the northeastern section of sidewall, with approximately 350 feet remaining. Upper horizontal collector placement has been completed along the west sidewall south of Phase 1, the south sidewall, the southern portion of the east sidewall, as well as portions of the northeastern sidewall. Upper horizontal collector remains to be installed in the remaining less than 100-foot section of the northern sidewall, and the 350-foot section along the eastern section of the sidewall. Figure 5 shows Phase 2 construction activities. The crew continued the installation of liquids collection sumps at low elevation points, and wellhead(s) installation at every 100'. Phase 2 lower and upper collectors construction progress, including HC wellhead and sump locations, is shown in the approximate as-built depicted as Figure 6. An additional drawing showing the completed portions of the SOMS is included in Appendix H.

Figure 5. Phase 2 SOMS Construction

Upon placement of the upper collector, stone, and liner on the southern section of the sidewall, clay placement was completed to a depth of 3 feet, and continues to be placed to meet the 7 foot depth of cover.

Figure 6. Phase 2 Sidewall Odor Mitigation System Progress As-Built



Throughout the month of April 2023, SCS-CON continued installing Phase 2 lower and upper horizontal collectors. There remains approximately 350 feet of the system to be installed along the eastern sidewall. Installation of this section will be completed as soon as GCCS liquids removal infrastructure and header pipes can be relocated. A small section (approximately less than 100 feet) of the upper collector also needs to be installed on the northern section. Installation of the upper horizontal collector proceeded past this section, due to a road crossing in that area.

3.0 WASTE TEMPERATURE MONITORING

On behalf of the City, SCS designed a temperature monitoring system to collect temperature data throughout the waste mass. The steps taken by the City to implement this system are described in the following sections.

3.1 TEMPERATURE MONITORING SYSTEM DESIGN

The temperature monitoring system consists of 9 boreholes drilled into the waste mass. A steel casing was placed in each borehole and the hole was backfilled around the casing with aggregate. A series of temperature sensors was placed inside the steel casing. At the top of each borehole, an IIoT transmitter collects the data from the sensors and transmits it to a cloud-based RMC system. The City submitted design of the temperature monitoring system to VDEQ on November 30, 2022.

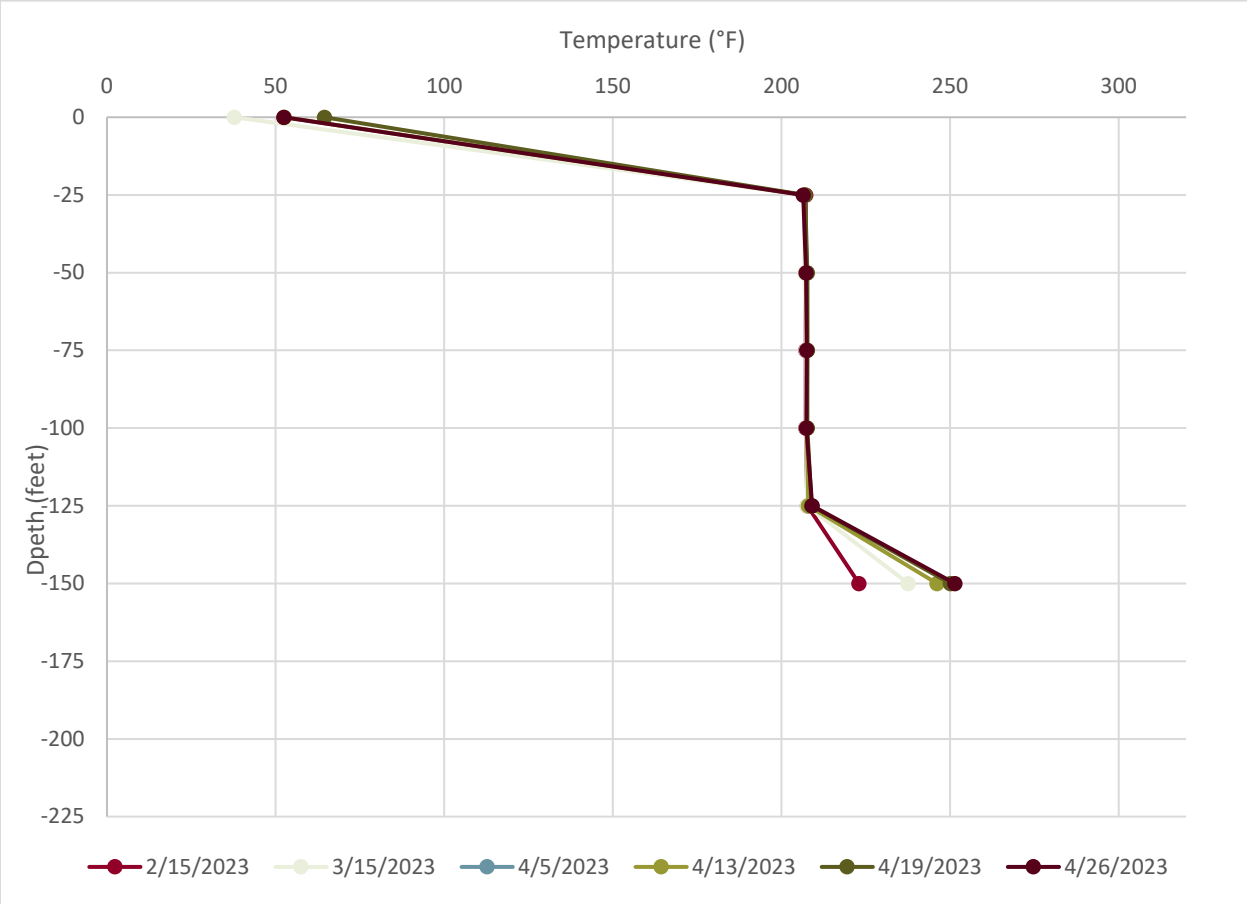
3.2 TEMPERATURE MONITORING SYSTEM INSTALLATION

Installation of the in-situ Landfill Temperature Monitoring System began in October of 2022 and installation of replacement sensors was completed in February of 2023. Details of construction progress can be found in the monthly compliance reports for the SWP No. 588 Landfill.

SCS began collecting temperature data on a daily basis on February 15, 2023. The temperature sensors continued to transmit temperature data from all 9 casings during the month of April. Average daily temperatures recorded by the sensors for the Month of April are included in Appendix D. Each week the average temperatures from a select day of that week are downloaded and compared to temperatures recorded during the previous week. Average daily temperatures recorded on select days during the month of April are shown in Figures 7 through 15 on the following pages. Average temperatures recorded on February 15, 2023 (the first day that the sensors collected data) and March 15, 2023 are also shown.

Figure 7 shows daily average temperatures in Temperature Probe 1 (TP-1) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. On average, during the month of April the average variation[1] in temperatures at any given monitoring point along the length of the probe[2] was approximately 8 degrees Fahrenheit. TP-1 was originally drilled to a depth of 180 feet, but the contractor was unable to install the casing beyond a depth of 160 feet. TP-1 is equipped with an ambient temperature sensor above the waste surface, but a software issue prevented that sensor from reporting during the month of February. A software update resolved the ambient temperature reporting issue and ambient temperatures were recorded during the months of March and April.

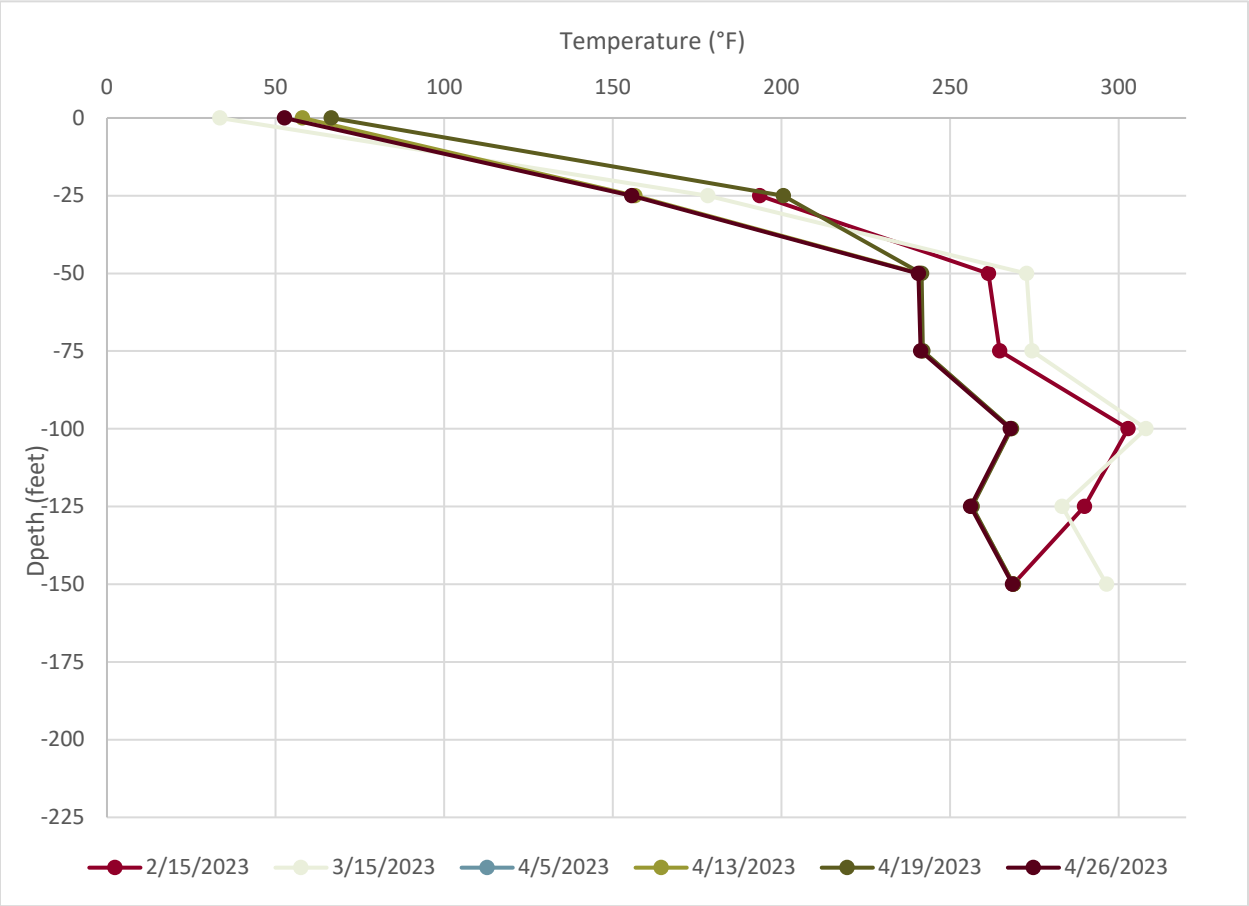
Figure 7. Average Temperatures within TP-1 on Select Days in April



[1] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[2] Ambient temperatures were excluded from the average.

Figure 8 shows daily average temperatures in Temperature Probe 2 (TP-2) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[3] in temperatures at any given monitoring point along the length of the probe[4] was approximately 9 degrees Fahrenheit. TP-2 was originally drilled to a depth of 160 feet. TP-2 is equipped with an ambient temperature sensor above the waste surface, but a software issue prevented that sensor from reporting during the month of February. A software update resolved the ambient temperature reporting issue and ambient temperatures were recorded during the month of April.

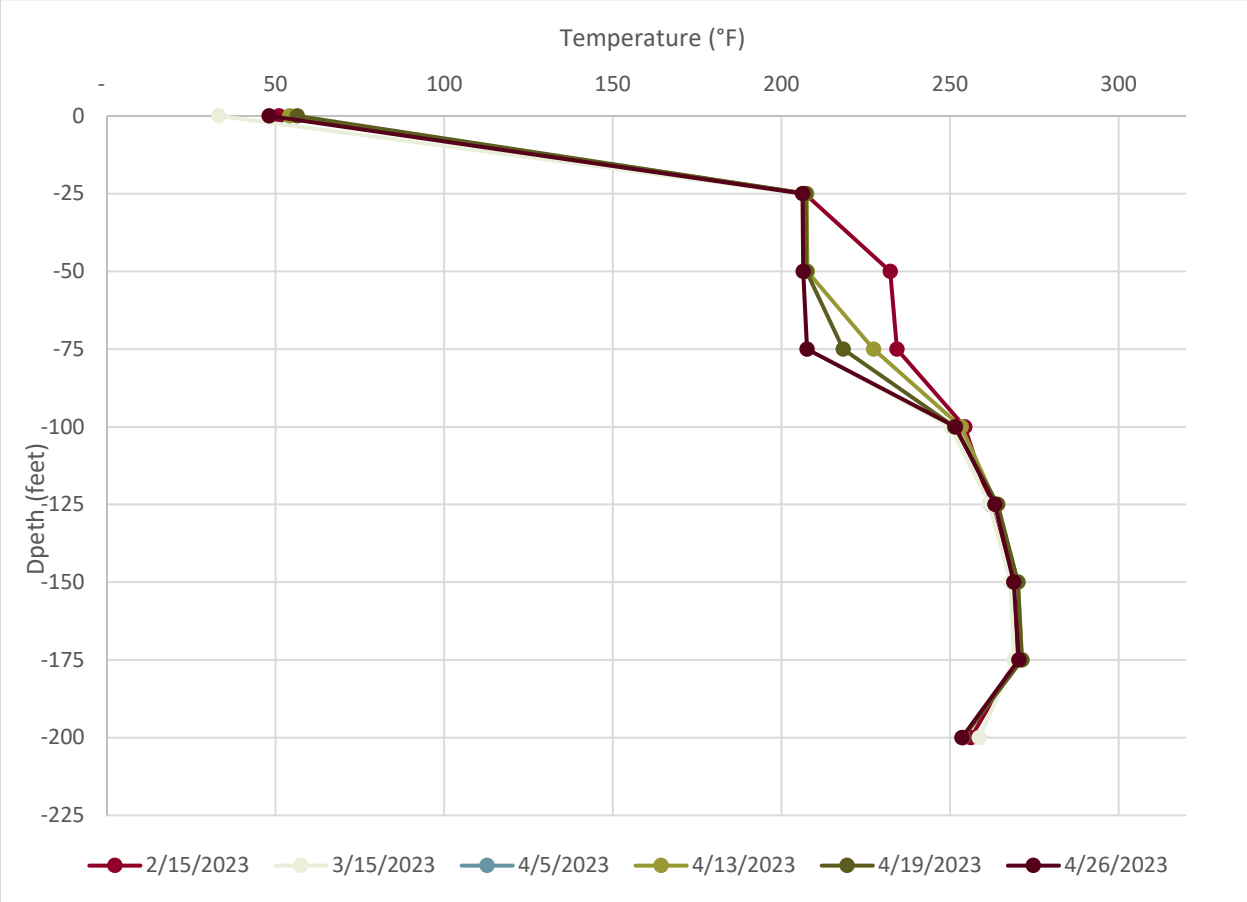
Figure 8. Average Temperatures within TP-2 on Select Days in April



[3] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[4] Ambient temperatures were excluded from the average.

Figure 9 shows daily average temperatures in Temperature Probe 3 (TP-3) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[5] in temperatures at any given monitoring point along the length of the probe[6] was approximately 4 degrees Fahrenheit.

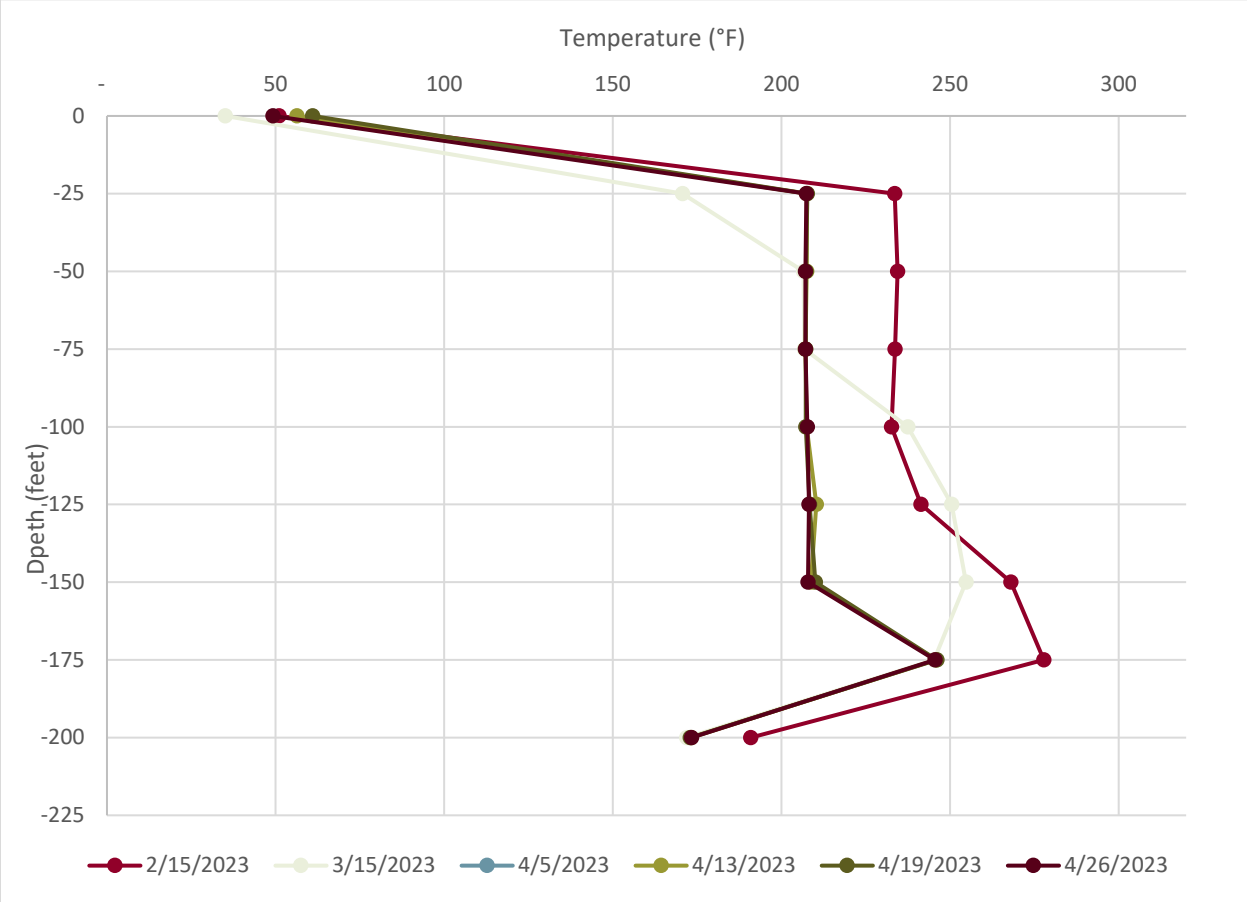
Figure 9. Average Temperatures within TP-3 on Select Days in April



[5] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[6] Ambient temperatures were excluded from the average.

Figure 10 shows daily average temperatures in Temperature Probe 4 (TP-4) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[7] in temperatures at any given monitoring point along the length of the probe[8] was approximately 6 degrees Fahrenheit.

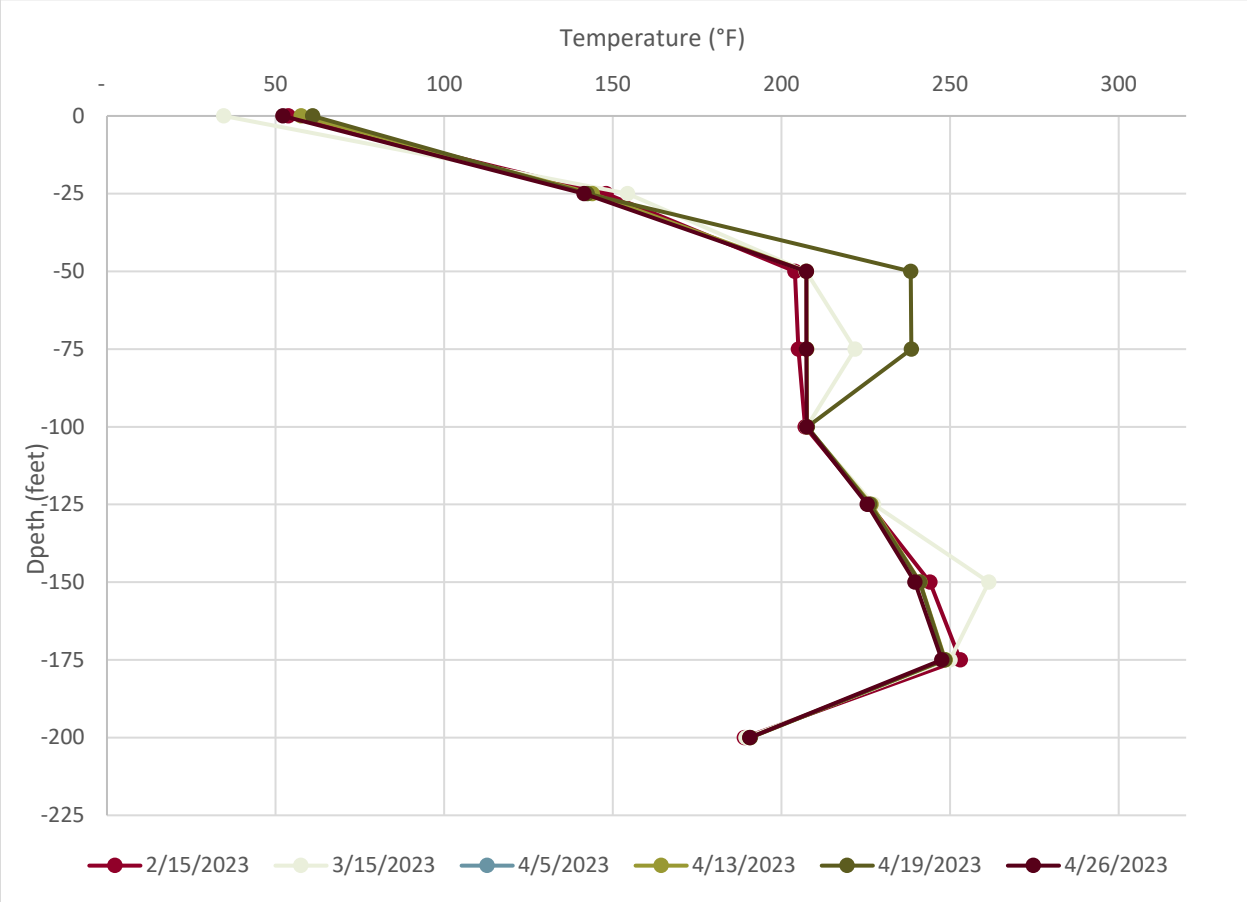
Figure 10. Average Temperatures within TP-4 on Select Days in April



[7] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[8] Ambient temperatures were excluded from the average.

Figure 11 shows daily average temperatures in Temperature Probe 5 (TP-5) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[9] in temperatures at any given monitoring point along the length of the probe[10] was approximately 9 degrees Fahrenheit.

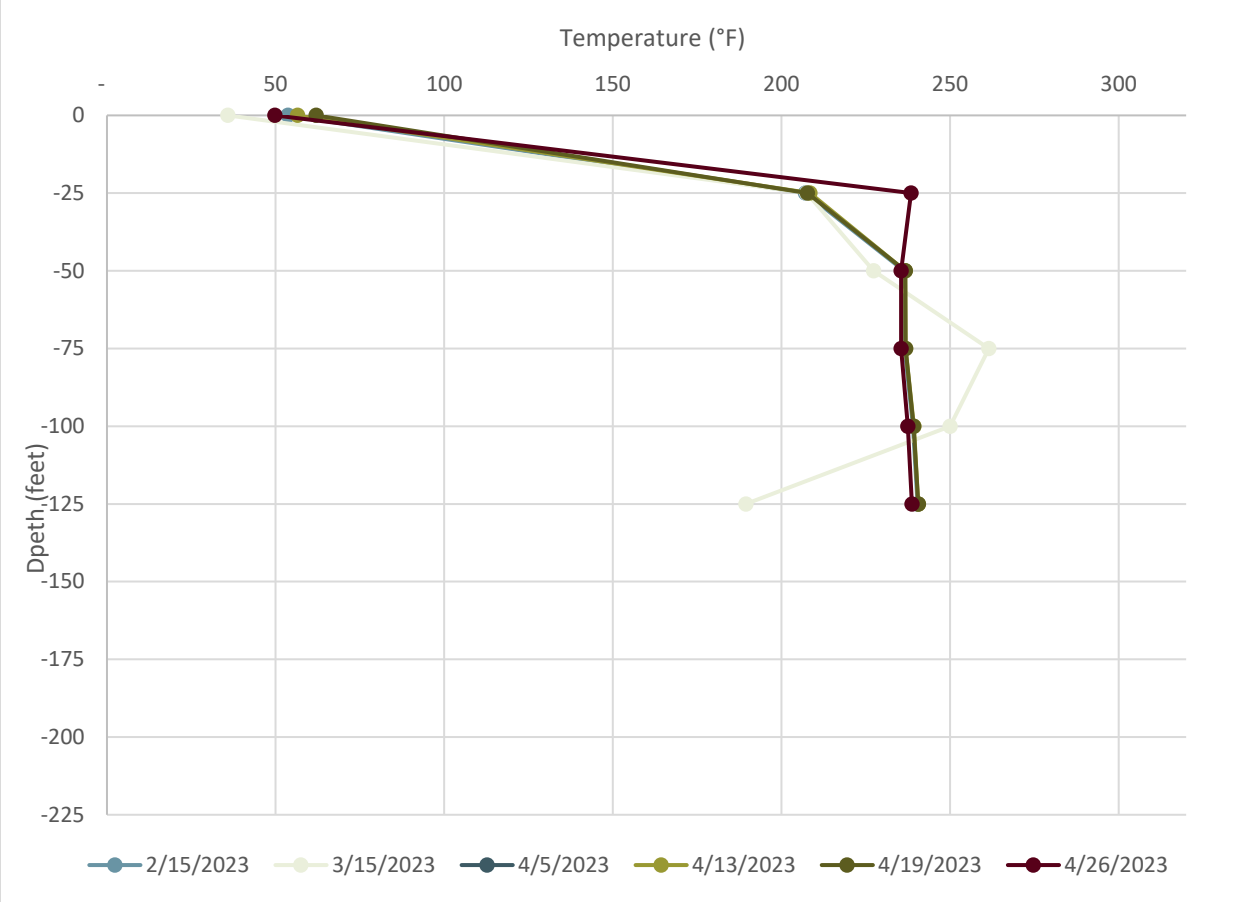
Figure 11. Average Temperatures within TP-5 on Select Days in April



[9] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[10] Ambient temperatures were excluded from the average.

Figure 12 shows daily average temperatures in Temperature Probe 6 (TP-6) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of March the average variation[11] in temperatures at any given monitoring point along the length of the probe[12] was approximately 8 degrees Fahrenheit. TP-6 was originally drilled to a depth of 208 feet and casing was installed to the full depth. During the installation of the installation of replacement sensors, a blockage within the casing prevented placement of sensors below the 125-foot depth.

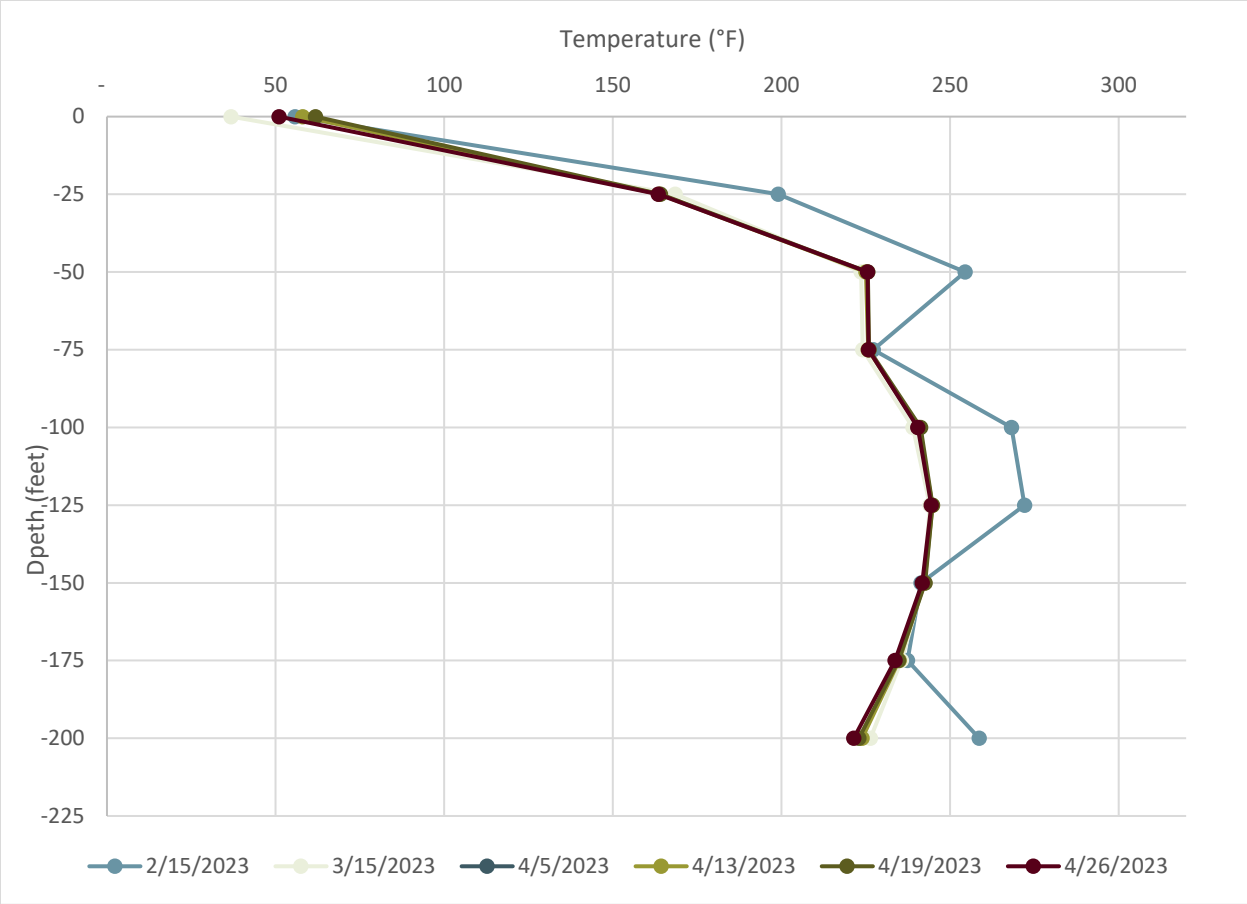
Figure 12. Average Temperatures within TP-6 on Select Days in April



[11] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[12] Ambient temperatures were excluded from the average.

Figure 13 shows daily average temperatures in Temperature Probe 7 (TP-7) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[13] in temperatures at any given monitoring point along the length of the probe[14] was approximately 4 degrees Fahrenheit.

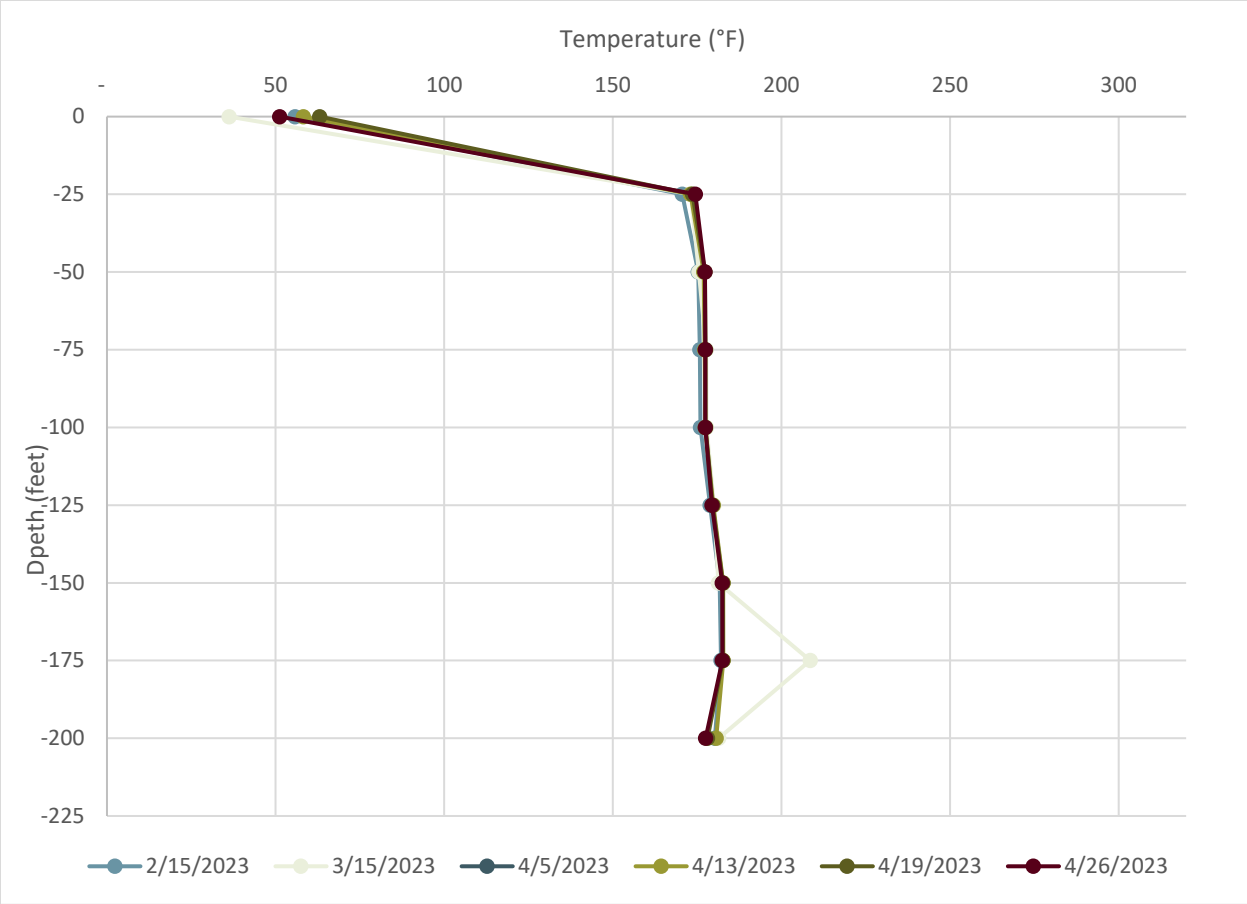
Figure 13. Average Temperatures within TP-7 on Select Days in April



[13] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[14] Ambient temperatures were excluded from the average.

Figure 14 shows daily average temperatures in Temperature Probe 8 (TP-8) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[15] in temperatures at any given monitoring point along the length of the probe[16] was approximately 1 degree Fahrenheit.

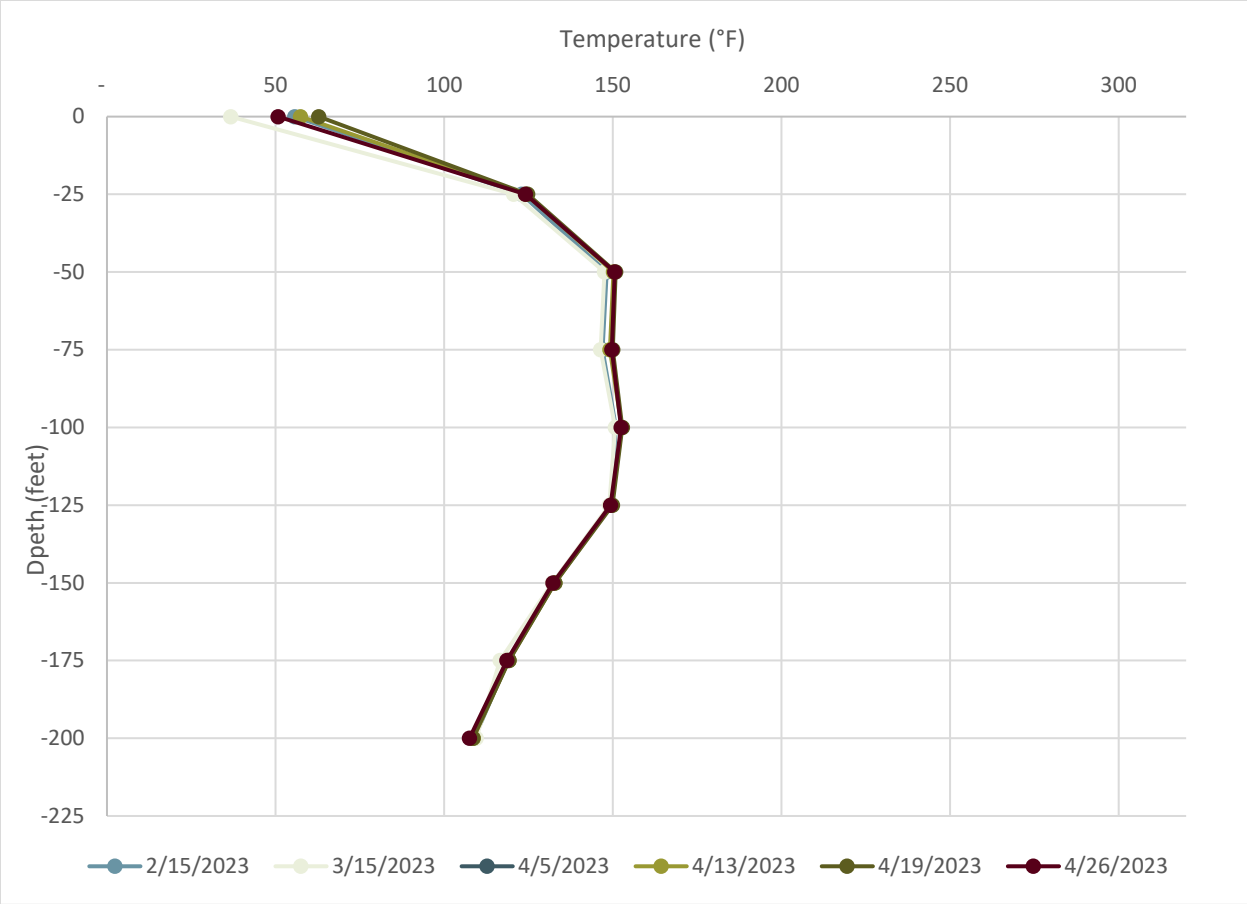
Figure 14. Average Temperatures within TP-8 on Select Days in April



[15] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[16] Ambient temperatures were excluded from the average.

Figure 15 shows daily average temperatures in Temperature Probe 9 (TP-9) on February 15, 2023; March 15, 2023; April 5, 2023; April 13, 2023; April 19, 2023; and April 26, 2023. During the month of April the average variation[17] in temperatures at any given monitoring point along the length of the probe[18] was approximately 1 degree Fahrenheit.

Figure 15. Average Temperatures within TP-9 on Select Days in April



The data indicate that temperatures within the landfill are stable and are typical of those observe at elevated temperature landfills (ETLFs). These temperatures are substantially lower than those associated with landfill fires or other combustion processes which can exceed 1000°F.

4.0 LEACHATE EXTRACTION AND MONITORING

The City has begun taking steps to improve the extraction of leachate from the waste mass and collect analytical data on leachate characteristics. The following sections detail steps taken to achieve these goals.

[17] Variation is defined as the difference in the minimum and maximum daily average temperatures on the select days reviewed.
[18] Ambient temperatures were excluded from the average.

4.1 EXISTING SYSTEM OPTIMIZATION

During weekly gas extraction well monitoring, SCS also collected stroke counter data from the pumps installed in the GCCS extraction wells. Stroke counts were collected from 20 wells on April 4, 2023; April 11, 2023; April 17, 2023; and April 24, 2023. The data collected is summarized in Table 4. Cells marked with "*" represent dates when the pump was removed from the well for maintenance or had not yet been installed.

Table 4. Summary of Dual Extraction Well Pump Stroke Counter Data

Well	April 4, 2023	April 11, 2023	April 17, 2023	April 24, 2023
EW49	439674	439689	439689	473548
EW50	845964	845969	845969	875548
EW51	293870	295093	386151	386151
EW52	*	227419	227419	227419
EW53	1852621	1852621	1852623	2058923
EW54	*	187927	241201	241210
EW55	*	*	67988	73869
EW57	248612	249017	271202	271262
EW58	1765798	1765870	1818020	1861996
EW59	1455025	1509345	1561477	1613360
EW60	*	165775	171643	172057
EW61	212105	212106	212110	212110
EW62	114035	114038	114043	114045
EW63	48073	48074	48074	48074
EW64	98083	98085	98085	98090
EW65	3950	3956	3967	3967
EW67	347194	347200	386151	450465
EW68	1839271	1844600	1849676	1851951
EW94	*	*	*	33291

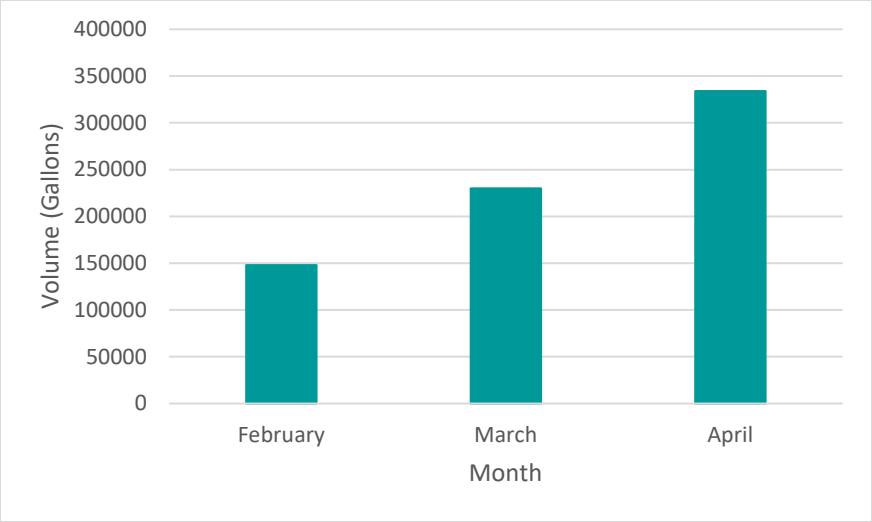
Based on this data and stroke counts taken on March 30, 2023, SCS can estimate the number of gallons of liquid pumped from each well. SCS assumed that each stroke correlates to approximately 0.3 gallons of liquid removed from the well. This data will then be used to repair or replace pumps or replace nonfunctional stroke counters. Estimates of the quantities of liquids removed between the reading dates is shown in Table 5.

Table 5. Summary of Dual Extraction Well Pump Liquids Removal

Well	Liquids Removed (gal) March 30, 2023 to April 4, 2023	Liquids Removed (gal) April 4, 2023 to April 11, 2023	Liquids Removed (gal) April 11, 2023 to April 17, 2023	Liquids Removed (gal) April 17, 2023 to April 24, 2023
EW49	1	5	1	10158
EW50	0	2	0	8874
EW51	3838	367	27317	0
EW52	0	3	0	0
EW53	1	0	1	61890
EW54	0	24619	15982	3
EW55	0	0	20396	1764
EW57	0	122	6655	18
EW58	2312	22	15645	13193
EW59	25108	16296	15639	15564
EW60	0	559	1760	124
EW61	0	0	1	0
EW62	7	0	2	1
EW63	1	1	0	0
EW64	0	1	0	2
EW65	0	2	3	0
EW67	1	2	11685	19294
EW68	1780	1599	1522	683
EW94	1	0	5	9987

SCS estimates that approximately 334,000 gallons of liquids were removed from the landfill gas collection and control system during the month of April. This is an increase of approximately 104,000 gallons when compared to the previous month. The change in landfill gas liquids removal over the last three months is depicted in Figure 16.

Figure 16. Estimated Volume of Liquids Removed from Landfill Gas Wells



The City and SCS understand that operations of dewatering pumps are critical to address issues related to heat, odors, and the efficient operation of the GCCS. The landfill conditions present a challenging environment for pump operations. Pumps require servicing after relatively short intervals. During April, pumps were cleaned and repaired on 4/5, 4/6, 4/10, 4/18, 4/19, and 4/21.

Pumps that were determined to be inoperative were removed from their respective extraction wells and replaced with a clean, functioning pump. In April, EW-49, EW -53, EW-55 and EW-59 had their pumps removed and replaced. While servicing EW-53, the tri-tubing was found to be kinked and was repaired. The pump for EW-51 was removed for an extraction well raise and will be reinstalled once fill has been placed around that device.

On April 25, 2023, four pumps were removed and shipped back to the manufacturer's facility (Pump One) for cleaning and repair. These pumps will be returned to the site once repaired and reinstalled in their respective extraction wells.

Wells EW-62, EW-63, EW-64, and EW-65 were disconnected from the airline used to power the pumps for portions of the month of April 2023 due infrastructure relocation associated with the sidewall odor mitigation system and landfill GCCS expansion construction projects.

During the construction of the LFGCCS expansion outlined in Sections 1.4 and 2.1, multiple types of leachate extraction pumps will be installed. After installation, the City and SCS will evaluate the performance of those pumps. Based on that evaluation, the City will select the pump type that is most effective given the landfill conditions.

4.2 SAMPLING AND ANALYSIS PLAN

On November 1, 2022, SCS submitted to VDEQ the Dual Phase Landfill Gas Extraction Well Leachate Monitoring Plan for the Bristol Integrated Solid Waste Management Facility Solid Waste Permit No. 588 Landfill and the plan was subsequently revised on December 1, 2022. Refer to the November and December Compliance Reports for the SWP No. 588 Landfill for additional information.

4.3 SAMPLING AND ANALYSIS

4.3.1 Sample Collection

On April 13, 2023, SCS collected leachate samples from two Dual Phase LFG-EWs (EW-58 and EW-60). At the time of sample collection dissolved oxygen, oxidation-reduction potential, pH, specific conductance, temperature, and turbidity were measured and recorded. The sample collection log is included in Appendix F.

SCS' field staff was not able to collect samples from the other wells for the following reasons:

- Pumps were not running at the time of sample collection in the following wells: EW-49, EW-50, EW-51, EW-52, EW-53, EW-54, EW-56, EW-57, EW-59, EW-61, EW-62, EW-63, EW-64, EW-65, EW-67, and EW-68.

- The pump was not running and well head was stuck and could not be removed on well EW-55.

The samples were delivered to Enthalpy Analytical (Enthalpy) in Richmond, Virginia and Weck Laboratories, Inc (Weck) in City of Industry, California for analysis. The Enthalpy's Virginia Division of Consolidated Laboratory Services (VELAP) certifications are provided on the certificate of analysis (COA) included in Appendix F. The samples were analyzed for the parameters utilizing the analytical methods described in the Dual Phase Landfill Gas Extraction Well Leachate Monitoring Plan.

4.3.2 Quality Assurance and Quality Control

Field quality control (QC) involved the collection and analysis of trip blanks to verify that the sample collection and handling processes did not impair the quality of the samples. Trip blanks were prepared for volatile organic compound (VOC) analysis via Solid Waste (SW)-846 Method 8260D. In conjunction with the preparation of the groundwater sample collection bottle set, laboratory personnel filled each trip blank sample bottle with distilled/deionized water and transported them with the empty bottle kits to SCS. Field personnel handled the trip blanks like a sample; they remained un-opened, were transported in the sample cooler, and were returned to the laboratory for analyses. A trip blank is used to indicate potential contamination due to the potential migration of VOCs from the air at the site or in the sample shipping containers, through the septum or around the lid of the sampling vials and into the sample.

Laboratory quality assurance/quality control (QA/QC) involves the routine collection and analysis of method reagent blanks, matrix spike (MS) and matrix spike duplicate (MSD) samples, and laboratory control samples (LCS). A brief summary of each of these is presented below:

- Method Blank – The method blank is deionized water subjected to the same reagents and manipulations to which site samples are subjected. Positive results in the method blanks may indicate either contamination of the chemical reagents or the glassware and implements used to store or prepare the sample and resulting solutions.

- MS/MSD – A MS is an aliquot of a field sample with a known concentration of target parameter added to it. An MSD is an intra-laboratory split sample spiked with a known concentration of target parameter. Spiking for each occurs prior to sample analysis. MS/MSD samples are collected for every batch of twenty or fewer samples. Matrix spike

recoveries are used to indicate what effect the sample matrix may have on the reported concentration and/or the performance of the sample preparation and analysis.

- LCS – These samples consist of distilled/deionized water injected with the parameters of interest for single parameter methods and selected parameters for multi-parameter methods according to the appropriate analytical method. LCS samples are prepared and analyzed for each batch containing twenty or fewer samples. LCS recoveries are used to monitor analytical accuracy.

Surrogate recoveries are also measured as a part of laboratory QA/QC. Surrogates are organic compounds that are similar to the parameters of interest in chemical composition, extraction, and chromatography, but are not normally found in environmental samples. These compounds are inserted into blank, standards, samples, and spiked samples prior to analysis for organic parameters only. Percent recoveries are calculated for each surrogate. Spike recoveries at or below acceptance criteria indicate whether analytical results can be considered biased high or biased low.

Field and laboratory QA/QC also involves the routine collection and analysis of duplicate field samples. These samples are collected at a rate of one per sample event. A duplicate is a separate sample collected independently in such a manner that it equally represents the medium at a given time and location. Co-located samples provide intra-laboratory precision information for the entire measurement system, including sample collection, homogeneity, handling, shipping, storage, preparation, and analysis.

No method or trip blank detects were identified for the April 2023 monitoring event. The laboratory analysis report for the April 2023 monitoring event trip blank is included in Appendix F. The April 2023 monitoring event laboratory QA/QC reports, including the method blank results, are included in the COAs in Appendix F.

4.3.3 Data Validation

To identify analytical data that may not represent valid results, data from the monitoring events were validated by the Laboratory and SCS in accordance with United States Environmental Protection Agency (EPA) guidance[19]. Data flagged with a "J" qualifier indicates the quantitation of the parameter is less than the laboratory's limit of quantitation but greater than the laboratory's limit of detection (LOD); thus, the concentration is considered estimated. Samples with parameter detections less than five times that of the trip blank, field blank, and/or method blank detection but greater than the laboratory's LOD are flagged with a "B" qualifier. Samples with common laboratory contaminant parameter detections less than 10 times that of the trip blank, field blank, and/or method/laboratory blank detection but greater than the laboratory's LOD are flagged with a "B" qualifier. Data with a "B" qualifier are considered not validated as the detection may be anomalous due to cross-contamination during sampling, transportation of samples, or laboratory analysis.

[19] United States Environmental Protection Agency. Guidance for Data Usability in Risk Assessment (Part A-14). April 1992.
United States Environmental Protection Agency. Office of Superfund Remediation and Technology Innovation. National Functional Guidelines for Inorganic Superfund Methods Data Review. January 2017.
United States Environmental Protection Agency. Office of Superfund Remediation and Technology Innovation. National Functional Guidelines for Organic Superfund Methods Data Review. January 2017.

No leachate results were flagged with a "B" qualifier for the April 2023 monitoring event as no constituents were detected in the April 2023 method and trip blanks. Constituent detections flagged with a "J" qualifier are shown on Table 6.

4.3.4 Laboratory Analytical Results

Chemical characteristics of leachate samples collected from extraction wells EW-58 and EW-60 are summarized in Table 6. The associated COA is included in Appendix F. Parameter results from April 2023 and previous monitoring events (November 2022 – March 2023) are presented on a table in Appendix F. The volatile fatty acids (VFAs) lab results were not available at the time of preparation of this report. VFA monitoring results will be provided in the next compliance report when available.

Table 6. Monthly LFG-EW Leachate Monitoring Event Summary

Well ID	EW-58	EW-60	LOD	LOQ
Parameter	April 2023 Concentration			
Ammonia as N (mg/L)	**1410**	**1220**	73.1	100
Biological Oxygen Demand (mg/L)	**8430**	**2860**	0.2	2
Chemical Oxygen Demand (mg/L)	---	**7370**	1000	1000
	16800	---	2000	2000
Nitrate as N (mg/L)	ND	ND	0.6	2.6
Nitrite as N (mg/L)	ND	ND	0.5	2.5
Total Kjeldahl Nitrogen (mg/L)	**1820**	**1510**	16.8	50
Total Recoverable Phenolics (mg/L)	**18.7**	**5.1**	0.3	0.5
SEMI-VOLATILE ORGANIC COMPOUND (ug/L)				
Anthracene	ND	---	37.4	74.8
	---	ND	38.8	77.7
TOTAL METALS (mg/L)				
Arsenic	---	**0.11**	0.0005	0.001
	0.36	---	0.005	0.01
TOTAL METALS (mg/L)				
Barium	**1.21**	**0.326**	0.01	0.05
Cadmium	**0.000158 J**	**0.000333 J**	0.0001	0.001
Chromium	---	**0.142**	0.0004	0.001
	0.306	---	0.004	0.01
Copper	**0.00664**	**0.00767**	0.0003	0.001
Lead	**0.0022**	**0.0067**	0.001	0.001
Mercury	---	**0.00128**	0.0002	0.0002
	ND	---	0.0004	0.0004
Nickel	**0.1143**	**0.1732**	0.001	0.001
Selenium	**0.00189**	**0.00185**	0.00085	0.001
Silver	ND	**0.00011 J**	0.00006	0.001
Zinc	**0.0539**	---	0.0025	0.005
	---	**0.414**	0.025	0.05

Table 6. Monthly LFG-EW Leachate Monitoring Event Summary

Well ID	EW-58	EW-60	LOD	LOQ
Parameter	April 2023 Concentration			
VOLATILE ORGANIC COMPOUNDS (ug/L)				
2-Butanone (MEK)	**3420**	**5530**	750	2500
Acetone	**8290**	**7560**	1750	2500
Benzene	**3740**	**320**	4	10
Ethylbenzene	**186**	**43.4**	4	10
Tetrahydrofuran	**2410**	**4790**	100	100
Toluene	**303**	**94.4**	5	10
Xylenes, Total	**329**	**97.4**	10	30

--- = not available
J = Constituent was detected at a concentration above the laboratory's LOD but below the laboratory's LOQ. Concentration is estimated and not validated.
LOD = laboratory's Limit of Detection
LOQ = laboratory's Limit of Quantitation
mg/L = milligrams per liter
ND = Not Detected
ug/L = micrograms per liter

5.0 SETTLEMENT MONITORING AND MANAGEMENT

The City is taking steps to track and manage settlement occurring in the landfill. A summary of actions taken to quantify and manage settlement is included in the sections below.

5.1 SETTLEMENT MONITORING AND MANAGEMENT PLAN

On behalf of the City, SCS submitted a settlement monitoring and management plan to VDEQ on November 15, 2022. Refer to the November Monthly Compliance Report for the SWP No. 588 Landfill for additional information.

5.2 MONTHLY SURVEYS

5.2.1 Topographic Data Collection

The City, through SCS, collected topographic data of the Solid Waste Permit No. 588 Landfill using photogrammetric methods via an unmanned aerial vehicle (UAV or drone). On April 11, 2023 the flight was completed and the topographic data collected. The topographic data collected is shown on Sheet 1 in Appendix E.

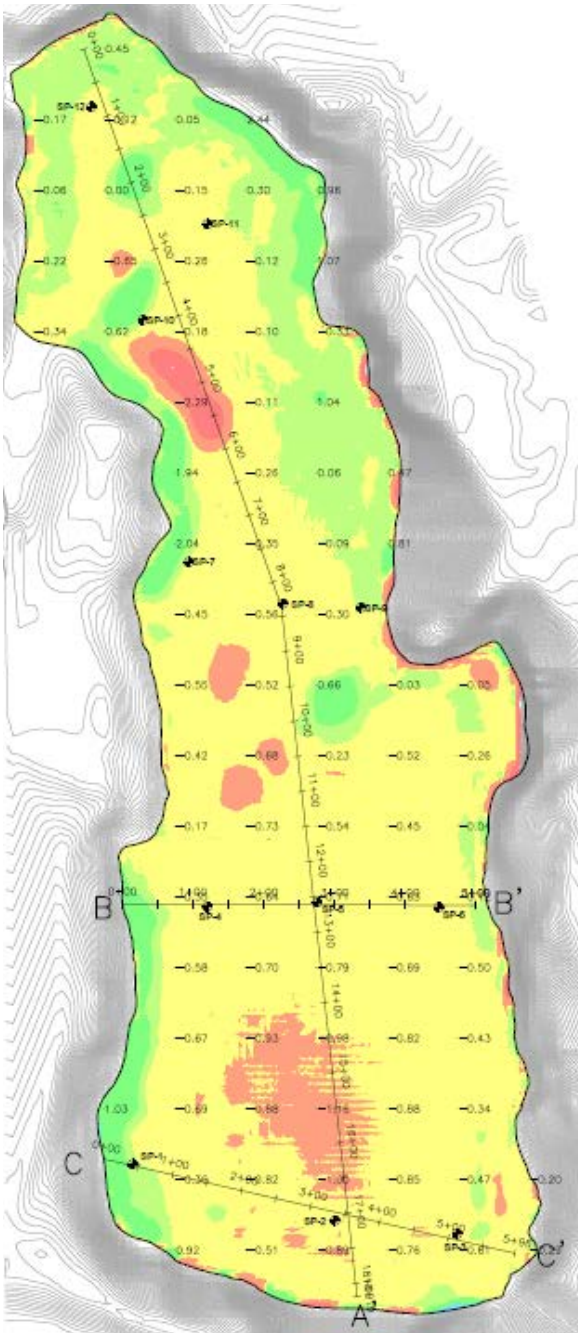
The topography within the landfill footprint was compared to topographic data collected by SCS using photogrammetric methods on March 9, 2023. A drawing depicting the March 9, 2023 topography is included as Sheet 2 in Appendix E.

Based on a comparison of the topographic data collected on those two dates, settlement occurred that reduced the volume of waste in the landfill by approximately 15,300 cubic yards. During that same time period approximately 5,400 cubic yards of construction related fill were placed on the

landfill. This fill was primarily soil placed as part of the sidewall odor mitigation system construction. This resulted in a net volume decrease of approximately 9,900 cubic yards.

A visual depiction of settlement and filling at the landfill during this time is depicted in Figure 17. Areas in red indicate where elevations decreased and areas in green indicate areas where elevations have increased. Darker colors indicate greater changes in elevation. This drawing is also included as Sheet 3 in Appendix E.

Figure 17. 1-Month Elevation Change Color Map



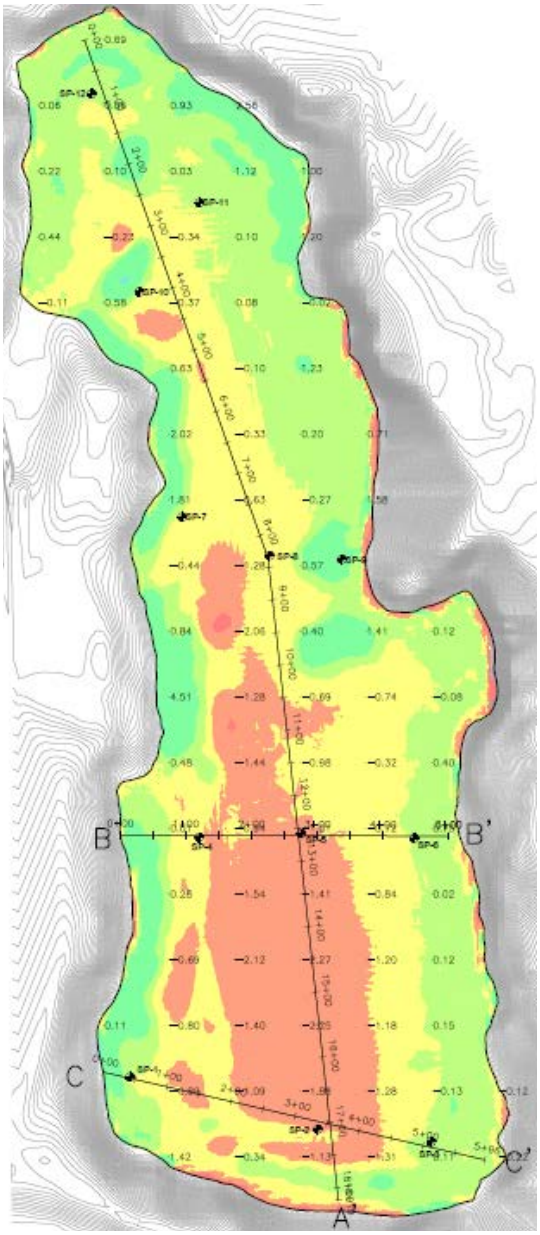
The largest settlement occurred primarily in the southern end of the landfill where the waste settled by approximately 1 foot or more in some areas. The southern end of the landfill is the location of the gas wells and temperature probes exhibiting higher temperatures. These higher settlement values are typical of elevated temperature landfill conditions. Settlement in the northern portion of the landfill was generally less substantial or was offset by soil placement associated with construction activities. These changes in elevation more representative of typical settlement at municipal landfills.The eastern side of the landfill exhibited an increase in elevation, likely due to sediment deposition during storm events and waste relocation associated with construction of the Sidewall Odor Mitigation System. Increases in elevation along the western edge of the landfill are most likely due to installation of the Sidewall Odor Mitigation System. Some soil stockpile locations associated with the Sidewall Odor Mitigation System showed a large negative elevation change due to material removal from the stockpiles.

SCS calculated the waste footprint for purposes of analysis to be 752,610 square feet. Based on that area and the net volume change, the average elevation decrease was approximately 0.4 feet.

SCS also compared the topographic data collected in April to the topographic data collected on January 10, 2023. Based on a comparison of the topographic data collected on those two dates, settlement occurred that reduced the volume of waste in the landfill by approximately 16,300 cubic yards. During that same time period approximately 9,900 cubic yards of construction related fill were placed on the landfill. This fill was primarily soil placed as part of the sidewall odor mitigation system construction. This resulted in a net volume decrease of approximately 6,400 cubic yards.

A visual depiction of settlement and filling at the landfill during this time is depicted in Figure 18. Areas in red indicate where elevations decreased and areas in green indicate areas where elevations have increased. Darker colors indicate greater changes in elevation. This drawing is also included as Sheet 4 in Appendix E.

Figure 18. 3-Month Elevation Change Color Map



The largest settlement occurred primarily in the southern end of the landfill where the waste settled by approximately 2 feet or more in some areas. The southern end of the landfill is the location of the gas wells and temperature probes exhibiting higher temperatures. These higher settlement values are typical of elevated temperature landfill conditions. Settlement in the northern portion of the landfill was generally less substantial or was offset by soil placement associated with construction activities. Changes in elevation in these areas are more representative of typical settlement at municipal landfills. The eastern side of the landfill exhibited an increase in elevation, likely due to sediment deposition during storm events and waste relocation associated with construction of the Sidewall Odor Mitigation System. Increases in elevation along the western edge of the landfill are most likely due to installation of the Sidewall Odor Mitigation System. There were some large variations in elevation associated with soil stockpiling operations.

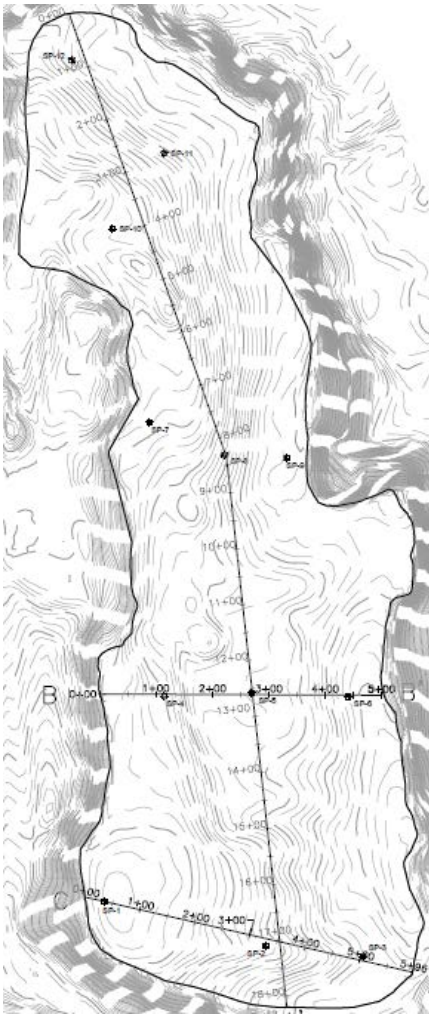
SCS will collect topographic data covering the landfill surface again in May using photogrammetric methods via UAV. This data will be compared to the data collected in April and February.

5.2.2 Settlement Plate Surveys

On November 7, 2022 SCS field services installed 12 settlement plates on the Solid Waste Permit No. 588 landfill. The construction and installation of the settlement plates generally conforms to the design outline in the Settlement Monitoring and Management Plan. The tops of the PVC pipes were spray painted orange to improve visibility.

The locations of the settlement plates were surveyed by the City's surveyor on November 14, 2022. The settlement plates were surveyed again on December 13, 2022; January 3, 2023; February 6, 2023; March 8, 2023; and April 3, 2023. The settlement plate locations are depicted in Figure 23 on Sheet 1 in Appendix E. The surveyed coordinates[20] and elevation changes of the settlement plates are shown in Table 7.

Figure 19. Settlement Plate Locations



[20] Settlement plate locations and coordinates are based on a local coordinate system.

Table 7. Settlement Plate Locations

Settlement Plate	Northing	Easting	Elevation on April 3, 2023	Elevation Change Since March 8, 2023	Strain[21] Since March 8, 2023	Elevation Change Since Installation	Strain Since Installation
SP-1	3,397,886.5	10,412,078.5	1,832.9	0.0	0.0%	-1.5	-2.2%
SP-2	3,397,807.4	10,412,364.5	1,807.4	-0.4	-0.2%	-3.1	-1.9%
SP-3	3,397,787.2	10,412,536.6	1,783.4	0.0	0.0%	-0.3	-0.4%
SP-4[22]	3,398,250.1	10,412,186.7	1,813.8	-0.6	-0.4%	-3.7	-2.4%
SP-5	3,398,256.4	10,412,339.0	1,798.2	-0.3	-0.1%	-2.5	-1.0%
SP-6	3,398,249.5	10,412,510.7	1,777.0	0.0	0.0%	-0.7	-0.5%
SP-7[23]	3,398,736.5	10,412,156.8	1,827.7	0.9	0.8%	-0.9	-0.8%
SP-8	3,398,679.2	10,412,290.7	1,805.4	-0.2	-0.1%	-1.9	-0.8%
SP-9	3,398,674.0	10,412,401.2	1,785.0	-0.2	-0.2%	-0.8	-0.8%
SP-10	3,399,080.4	10,412,091.9	1,839.4	-0.2	-0.1%	-0.8	-0.3%
SP-11	3,399,216.1	10,412,183.7	1,816.0	0.0	0.0%	-0.3	-0.1%
SP-12	3,399,381.7	10,412,019.4	1,810.4	0.0	0.0%	-0.2	-0.2%

Settlement Plates 1, 2, and 4 demonstrated substantial elevation change. SCS believes that Settlement Plate 4 was disturbed by grading work on an adjacent roadway. The other 2 settlement plates are towards the center of the waste mass and in the southern end of the landfill. This area is where waste was most recently placed and is expected to show the most rapid settlement. This area is also the location of the gas wells and temperature probes exhibiting higher temperatures. These higher settlement values are typical of elevated temperature landfill conditions.

The changed in elevation at Settlement Plates 10, 11, and 12 is lower more representative of typical settlement at municipal landfills. The change in elevation at Settlement Plates 3, 5, 6, 8, and 9 falls somewhere in between these two categories. Field observations indicate that Settlement Plate 7 may also have been damaged during construction operations.

The settlement plates will be surveyed again during the month of May. The elevations surveyed will be compared to the elevations surveyed the previous months.

6.0 INTERMEDIATE COVER AND EVOH COVER SYSTEM

The City is taking steps to provide intermediate and temporary cover of the wastes in the landfill. The sections below outline the steps taken by the City.

[21] Strain is defined as the change in elevation divided by the estimated waste depth.
[22] Based on field observations SP-4 appears to have been disturbed during grading on an adjacent roadway.
[23] Based on field observations SP-7 appears to have been disturbed during grading on an adjacent stockpile.

6.1 INTERMEDIATE COVER INSTALLATION

The City completed hauling and placement of a 12-inch thick intermediate cover across the entire landfill prior to October 10, 2022. The cover was placed in accordance with 9VAC20-81-140(B)(1)(d). SCS coordinated with the City to dig a series of test holes to verify cover thickness in select locations. Details of these verifications were discussed in the October Monthly Compliance Report for the SWP No. 588 Landfill.

6.2 EVOH COVER SYSTEM DESIGN

SCS submitted responses, including revised documents, on March 20, 2023 to comments received from VDEQ concerning the Interim EVOH Cover System Preliminary Design Plans. The submitted documents included a revised operations manual and settlement calculations for the proposed stormwater basin.

SCS is preparing construction drawings for the EVOH Cover System, including revisions discussed in the response to comments letter. The construction drawings build upon the preliminary design plans. The stormwater management plan drawings will be incorporated into the construction drawing set. Potential modifications to the stormwater management plan submitted to VDEQ on April 28, 2023 will be included in the construction drawing set along with applicable calculations. Other additions to the construction drawings include additional design cross sections, landfill gas management plans and details, access road design, and other items.

SCS is also drafting specifications and contract documents for the construction of the EVOH Cover System.

6.3 EVOH COVER SYSTEM PROCUREMENT

Drawings used for the purposes of bidding, procurement and construction of the EVOH cover system will generally conform to the layout and details in the drawings described in section 6.2. SCS also prepared and submitted to VDEQ a specification for the EVOH geomembrane on January 30, 2023 based upon industry standards and discussions with material manufacturers. This specification and drawing set represent the first steps in the procurement process. SCS and the City have coordinated with potential suppliers to specify a product that is not currently anticipated to have long lead times. SCS has received a pro-forma data sheet from one manufacturer which is preparing a customized EVOH product for the No. 588 landfill.

6.4 EVOH COVER SYSTEM INSTALLATION

Installation of the EVOH cover system will begin after the installation of other infrastructure is complete.

7.0 STORMWATER MANAGEMENT

The stormwater management plan was submitted to VDEQ on April 28, 2023. The plan addresses the stormwater volume calculations, assumptions, design, and control measures. A copy of this plan in included in Appendix I.

The plan proposes a stormwater pumping system to convey stormwater collected atop the EVOH cover system to an adequate discharge point in compliance with VPDES permit VAR050053. The

proposed system includes the construction of a collection basin in the southeast corner of the quarry and the installation of a nearby long-term stormwater pump. The stormwater will be conveyed by a pipe adjacent to the basin access road.

The plan proposes modifications to the existing stormwater basins west of the quarry to achieve discharge quantity targets. Modifications include potentially increasing the basin depths and installing new outlet riser structures.

8.0 MISCELLANEOUS

8.1 CEASE WASTE ACCEPTANCE

The City ceased acceptance of offsite waste at the Solid Waste Permit No. 588 landfill prior to September 12, 2022.

8.2 LONG-TERM PLAN

SCS submitted the Monitoring, Maintenance, and Repair Plan to VDEQ for the SWP No. 588 landfill on December 30, 2022. Refer to the December 2022 Monthly Compliance Report for the SWP No. 588 Landfill for additional information. The City has taken steps to implement the plan that were detailed in the March 2023 Monthly Compliance Report for the SWP No. 588.

8.3 MONTHLY COMPLIANCE REPORTS

As described in the introduction this report is intended to provide comprehensive updates regarding progress towards completion of each item described in Appendix A of the Consent Decree between the City and VDEQ,

8.4 COMMUNITY OUTREACH PROGRAM

The City's consultant leading community outreach, McGuireWoods Consulting, described the actions taken as part of their community outreach efforts. For the month of April, those actions include:

- April – ongoing basis: Fifteen posts on the BristalVALandfill.org site and the existing City of Bristol Landfill Notifications and Information page covering several important updates including:
  - Progress updates during construction of the Sidewall Odor Mitigation System (SOMS).
  - Progress updates during installation of the gas well expansion project
  - City published statement related to the consent order resolution regarding the federal lawsuit over the Bristol Quarry Landfill between Bristol, VA and Bristol, TN
  - Provided links to news articles chronicling construction updates and information on legal updates about the quarry landfill
- E-mail communication sent to the list of members of the public signed up through the Bristol, VA website, the BristolVALandfill.org website, or at the November 1 Open House to receive information via e-mail

- E-mails sent included weekly remediation progress update and links to website updates and latest news articles on the following days:
  - Friday, April 7th
  - Friday, April 21st
  - Friday, April 28th

Appendix A

Surface Emissions Monitoring Summary Letters

April 12, 2023
File No. 02218208.04

Mr. Jonathan Chapman
Enforcement Specialist
Virginia Department of Environmental Quality
SW Regional Office
355-A Deadmore Street
Abingdon, VA 24210

Subject: Weekly Surface Emissions Monitoring Event – April 4, 2023
Bristol Integrated Solid Waste Facility – Bristol, Virginia

Dear Mr. Chapman:

On behalf of the City of Bristol (City), SCS Engineers (SCS), is pleased to submit the results of the Weekly Surface Emissions Monitoring event performed at the Bristol Integrated Solid Waste Facility located in Bristol, Virginia on April 4, 2023. This Weekly Surface Emissions Monitoring (SEM) Event was performed in accordance with Appendix A.1.i of the Consent Decree between the Commonwealth of Virginia and the City of Bristol.

The monitoring generally conforms to the requirements of 40 CFR 63.1960(c) and (d), and 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. The landfill gas (LFG) collection system is required to operate such that the methane concentration is less than 500 ppm above background at the landfill surface.

The monitoring route includes the entire waste footprint of the Permit No. 588 Landfill. Sampling was conducted with a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) at 30-meter intervals and where visual observations indicated the potential for elevated concentrations of LFG, such as distressed vegetation and surface cover cracks. In addition, in accordance with 40 CFR 63.1958(d)(ii)(2) and 40 CFR 60.34f(d), monitoring was conducted at all surface cover penetrations within the waste footprint, including at the newly installed temperature probes. The approximate monitoring route and sampling locations are presented in the attached Drawing.

At the time of monitoring, all areas of the Permit No. 588 Landfill footprint are subject to regulatory monitoring based on the regulatory time schedule stipulated in 40 CFR 63.1960(b) and 40 CFR 60.36f(b). The Permit No. 588 Landfill has a surface area of approximately 17.3 acres. Therefore, the minimum number of sampling points to cover the appropriate portion of the landfill footprint, utilizing a 30-meter grid interval, is approximately 82 (4.75 points per acre). A summary of the results of the surface emissions monitory is provided in Table 1.

Table 1. Summary of Surface Emissions Monitoring

Description	Quantity
Number of Points Sampled	147
Number of Points in Serpentine Route	100
Number of Points at Surface Cover Penetrations	47
Number of Exceedances[1]	1
Number of Serpentine Exceedances	1
Number of Pipe Penetration Exceedances	0

Remonitoring of Ongoing Exceedances

In accordance with 40 CFR 63.1960(c)(4)(ii) and 40 CFR 60.36f(c)(4)(ii), corrective actions and a remonitoring event are to be performed within 10 days of the initial exceedance. In accordance with 40 CFR 63.1960(c)(4)(iii) and 40 CFR 60.36f(c)(4)(iii) additional corrective actions and a second 10-day retest are to be performed if the initial 10-day retest indicates methane values greater than the regulatory threshold. The Facility performs corrective actions, as necessary, including wellhead vacuum adjustments, the installation of well-bore seals, and addition of soil cover prior to weekly monitoring events at locations that previously exhibited elevated methane concentrations.

In accordance with 40 CFR 63.1960(c)(4)(v) and 40 CFR 60.36f(c)(4)(v) a new well or collection device must be installed or an alternate remedy must be submitted within 120-days at locations that continue to exhibit methane concentrations above the regulatory threshold for two consecutive re-tests.

A summary of ongoing exceedance points is provided in Table 2.

Table 2. Ongoing Weekly SEM Exceedances

Point ID	Initial Exceedance Date	4/4/23 Event	4/4/23 Event Result	Comments
EW-52	3/29/23	10-Day Retest	Passed	Requires 30-Day Retest

If you have questions or require additional information, please contact either of the undersigned.

Sincerely,

Quinn F. Bernier, PE
Project Professional
SCS Engineers

Lucas S. Nachman
Project Professional
SCS Engineers

LSN/QFB/cjw

cc: Randall Eads, City of Bristol
Mike Martin, City of Bristol
Joey Lamie, City of Bristol
Jonathan Hayes, City of Bristol
Jake Chandler, City of Bristol
Susan “Tracey” Blalock, VDEQ

Encl. Surface Emissions Monitoring Results
Bristol SEM Route Drawing

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 4, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
1	20.8 PPM	OK			Start Serpentine Route
2	3.5 PPM	OK			
3	35.8 PPM	OK			
4	4.5 PPM	OK			
5	49.4 PPM	OK			
6	6.9 PPM	OK			
7	8.4 PPM	OK			
8	33 PPM	OK			
9	15.7 PPM	OK			
10	40 PPM	OK			
11	31.8 PPM	OK			
12	318 PPM	OK			
13	5.5 PPM	OK			
14	4.8 PPM	OK			
15	8.8 PPM	OK			
16	9.1 PPM	OK			
17	410 PPM	OK			
18	6.7 PPM	OK			
19	7.8 PPM	OK			
20	65 PPM	OK			
21	42.4 PPM	OK			
22	81.9 PPM	OK			
23	71.4 PPM	OK			
24	190 PPM	OK			
25	229 PPM	OK			
26	5908 PPM	HIGH_ALRM	36.59755	-82.14758	
27	89.3 PPM	OK			
28	208 PPM	OK			
29	44.5 PPM	OK			
30	10.9 PPM	OK			
31	12.3 PPM	OK			
32	4.6 PPM	OK			
33	6.4 PPM	OK			
34	10.8 PPM	OK			
35	7.3 PPM	OK			
36	15.4 PPM	OK			
37	6.8 PPM	OK			
38	1.5 PPM	OK			
39	0.9 PPM	OK			
40	1 PPM	OK			
41	2.7 PPM	OK			
42	7.4 PPM	OK			

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 4, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
43	4.6 PPM	OK			
44	3.8 PPM	OK			
45	0.4 PPM	OK			
46	3.7 PPM	OK			
47	3.5 PPM	OK			
48	44.4 PPM	OK			
49	7.7 PPM	OK			
50	2.5 PPM	OK			
51	2.7 PPM	OK			
52	463 PPM	OK			
53	0.6 PPM	OK			
54	10.2 PPM	OK			
55	15.2 PPM	OK			
56	3.5 PPM	OK			
57	0 PPM	OK			
58	0.4 PPM	OK			
59	3 PPM	OK			
60	0.5 PPM	OK			
61	2.5 PPM	OK			
62	32.5 PPM	OK			
63	4.6 PPM	OK			
64	12.4 PPM	OK			
65	3.5 PPM	OK			
66	2 PPM	OK			
67	19.2 PPM	OK			
68	37.5 PPM	OK			
69	25.9 PPM	OK			
70	77.3 PPM	OK			
71	2.6 PPM	OK			
72	36.7 PPM	OK			
73	6.2 PPM	OK			
74	30.1 PPM	OK			
75	40.7 PPM	OK			
76	39.6 PPM	OK			
77	59.6 PPM	OK			
78	107 PPM	OK			
79	52.3 PPM	OK			
80	2.8 PPM	OK			
81	1 PPM	OK			
82	1.1 PPM	OK			
83	3.5 PPM	OK			
84	7.4 PPM	OK			

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 4, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	GPS Coordinates Long.	Comments
85	3.6 PPM	OK			
86	0.4 PPM	OK			
87	1.7 PPM	OK			
88	11.9 PPM	OK			
89	4.4 PPM	OK			
90	0.1 PPM	OK			
91	13.9 PPM	OK			
92	11.2 PPM	OK			
93	5.4 PPM	OK			
94	40.3 PPM	OK			
95	67.1 PPM	OK			
96	13.8 PPM	OK			
97	171 PPM	OK			
98	12.2 PPM	OK			
99	115 PPM	OK			
100	13.6 PPM	OK			End Serpentine Route
101	43.2 PPM	OK			EW-35
102	64.8 PPM	OK			EW-52
103	6.9 PPM	OK			TP-4
104	119 PPM	OK			EW-60
105	104 PPM	OK			EW-48
106	0.2 PPM	OK			TP-6
107	9.6 PPM	OK			EW-61
108	3.3 PPM	OK			EW-36
109	18.2 PPM	OK			EW-34
110	37 PPM	OK			EW-50
111	68.9 PPM	OK			EW-67
112	0.7 PPM	OK			EW-47
113	416 PPM	OK			EW-54
114	29 PPM	OK			EW-55
115	4 PPM	OK			TP-2
116	5.2 PPM	OK			EW-46
117	9.7 PPM	OK			EW-66
118	152 PPM	OK			EW-58
119	3.3 PPM	OK			EW-57
120	26 PPM	OK			TP-1
121	170 PPM	OK			EW-59
122	148 PPM	OK			EW-56
123	68.9 PPM	OK			EW-41
124	36.9 PPM	OK			EW-53
125	19.6 PPM	OK			EW-40

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 4, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
126	17.2 PPM	OK			TP-3
127	202 PPM	OK			EW-51
128	46 PPM	OK			EW-39
129	12.3 PPM	OK			TP-5
130	55.9 PPM	OK			EW-68
131	206 PPM	OK			EW-38
132	5.5 PPM	OK			TP-7
133	0.8 PPM	OK			EW-49
134	3.9 PPM	OK			EW-31R
135	0.1 PPM	OK			EW-65
136	0.3 PPM	OK			EW-37
137	1.1 PPM	OK			TP-8
138	0.8 PPM	OK			EW-64
139	7.6 PPM	OK			EW-30R
140	6.4 PPM	OK			EW-63
141	3.3 PPM	OK			EW-42
142	2.2 PPM	OK			TP-9
143	1 PPM	OK			EW-33R
144	2.3 PPM	OK			EW-62
145	0.8 PPM	OK			EW-29R
146	4.5 PPM	OK			EW-32
147	8 PPM	OK			EW-32R

Number of locations sampled:	147
Number of exceedance locations:	1

SCS ENGINEERS

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 4, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments

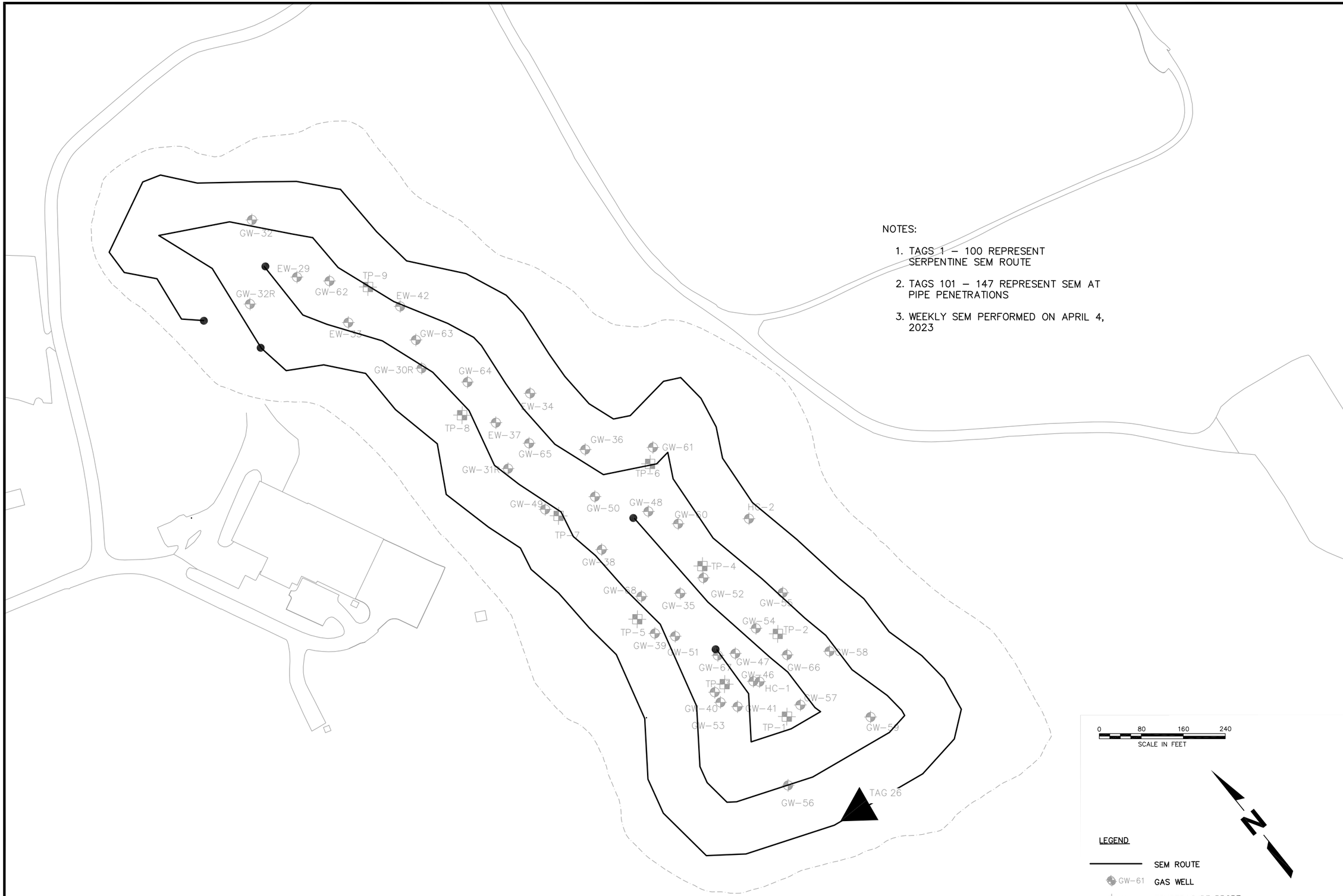
NOTES:
Points 1 through 100 represent serpentine SEM route.
Points 101 through 147 represent SEM at Pipe Penetrations
Weather Conditions: Partly Cloudy, 65˚F Wind: W - 5 MPH

Sampling Calibration: Methane - 500 ppm, Zero Air - 0.0 ppm

4/4/2023	8:15	ZERO	0.0 PPM
4/4/2023	8:17	SPAN	500.0 PPM

Background Reading:

4/4/2023	8:21	Upwind	1.5 PPM
4/4/2023	8:28	Downwind	22.1 PPM



NOTES:

1. TAGS 1 – 100 REPRESENT SERPENTINE SEM ROUTE
2. TAGS 101 – 147 REPRESENT SEM AT PIPE PENETRATIONS
3. WEEKLY SEM PERFORMED ON APRIL 4, 2023

NO.	REVISION	DATE

SHEET TITLE
WEEKLY SEM ROUTE

PROJECT TITLE
SURFACE EMISSIONS MONITORING
SOLID WASTE PERMIT #588

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15821 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.04	DWN. BY: LSN	CHK. BY: DBK	APP. BY:
DSK. BY: LSN			O/A R/W BY:

FILE: 02218208.04
DATE: 4/4/23
SCALE: AS SHOWN
DRAWING NO. 1 of 1

April 19, 2023
File No. 02218208.04

Mr. Jonathan Chapman
Enforcement Specialist
Virginia Department of Environmental Quality
SW Regional Office
355-A Deadmore Street
Abingdon, VA 24210

Subject: Weekly Surface Emissions Monitoring Event – April 13, 2023
Bristol Integrated Solid Waste Facility – Bristol, Virginia

Dear Mr. Chapman:

On behalf of the City of Bristol (City), SCS Engineers (SCS), is pleased to submit the results of the Weekly Surface Emissions Monitoring event performed at the Bristol Integrated Solid Waste Facility located in Bristol, Virginia on April 13, 2023. This Weekly Surface Emissions Monitoring (SEM) Event was performed in accordance with Appendix A.1.i of the Consent Decree between the Commonwealth of Virginia and the City of Bristol.

The monitoring generally conforms to the requirements of 40 CFR 63.1960(c) and (d), and 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. The landfill gas (LFG) collection system is required to operate such that the methane concentration is less than 500 ppm above background at the landfill surface.

The monitoring route includes the entire waste footprint of the Permit No. 588 Landfill. Sampling was conducted with a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) at 30-meter intervals and where visual observations indicated the potential for elevated concentrations of LFG, such as distressed vegetation and surface cover cracks. In addition, in accordance with 40 CFR 63.1958(d)(ii)(2) and 40 CFR 60.34f(d), monitoring was conducted at all surface cover penetrations within the waste footprint, including at the temperature probes. The approximate monitoring route and sampling locations are presented in the attached Drawing.

At the time of monitoring, all areas of the Permit No. 588 Landfill footprint are subject to regulatory monitoring based on the regulatory time schedule stipulated in 40 CFR 63.1960(b) and 40 CFR 60.36f(b). The Permit No. 588 Landfill has a surface area of approximately 17.3 acres. Therefore, the minimum number of sampling points to cover the appropriate portion of the landfill footprint, utilizing a 30-meter grid interval, is approximately 82 (4.75 points per acre). A summary of the results of the surface emissions monitory is provided in Table 1.

Table 1. Summary of Surface Emissions Monitoring

Description	Quantity
Number of Points Sampled	147
Number of Points in Serpentine Route	100
Number of Points at Surface Cover Penetrations	47
Number of Exceedances[1]	3
Number of Serpentine Exceedances	1
Number of Pipe Penetration Exceedances	2

Remonitoring of Ongoing Exceedances

In accordance with 40 CFR 63.1960(c)(4)(ii) and 40 CFR 60.36f(c)(4)(ii), corrective actions and a remonitoring event are to be performed within 10 days of the initial exceedance. In accordance with 40 CFR 63.1960(c)(4)(iii) and 40 CFR 60.36f(c)(4)(iii) additional corrective actions and a second 10-day retest are to be performed if the initial 10-day retest indicates methane values greater than the regulatory threshold. The Facility performs corrective actions, as necessary, including wellhead vacuum adjustments, the installation of well-bore seals, and addition of soil cover prior to weekly monitoring events at locations that previously exhibited elevated methane concentrations.

In accordance with 40 CFR 63.1960(c)(4)(v) and 40 CFR 60.36f(c)(4)(v) a new well or collection device must be installed or an alternate remedy must be submitted within 120-days at locations that continue to exhibit methane concentrations above the regulatory threshold for two consecutive re-tests.

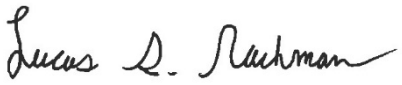
A summary of ongoing exceedance points is provided in Table 2.

Table 2. Ongoing Weekly SEM Exceedances

Point ID	Initial Exceedance Date	4/13/23 Event	4/13/23 Event Result	Comments
EW-52	3/29/23	10-Day Retest	Failed	Requires Second 10-Day Retest
Tag 26	4/4/23	10-Day Retest	Failed	Requires Second 10-Day Retest

If you have questions or require additional information, please contact either of the undersigned.

Sincerely,



Nicholas Gathings
Associate Staff Professional
SCS Engineers

Lucas S. Nachman
Senior Project Professional
SCS Engineers

LSN/QFB/cjw

cc: Randall Eads, City of Bristol
Mike Martin, City of Bristol
Joey Lamie, City of Bristol
Jonathan Hayes, City of Bristol
Jake Chandler, City of Bristol
Susan “Tracey” Blalock, VDEQ

Encl. Surface Emissions Monitoring Results
Bristol SEM Route Drawing

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 13, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
1	44.2 PPM	OK			Start Serpentine Route
2	147 PPM	OK			
3	78.7 PPM	OK			
4	126 PPM	OK			
5	60.4 PPM	OK			
6	94.7 PPM	OK			
7	325 PPM	OK			
8	126 PPM	OK			
9	93.1 PPM	OK			
10	74.7 PPM	OK			
11	78.9 PPM	OK			
12	61 PPM	OK			
13	127 PPM	OK			
14	115 PPM	OK			
15	91.7 PPM	OK			
16	78 PPM	OK			
17	210 PPM	OK			
18	150 PPM	OK			
19	55.6 PPM	OK			
20	280 PPM	OK			
21	129 PPM	OK			
22	267 PPM	OK			
23	29.8 PPM	OK			
24	4.1 PPM	OK			
25	80.3 PPM	OK			
26	117 PPM	OK			
27	4415 PPM	HIGH_ALRM	36.59729	-82.14759	
28	315 PPM	OK			
29	212 PPM	OK			
30	29.6 PPM	OK			
31	147 PPM	OK			
32	6.2 PPM	OK			
33	7.3 PPM	OK			
34	7.6 PPM	OK			
35	43.4 PPM	OK			
36	9.2 PPM	OK			
37	144 PPM	OK			
38	58.8 PPM	OK			
39	22.4 PPM	OK			
40	32.2 PPM	OK			
41	15.9 PPM	OK			
42	31.6 PPM	OK			

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 13, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
43	34.7 PPM	OK			
44	30.5 PPM	OK			
45	36.3 PPM	OK			
46	26 PPM	OK			
47	285 PPM	OK			
48	70 PPM	OK			
49	173 PPM	OK			
50	411 PPM	OK			
51	72.6 PPM	OK			
52	213 PPM	OK			
53	141 PPM	OK			
54	156 PPM	OK			
55	57.5 PPM	OK			
56	44.3 PPM	OK			
57	30.7 PPM	OK			
58	29.1 PPM	OK			
59	29.1 PPM	OK			
60	24.8 PPM	OK			
61	37.1 PPM	OK			
62	90.8 PPM	OK			
63	50.8 PPM	OK			
64	105 PPM	OK			
65	78.9 PPM	OK			
66	448 PPM	OK			
67	228 PPM	OK			
68	93.2 PPM	OK			
69	131 PPM	OK			
70	113 PPM	OK			
71	465 PPM	OK			
72	97.8 PPM	OK			
73	8.1 PPM	OK			
74	5.7 PPM	OK			
75	6.7 PPM	OK			
76	27.4 PPM	OK			
77	12.1 PPM	OK			
78	10 PPM	OK			
79	10.7 PPM	OK			
80	3.2 PPM	OK			
81	97.7 PPM	OK			
82	92.2 PPM	OK			
83	18.4 PPM	OK			
84	10.6 PPM	OK			

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 13, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
85	33 PPM	OK			
86	29.2 PPM	OK			
87	28.3 PPM	OK			
88	29.8 PPM	OK			
89	29 PPM	OK			
90	29.8 PPM	OK			
91	343 PPM	OK			
92	43.8 PPM	OK			
93	7.2 PPM	OK			
94	144 PPM	OK			
95	474 PPM	OK			
96	147 PPM	OK			
97	298 PPM	OK			
98	107 PPM	OK			
99	119 PPM	OK			
100	50.9 PPM	OK			End Serpentine Route
101	458 PPM	OK			EW-35
102	1705 PPM	HIGH_ALRM	36.59900	-82.14749	EW-52
103	196 PPM	OK			TP-4
104	216 PPM	OK			EW-60
105	186 PPM	OK			EW-48
106	90.5 PPM	OK			TP-6
107	90.7 PPM	OK			EW-61
108	151 PPM	OK			EW-36
109	364 PPM	OK			EW-34
110	164 PPM	OK			EW-50
111	373 PPM	OK			EW-67
112	220 PPM	OK			EW-47
113	193 PPM	OK			EW-54
114	252 PPM	OK			EW-55
115	46.1 PPM	OK			TP-2
116	44.4 PPM	OK			EW-46
117	299 PPM	OK			EW-66
118	366 PPM	OK			EW-58
119	154 PPM	OK			EW-57
120	155 PPM	OK			TP-1
121	798 PPM	HIGH_ALRM	36.59789	-82.14716	EW-59
122	38.7 PPM	OK			EW-56
123	45.3 PPM	OK			EW-41
124	135 PPM	OK			EW-53
125	65 PPM	OK			EW-40

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 13, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
126	123 PPM	OK			TP-3
127	11.5 PPM	OK			EW-51
128	24.5 PPM	OK			EW-39
129	267 PPM	OK			TP-5
130	3.7 PPM	OK			EW-68
131	61.6 PPM	OK			EW-38
132	106 PPM	OK			TP-7
133	2.2 PPM	OK			EW-49
134	4.2 PPM	OK			EW-31R
135	12.1 PPM	OK			EW-65
136	1.7 PPM	OK			EW-37
137	36.6 PPM	OK			TP-8
138	3.3 PPM	OK			EW-64
139	6.1 PPM	OK			EW-30R
140	13.6 PPM	OK			EW-63
141	0.4 PPM	OK			EW-42
142	3.1 PPM	OK			TP-9
143	2.7 PPM	OK			EW-33R
144	5.5 PPM	OK			EW-62
145	0.8 PPM	OK			EW-29R
146	38.3 PPM	OK			EW-32
147	0.8 PPM	OK			EW-32R

Number of locations sampled:	147
Number of exceedance locations:	3

SCS ENGINEERS

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 13, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments

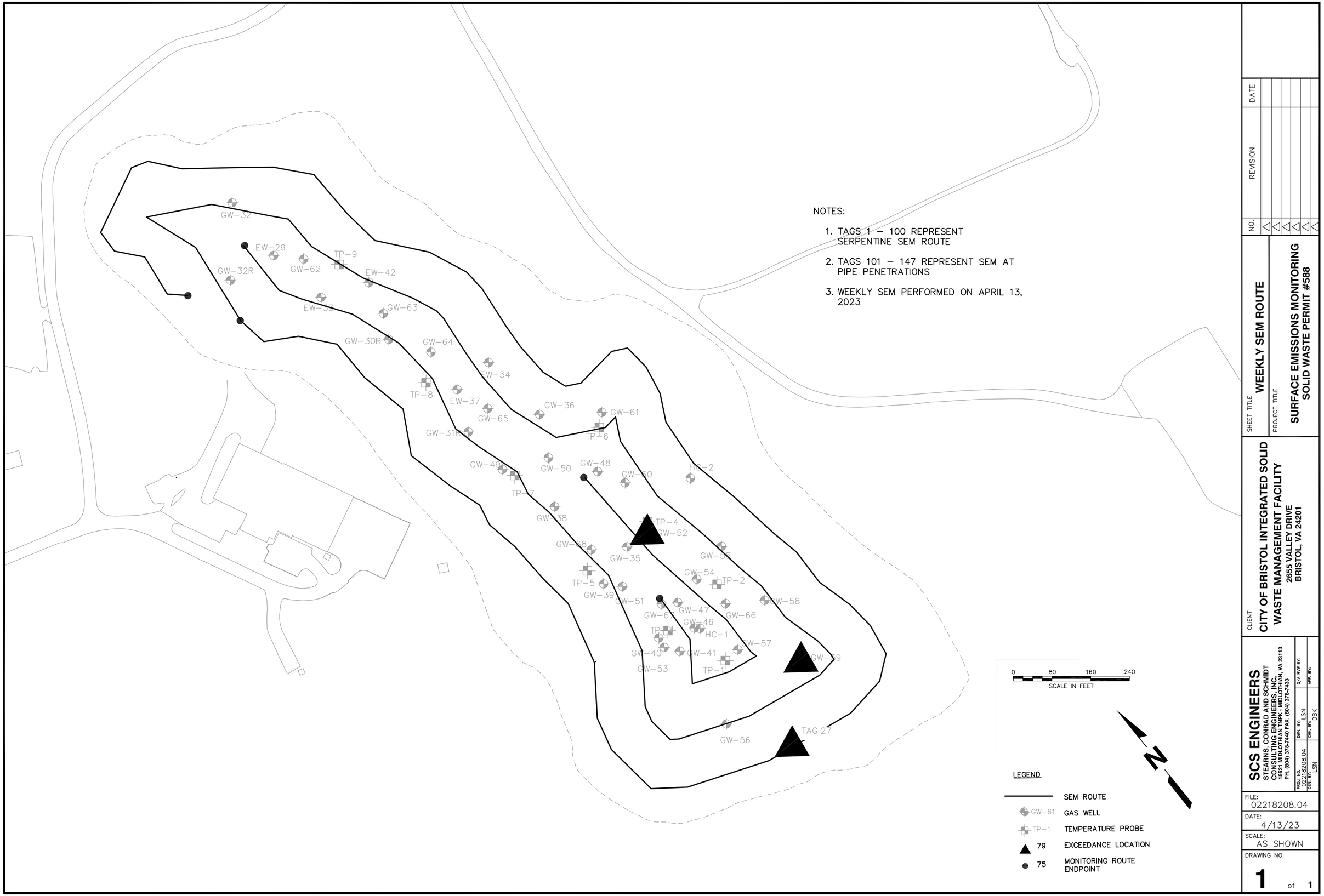
NOTES:
Points 1 through 100 represent serpentine SEM route.
Points 101 through 147 represent SEM at Pipe Penetrations
Weather Conditions: Partly Cloudy,74°F Wind: NW - 5 MPH
Tag 27 was recorded at the approximate location of the exceedance tag 26 from the April 4, 2023 monitoring event. Therefore, Tag 27 is to be documented as a continuation of the exceedance rather than a new exceedance point

Sampling Calibration: Methane - 500 ppm, Zero Air - 0.0 ppm

4/13/2023	7:12	ZERO	0.0 PPM
4/13/2023	7:15	SPAN	500.0 PPM

Background Reading:

4/13/2023	7:18	Upwind	3.2 PPM
4/13/2023	7:25	Downwind	11.3 PPM



NOTES:

1. TAGS 1 – 100 REPRESENT SERPENTINE SEM ROUTE
2. TAGS 101 – 147 REPRESENT SEM AT PIPE PENETRATIONS
3. WEEKLY SEM PERFORMED ON APRIL 13, 2023

NO.	REVISION	DATE

SHEET TITLE
WEEKLY SEM ROUTE

PROJECT TITLE
SURFACE EMISSIONS MONITORING
SOLID WASTE PERMIT #588

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.04	DWN. BY: LSN	CHK. BY: DBK	O/A R/W BY:
DSN. BY: LSN			APP. BY:

FILE: 02218208.04
DATE: 4/13/23
SCALE: AS SHOWN
DRAWING NO. 1 of 1

April 26, 2023
File No. 02218208.04

Mr. Jonathan Chapman
Enforcement Specialist
Virginia Department of Environmental Quality
SW Regional Office
355-A Deadmore Street
Abingdon, VA 24210

Subject: Weekly Surface Emissions Monitoring Event – April 20, 2023
Bristol Integrated Solid Waste Facility – Bristol, Virginia

Dear Mr. Chapman:

On behalf of the City of Bristol (City), SCS Engineers (SCS), is pleased to submit the results of the Weekly Surface Emissions Monitoring event performed at the Bristol Integrated Solid Waste Facility located in Bristol, Virginia on April 20, 2023. This Weekly Surface Emissions Monitoring (SEM) Event was performed in accordance with Appendix A.1.i of the Consent Decree between the Commonwealth of Virginia and the City of Bristol.

The monitoring generally conforms to the requirements of 40 CFR 63.1960(c) and (d), and 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. The landfill gas (LFG) collection system is required to operate such that the methane concentration is less than 500 ppm above background at the landfill surface.

The monitoring route includes the entire waste footprint of the Permit No. 588 Landfill. Sampling was conducted with a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) at 30-meter intervals and where visual observations indicated the potential for elevated concentrations of LFG, such as distressed vegetation and surface cover cracks. In addition, in accordance with 40 CFR 63.1958(d)(ii)(2) and 40 CFR 60.34f(d), monitoring was conducted at all surface cover penetrations within the waste footprint, including at the temperature probes and the newly installed and connected gas extraction wells. The approximate monitoring route and sampling locations are presented in the attached Drawing.

At the time of monitoring, all areas of the Permit No. 588 Landfill footprint are subject to regulatory monitoring based on the regulatory time schedule stipulated in 40 CFR 63.1960(b) and 40 CFR 60.36f(b). The Permit No. 588 Landfill has a surface area of approximately 17.3 acres. Therefore, the minimum number of sampling points to cover the appropriate portion of the landfill footprint, utilizing a 30-meter grid interval, is approximately 82 (4.75 points per acre). A summary of the results of the surface emissions monitory is provided in Table 1.

Table 1. Summary of Surface Emissions Monitoring

Description	Quantity
Number of Points Sampled	160
Number of Points in Serpentine Route	104
Number of Points at Surface Cover Penetrations	56
Number of Exceedances[1]	5
Number of Serpentine Exceedances	1
Number of Pipe Penetration Exceedances	4

Remonitoring of Ongoing Exceedances

In accordance with 40 CFR 63.1960(c)(4)(ii) and 40 CFR 60.36f(c)(4)(ii), corrective actions and a remonitoring event are to be performed within 10 days of the initial exceedance. In accordance with 40 CFR 63.1960(c)(4)(iii) and 40 CFR 60.36f(c)(4)(iii) additional corrective actions and a second 10-day retest are to be performed if the initial 10-day retest indicates methane values greater than the regulatory threshold. The Facility performs corrective actions, as necessary, including wellhead vacuum adjustments, the installation of well-bore seals, and addition of soil cover prior to weekly monitoring events at locations that previously exhibited elevated methane concentrations.

In accordance with 40 CFR 63.1960(c)(4)(v) and 40 CFR 60.36f(c)(4)(v) a new well or collection device must be installed or an alternate remedy must be submitted within 120-days at locations that continue to exhibit methane concentrations above the regulatory threshold for two consecutive re-tests.

SCS believes the following factors are influencing surface emissions at the Permit No. 588 Landfill:

- Construction of the Sidewall Odor Mitigation System has required excavations into the cover soil and waste temporarily resulting in increased surface emissions.

- Modifications to the landfill gas collection system has resulted in a temporary reduction in the capacity of the landfill gas collection system. These modifications are necessary to install the sidewall odor mitigation system.

- New landfill gas extraction wells have been installed and brought online, but have not yet been equipped with supplemental emissions reducing components, such as liquids extraction pumps and wellbore seals. Those components will be added after the expansion is complete.

The City and the installation contractor are working diligently to minimize the duration and impacts of these temporary factors.

A summary of ongoing exceedance points is provided in Table 2.

Table 2. Ongoing Weekly SEM Exceedances

Point ID	Initial Exceedance Date	4/20/23 Event	4/20/23 Event Result	Comments
EW-52	3/29/23	Second 10-Day Retest	Passed	Requires 30-Day Retest
Tag 26	4/4/23	Second 10-Day Retest	Passed	Requires 30-Day Retest
EW-59	4/13/23	10-Day Retest	Passed	Requires 30-Day Retest

If you have questions or require additional information, please contact either of the undersigned.

Sincerely,

Quinn F. Bernier, PE
Project Professional
SCS Engineers

Lucas S. Nachman
Senior Project Professional
SCS Engineers

LSN/QFB/cjw

cc: Randall Eads, City of Bristol
Mike Martin, City of Bristol
Joey Lamie, City of Bristol
Jonathan Hayes, City of Bristol
Jake Chandler, City of Bristol
Susan “Tracey” Blalock, VDEQ

Encl. Surface Emissions Monitoring Results
Bristol SEM Route Drawing

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 20, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
1	1.1 PPM	OK			Start Serpentine Route
2	5.8 PPM	OK			
3	12.8 PPM	OK			
4	404 PPM	OK			
5	13.6 PPM	OK			
6	37 PPM	OK			
7	84.4 PPM	OK			
8	110 PPM	OK			
9	54 PPM	OK			
10	55.3 PPM	OK			
11	184 PPM	OK			
12	287 PPM	OK			
13	267 PPM	OK			
14	29.5 PPM	OK			
15	108 PPM	OK			
16	20.5 PPM	OK			
17	9.1 PPM	OK			
18	49.3 PPM	OK			
19	59.5 PPM	OK			
20	6.8 PPM	OK			
21	1706 PPM	HIGH_ALRM	36.59845	-82.14681	
22	284 PPM	OK			
23	69.7 PPM	OK			
24	47.6 PPM	OK			
25	453 PPM	OK			
26	333 PPM	OK			
27	272 PPM	OK			
28	32.7 PPM	OK			
29	24.1 PPM	OK			
30	25.3 PPM	OK			
31	4.1 PPM	OK			
32	4.6 PPM	OK			
33	3.7 PPM	OK			
34	3.2 PPM	OK			
35	9.9 PPM	OK			
36	29.6 PPM	OK			
37	12.8 PPM	OK			
38	15.2 PPM	OK			
39	45.7 PPM	OK			
40	8.2 PPM	OK			
41	8.1 PPM	OK			
42	11.9 PPM	OK			

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 20, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
43	3.9 PPM	OK			
44	3.6 PPM	OK			
45	27.7 PPM	OK			
46	75.1 PPM	OK			
47	3.2 PPM	OK			
48	6.5 PPM	OK			
49	3.6 PPM	OK			
50	1.7 PPM	OK			
51	2.3 PPM	OK			
52	1.4 PPM	OK			
53	2.8 PPM	OK			
54	26.3 PPM	OK			
55	4.8 PPM	OK			
56	4.3 PPM	OK			
57	1.6 PPM	OK			
58	1.1 PPM	OK			
59	2.8 PPM	OK			
60	1.3 PPM	OK			
61	2.5 PPM	OK			
62	5.9 PPM	OK			
63	45.2 PPM	OK			
64	0.8 PPM	OK			
65	45.5 PPM	OK			
66	10.8 PPM	OK			
67	13.3 PPM	OK			
68	4.4 PPM	OK			
69	9.9 PPM	OK			
70	8.1 PPM	OK			
71	1.4 PPM	OK			
72	3 PPM	OK			
73	1.4 PPM	OK			
74	7.2 PPM	OK			
75	17.3 PPM	OK			
76	27.6 PPM	OK			
77	3.6 PPM	OK			
78	12.1 PPM	OK			
79	56.1 PPM	OK			
80	376 PPM	OK			
81	6.6 PPM	OK			
82	98.2 PPM	OK			
83	15 PPM	OK			
84	75.1 PPM	OK			

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 20, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
85	4 PPM	OK			
86	2.1 PPM	OK			
87	3.2 PPM	OK			
88	0.1 PPM	OK			
89	1.2 PPM	OK			
90	1.5 PPM	OK			
91	1.8 PPM	OK			
92	2.6 PPM	OK			
93	2 PPM	OK			
94	370 PPM	OK			
95	5.5 PPM	OK			
96	2.2 PPM	OK			
97	17.9 PPM	OK			
98	1.6 PPM	OK			
99	58.5 PPM	OK			
100	38.5 PPM	OK			
101	55.8 PPM	OK			
102	31.2 PPM	OK			
103	10.2 PPM	OK			
104	0.9 PPM	OK			End Serpentine Route
105	391 PPM	OK			EW-35
106	176 PPM	OK			EW-52
107	23.2 PPM	OK			TP-4
108	159 PPM	OK			EW-60
109	196 PPM	OK			EW-48
110	6 PPM	OK			TP-6
111	62.3 PPM	OK			EW-61
112	0.7 PPM	OK			EW-36
113	64.3 PPM	OK			EW-34
114	24.5 PPM	OK			EW-50
115	210 PPM	OK			EW-67
116	387 PPM	OK			EW-47
117	144 PPM	OK			EW-54
118	251 PPM	OK			EW-55
119	1.8 PPM	OK			TP-2
120	4.3 PPM	OK			EW-46
121	27.8 PPM	OK			EW-66
122	42.1 PPM	OK			EW-58
123	127 PPM	OK			EW-57
124	121 PPM	OK			TP-1
125	66.6 PPM	OK			EW-59

SCS ENGINEERS

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 20, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
126	423 PPM	OK			EW-56
127	136 PPM	OK			EW-41
128	55.2 PPM	OK			EW-53
129	23 PPM	OK			EW-40
130	31.1 PPM	OK			TP-3
131	9.6 PPM	OK			EW-51
132	424 PPM	OK			EW-39
133	94.3 PPM	OK			TP-5
134	15.6 PPM	OK			EW-68
135	3061 PPM	HIGH_ALRM	36.59944	-82.14791	EW-38
136	89.8 PPM	OK			TP-7
137	50.3 PPM	OK			EW-49
138	1.1 PPM	OK			EW-31R
139	5 PPM	OK			EW-65
140	1.6 PPM	OK			EW-37
141	1.8 PPM	OK			TP-8
142	0.2 PPM	OK			EW-64
143	4.1 PPM	OK			EW-30R
144	0.2 PPM	OK			EW-63
145	3.7 PPM	OK			EW-42
146	7 PPM	OK			TP-9
147	1.8 PPM	OK			EW-33R
148	1.8 PPM	OK			EW-62
149	5.5 PPM	OK			EW-29R
150	0.1 PPM	OK			EW-32
151	1 PPM	OK			EW-32R
152	1588 PPM	HIGH_ALRM	36.59860	-82.14692	EW-94
153	54.6 PPM	OK			EW-98
154	314 PPM	OK			EW-100
155	6 PPM	OK			EW-99
156	6.2 PPM	OK			EW-95
157	4123 PPM	HIGH_ALRM	36.59890	-82.14826	EW-90
158	477 PPM	OK			EW-86
159	2376 PPM	HIGH_ALRM	36.59989	-82.14832	EW-84
160	2.2 PPM	OK			EW-80

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 20, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments

Number of locations sampled:	160
Number of exceedance locations:	*5*

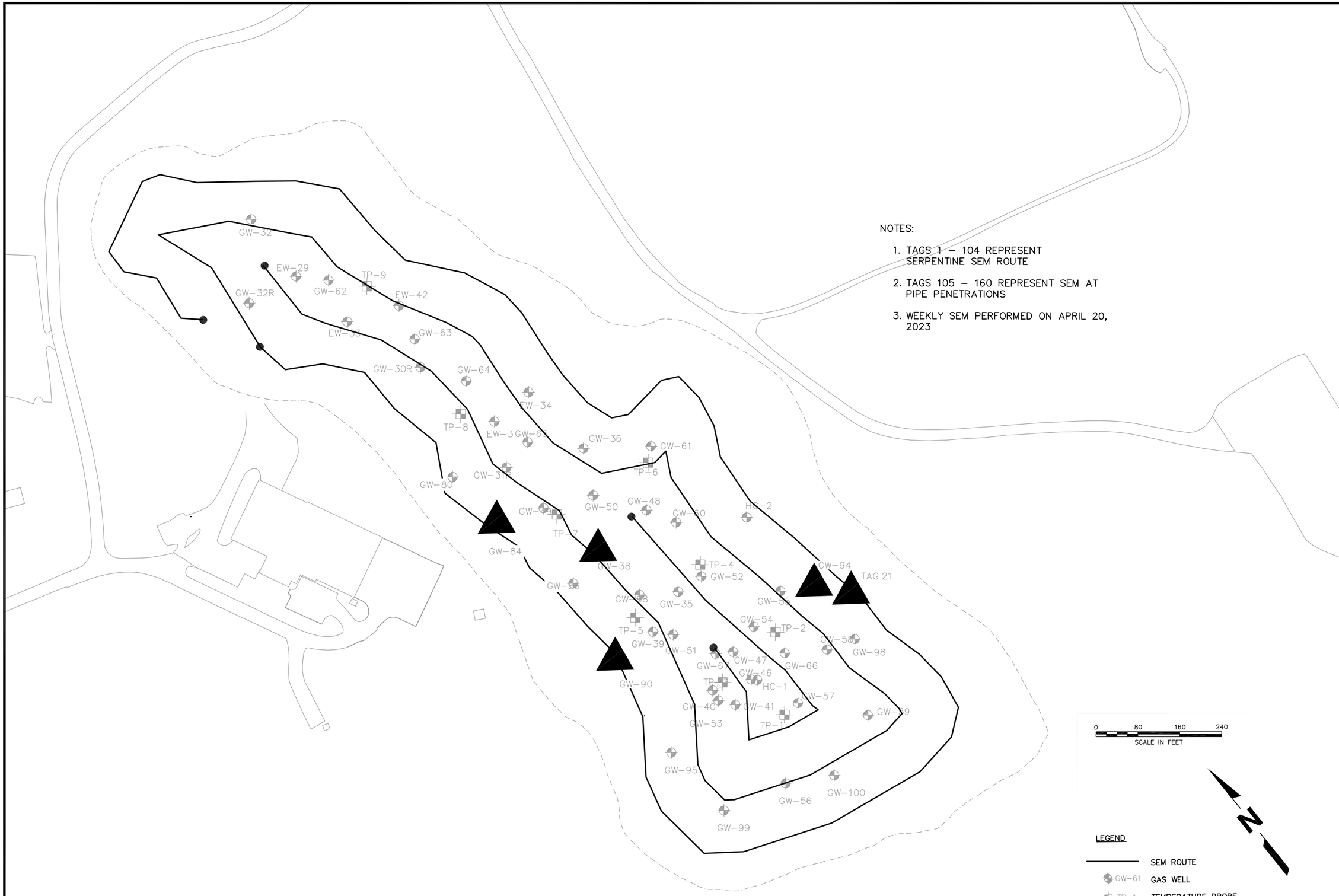
NOTES:
Points 1 through 104 represent serpentine SEM route.
Points 105 through 160 represent SEM at Pipe Penetrations
Weather Conditions: Sunny, 70˚F Wind: E - 5 MPH

Sampling Calibration: Methane - 500 ppm, Zero Air - 0.0 ppm

4/20/2023	8:13	ZERO	0.1 PPM
4/20/2023	8:16	SPAN	499.0 PPM

Background Reading:

4/20/2023	8:17	Upwind	2 PPM
4/20/2023	8:37	Downwind	3.6 PPM



NOTES:

1. TAGS 1 – 104 REPRESENT SERPENTINE SEM ROUTE
2. TAGS 105 – 160 REPRESENT SEM AT PIPE PENETRATIONS
3. WEEKLY SEM PERFORMED ON APRIL 20, 2023

NO.	REVISION	DATE

SHEET TITLE
WEEKLY SEM ROUTE

PROJECT TITLE
SURFACE EMISSIONS MONITORING
SOLID WASTE PERMIT #588

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO. 02218208.04	DWN. BY: LSN	QA/A RVW BY:	
DSN. BY: LSN	CHK. BY: DBK	APP. BY:	

FILE: 02218208.04

DATE: 4/20/23

SCALE: AS SHOWN

DRAWING NO. **1** of **1**

May 3, 2023
File No. 02218208.04

Mr. Jonathan Chapman
Enforcement Specialist
Virginia Department of Environmental Quality
SW Regional Office
355-A Deadmore Street
Abingdon, VA 24210

Subject: Weekly Surface Emissions Monitoring Event – April 27, 2023
Bristol Integrated Solid Waste Facility – Bristol, Virginia

Dear Mr. Chapman:

On behalf of the City of Bristol (City), SCS Engineers (SCS), is pleased to submit the results of the Weekly Surface Emissions Monitoring event performed at the Bristol Integrated Solid Waste Facility located in Bristol, Virginia on April 27, 2023. This Weekly Surface Emissions Monitoring (SEM) Event was performed in accordance with Appendix A.1.i of the Consent Decree between the Commonwealth of Virginia and the City of Bristol.

The monitoring generally conforms to the requirements of 40 CFR 63.1960(c) and (d), and 40 CFR 60.36f(c) and (d), and 40 CFR 60, Appendix A, Method 21. The landfill gas (LFG) collection system is required to operate such that the methane concentration is less than 500 ppm above background at the landfill surface.

The monitoring route includes the entire waste footprint of the Permit No. 588 Landfill. Sampling was conducted with a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) at 30-meter intervals and where visual observations indicated the potential for elevated concentrations of LFG, such as distressed vegetation and surface cover cracks. In addition, in accordance with 40 CFR 63.1958(d)(ii)(2) and 40 CFR 60.34f(d), monitoring was conducted at all surface cover penetrations within the waste footprint, including at the temperature probes and the newly installed and connected gas extraction wells. The approximate monitoring route and sampling locations are presented in the attached Drawing.

At the time of monitoring, all areas of the Permit No. 588 Landfill footprint are subject to regulatory monitoring based on the regulatory time schedule stipulated in 40 CFR 63.1960(b) and 40 CFR 60.36f(b). The Permit No. 588 Landfill has a surface area of approximately 17.3 acres. Therefore, the minimum number of sampling points to cover the appropriate portion of the landfill footprint, utilizing a 30-meter grid interval, is approximately 82 (4.75 points per acre). A summary of the results of the surface emissions monitory is provided in Table 1.

Table 1. Summary of Surface Emissions Monitoring

Description	Quantity
Number of Points Sampled	158
Number of Points in Serpentine Route	100
Number of Points at Surface Cover Penetrations	58
Number of Exceedances	4
Number of Serpentine Exceedances	1
Number of Pipe Penetration Exceedances	3

Remonitoring of Ongoing Exceedances

In accordance with 40 CFR 63.1960(c)(4)(ii) and 40 CFR 60.36f(c)(4)(ii), corrective actions and a remonitoring event are to be performed within 10 days of the initial exceedance. In accordance with 40 CFR 63.1960(c)(4)(iii) and 40 CFR 60.36f(c)(4)(iii) additional corrective actions and a second 10-day retest are to be performed if the initial 10-day retest indicates methane values greater than the regulatory threshold. The Facility performs corrective actions, as necessary, including wellhead vacuum adjustments, the installation of well-bore seals, and addition of soil cover prior to weekly monitoring events at locations that previously exhibited elevated methane concentrations.

In accordance with 40 CFR 63.1960(c)(4)(v) and 40 CFR 60.36f(c)(4)(v) a new well or collection device must be installed or an alternate remedy must be submitted within 120-days at locations that continue to exhibit methane concentrations above the regulatory threshold for two consecutive re-tests.

SCS believes the following factors are influencing surface emissions at the Permit No. 588 Landfill:

- Construction of the Sidewall Odor Mitigation System has required excavations into the cover soil and waste temporarily resulting in increased surface emissions.

- Modifications to the landfill gas collection system has resulted in a temporary reduction in the capacity of the landfill gas collection system. These modifications are necessary to install the sidewall odor mitigation system.

- New landfill gas extraction wells have been installed and brought online, but have not yet been equipped with supplemental emissions reducing components, such as liquids extraction pumps and wellbore seals. Those components will be added after the expansion is complete.

The City and the installation contractor are working diligently to minimize the duration and impacts of these temporary factors.

A summary of ongoing exceedance points is provided in Table 2.

Table 2. Ongoing Weekly SEM Exceedances

Point ID	Initial Exceedance Date	4/27/23 Event	4/27/23 Event Result	Comments
EW-52	3/29/23	30-Day Retest	Passed	Exceedance Resolved
Tag 26	4/4/23	N/A	Passed	Requires 30-Day Retest
EW-59	4/13/23	N/A	Passed	Requires 30-Day Retest
Tag 21	4/20/23	10-Day Retest	Passed	Requires 30-Day Retest
EW-38	4/20/23	10-Day Retest	Passed	Requires 30-Day Retest
EW-84	4/20/23	10-Day Retest	Passed	Requires 30-Day Retest
EW-90	4/20/23	10-Day Retest	Passed	Requires 30-Day Retest
EW-94	4/20/23	10-Day Retest	Passed	Requires 30-Day Retest

If you have questions or require additional information, please contact either of the undersigned.

Sincerely,

Nicholas Gathings
Associate Staff Professional
SCS Engineers

Lucas S. Nachman
Senior Project Professional
SCS Engineers

LSN/NG/cjw

cc: Randall Eads, City of Bristol
Mike Martin, City of Bristol
Joey Lamie, City of Bristol
Jonathan Hayes, City of Bristol
Jake Chandler, City of Bristol
Susan “Tracey” Blalock, VDEQ

Encl. Surface Emissions Monitoring Results
Bristol SEM Route Drawing

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 27, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
1	16.4 PPM	OK			Start Serpentine Route
2	11.9 PPM	OK			
3	52 PPM	OK			
4	14.4 PPM	OK			
5	56.8 PPM	OK			
6	54.9 PPM	OK			
7	39.6 PPM	OK			
8	63.4 PPM	OK			
9	116 PPM	OK			
10	51.4 PPM	OK			
11	63.8 PPM	OK			
12	60.3 PPM	OK			
13	61.8 PPM	OK			
14	54.7 PPM	OK			
15	179 PPM	OK			
16	62.5 PPM	OK			
17	60.8 PPM	OK			
18	39.9 PPM	OK			
19	92.5 PPM	OK			
20	49.9 PPM	OK			
21	43.3 PPM	OK			
22	51.1 PPM	OK			
23	216 PPM	OK			
24	27 PPM	OK			
25	30.8 PPM	OK			
26	40.7 PPM	OK			
27	17.3 PPM	OK			
28	7.2 PPM	OK			
29	3.5 PPM	OK			
30	2.9 PPM	OK			
31	3.5 PPM	OK			
32	9.6 PPM	OK			
33	10.5 PPM	OK			
34	31.1 PPM	OK			
35	66.2 PPM	OK			
36	12.4 PPM	OK			
37	9618 PPM	HIGH_ALRM	36.59857	-82.14844	
38	339 PPM	OK			
39	30.6 PPM	OK			
40	5.8 PPM	OK			
41	6.5 PPM	OK			
42	7.2 PPM	OK			

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 27, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
43	9.1 PPM	OK			
44	9.5 PPM	OK			
45	15.1 PPM	OK			
46	15.8 PPM	OK			
47	24.1 PPM	OK			
48	26.6 PPM	OK			
49	18.5 PPM	OK			
50	19.4 PPM	OK			
51	18.3 PPM	OK			
52	14.9 PPM	OK			
53	14.1 PPM	OK			
54	25.6 PPM	OK			
55	31.2 PPM	OK			
56	20.2 PPM	OK			
57	22.3 PPM	OK			
58	25 PPM	OK			
59	26.5 PPM	OK			
60	27 PPM	OK			
61	26.4 PPM	OK			
62	30.9 PPM	OK			
63	35.6 PPM	OK			
64	28.3 PPM	OK			
65	29.6 PPM	OK			
66	28.2 PPM	OK			
67	28.6 PPM	OK			
68	33.7 PPM	OK			
69	69.9 PPM	OK			
70	171 PPM	OK			
71	145 PPM	OK			
72	77.2 PPM	OK			
73	48.5 PPM	OK			
74	34.5 PPM	OK			
75	6.1 PPM	OK			
76	12.5 PPM	OK			
77	8 PPM	OK			
78	12.3 PPM	OK			
79	5.5 PPM	OK			
80	8.9 PPM	OK			
81	12.2 PPM	OK			
82	10.8 PPM	OK			
83	82.5 PPM	OK			
84	9.3 PPM	OK			

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 27, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
85	20 PPM	OK			
86	24.8 PPM	OK			
87	13.6 PPM	OK			
88	18.8 PPM	OK			
89	26.8 PPM	OK			
90	19.3 PPM	OK			
91	326 PPM	OK			
92	15.8 PPM	OK			
93	8.5 PPM	OK			
94	15.2 PPM	OK			
95	123 PPM	OK			
96	51.7 PPM	OK			
97	122 PPM	OK			
98	6.7 PPM	OK			
99	21.5 PPM	OK			
100	5.7 PPM	OK			End Serpentine Route
101	80.5 PPM	OK			EW-35
102	355 PPM	OK			EW-52
103	10.3 PPM	OK			TP-4
104	70.5 PPM	OK			EW-60
105	122 PPM	OK			EW-48
106	15.9 PPM	OK			TP-6
107	14.3 PPM	OK			EW-61
108	7.9 PPM	OK			EW-36
109	44.7 PPM	OK			EW-34
110	14.4 PPM	OK			EW-50
111	14.2 PPM	OK			EW-67
112	84.9 PPM	OK			EW-47
113	389 PPM	OK			EW-54
114	242 PPM	OK			EW-55
115	94.9 PPM	OK			TP-2
116	11.6 PPM	OK			EW-46
117	124 PPM	OK			EW-66
118	10.7 PPM	OK			EW-58
119	225 PPM	OK			EW-57
120	57.4 PPM	OK			TP-1
121	325 PPM	OK			EW-59
122	147 PPM	OK			EW-56
123	39.6 PPM	OK			EW-41
124	83.1 PPM	OK			EW-53
125	39.2 PPM	OK			EW-40

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 27, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments
126	15.5 PPM	OK			TP-3
127	14.1 PPM	OK			EW-51
128	52.1 PPM	OK			EW-39
129	17.4 PPM	OK			TP-5
130	16.9 PPM	OK			EW-68
131	457 PPM	OK			EW-38
132	54 PPM	OK			TP-7
133	14.5 PPM	OK			EW-49
134	5.5 PPM	OK			EW-31R
135	6.7 PPM	OK			EW-65
136	11.1 PPM	OK			EW-37
137	3.5 PPM	OK			TP-8
138	1.3 PPM	OK			EW-64
139	19 PPM	OK			EW-30R
140	2.5 PPM	OK			EW-63
141	2.1 PPM	OK			EW-42
142	1.6 PPM	OK			TP-9
143	2.4 PPM	OK			EW-33R
144	1.4 PPM	OK			EW-62
145	1.3 PPM	OK			EW-29R
146	6.5 PPM	OK			EW-32
147	4.4 PPM	OK			EW-32R
148	11600 PPM	HIGH_ALRM	36.59923	-82.14716	EW-89
149	58.9 PPM	OK			EW-93
150	199 PPM	OK			EW-94
151	64.2 PPM	OK			EW-98
152	13100 PPM	HIGH_ALRM	36.59775	-82.14757	EW-100
153	3 PPM	OK			EW-99
154	4331 PPM	HIGH_ALRM	36.59835	-82.14834	EW-95
155	5.8 PPM	OK			EW-90
156	0.4 PPM	OK			EW-86
157	8.9 PPM	OK			EW-84
158	7.8 PPM	OK			EW-80

S C S E N G I N E E R S

EXHIBIT 1. SURFACE EMISSIONS MONITORING RESULTS
WEEKLY MONITORING EVENT - APRIL 27, 2023
BRISTOL INTEGRATED SOLID WASTE FACILITY - BRISTOL, VIRGINIA

ID #	Methane Concentration	Compliance	GPS Coordinates Lat.	Long.	Comments

Number of locations sampled:	158
Number of exceedance locations:	4

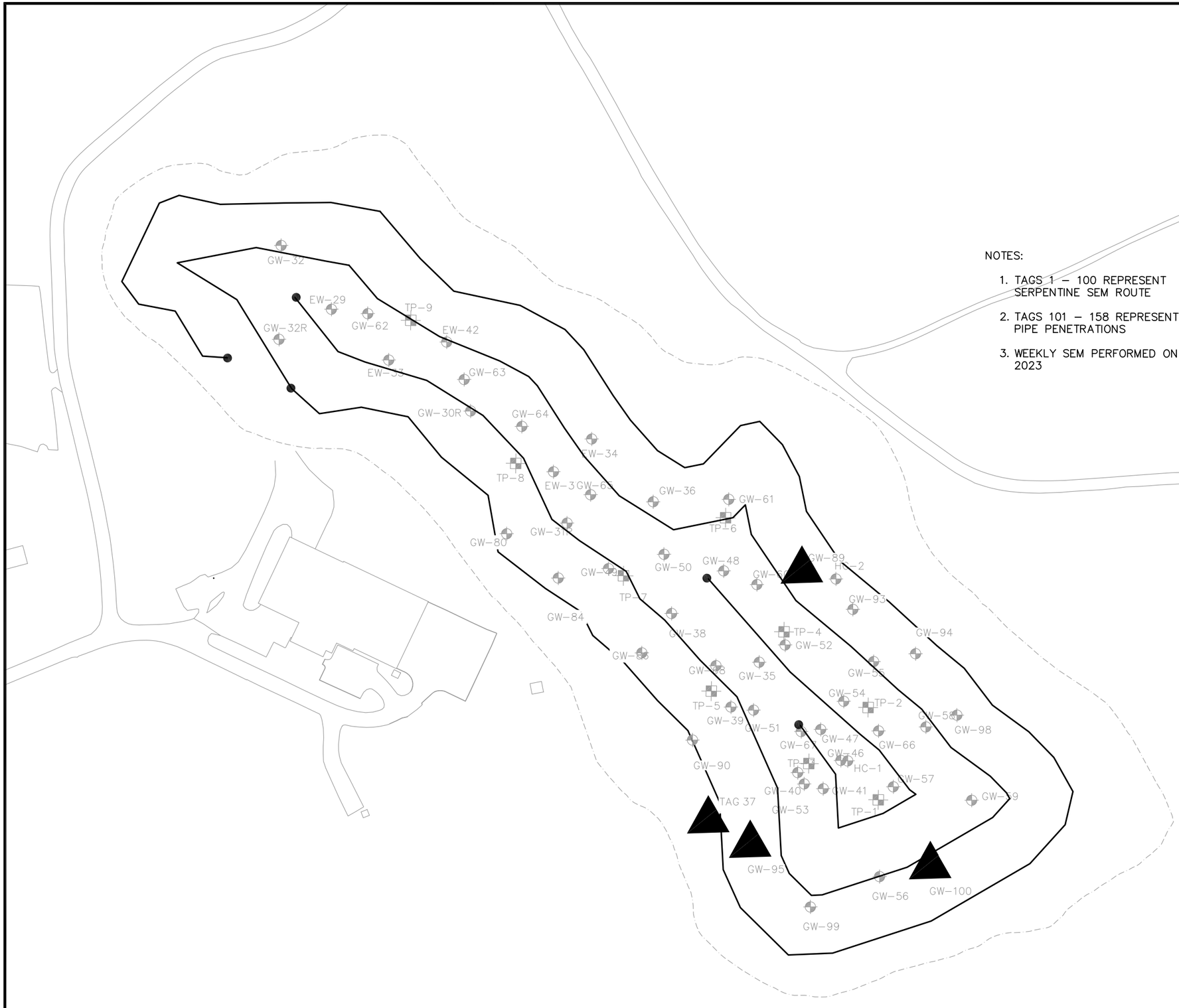
NOTES:
Points 1 through 100 represent serpentine SEM route.
Points 101 through 158 represent SEM at Pipe Penetrations
Weather Conditions: Sunny, 55˚F Wind: E - 10 MPH

Sampling Calibration: Methane - 500 ppm, Zero Air - 0.0 ppm

4/27/2023	6:59	ZERO	0.0 PPM
4/27/2023	7:03	SPAN	499.0 PPM

Background Reading:

4/27/2023	7:04	Upwind	2.6 PPM
4/27/2023	7:16	Downwind	7.1 PPM



NOTES:

1. TAGS 1 – 100 REPRESENT SERPENTINE SEM ROUTE
2. TAGS 101 – 158 REPRESENT SEM AT PIPE PENETRATIONS
3. WEEKLY SEM PERFORMED ON APRIL 27, 2023

0 80 160 240
SCALE IN FEET

N

LEGEND

- SEM ROUTE
- GW-61 GAS WELL
- TP-1 TEMPERATURE PROBE
- 79 EXCEEDANCE LOCATION
- 75 MONITORING ROUTE ENDPOINT

NO.	REVISION	DATE

SHEET TITLE
WEEKLY SEM ROUTE

PROJECT TITLE
SURFACE EMISSIONS MONITORING
SOLID WASTE PERMIT #588

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

PROJ. NO.	DWN. BY:	QA RVW BY:
02218208.04	LSN	
DSN. BY:	CHK. BY:	APP. BY:
LSN	DBK	

FILE: 02218208.04
DATE: 4/27/23
SCALE: AS SHOWN
DRAWING NO. 1 of 1

Appendix B

Bristol Virginia Landfill - North South Clean-Outs Data 04/01/2023 to 04/30/2023

Bristol Virginia Landfill - North South Clean-Outs Data - 04/01/2023 to 04/30/2023

Point Name	Record Date	CH4 (% by vol)	CO2 (% by vol)	O2 (% by vol)	Bal Gas (% by vol)	Init Temp (F)	Adj Temp (F)	Init Static Pressure ("H2O)	Adj Static Pressure ("H20)	System Pressure ("H20)	Comments
LC01	4/19/2023 09:13	52.0	46.4	0.0	1.6	58.5	58.5	-18.8	-18.8	-19.3	Valve Adjustment:Opened Valve 1/2 to 1 turn
LC02	4/19/2023 09:15	46.6	52.4	0.0	1.0	58.0	58.0	-19.1	-19.0	-19.3	
LC03	4/19/2023 09:17	3.2	6.6	19.7	70.5	55.1	55.1	-19.2	-19.1	-19.0	
LC04	4/19/2023 09:20	17.1	9.6	14.0	59.3	56.5	56.6	-19.1	-19.1	-19.3	Valve Adjustment:Closed valve 1/2 to 1 turn
LC05	4/19/2023 09:22	50.2	48.1	0.0	1.7	58.7	58.7	-18.8	-18.7	-19.1	
LC06	4/19/2023 09:25	40.4	35.4	4.6	19.7	58.5	58.5	-19.0	-19.0	-19.0	
LC08	4/19/2023 09:27	49.9	48.6	0.0	1.5	58.2	58.2	-18.5	-18.7	-19.0	Valve Adjustment:Opened Valve 1/2 to 1 turn
LC09	4/19/2023 09:30	28.6	24.3	9.9	37.2	60.5	60.7	-18.9	-18.9	-18.8	Valve Adjustment:Closed Valve > 1 turn
LC10	4/3/2023 11:52	19.1	15.5	14.5	51.0	62.4	62.4	-17.5	-17.6	-17.8	
LC10	4/19/2023 09:32	16.4	13.5	14.4	55.7	63.0	63.2	-18.9	-18.9	-18.8	
NC01	4/3/2023 13:49	0.0	0.0	21.3	78.7	77.5	77.3	-41.1	-16.4	-22.8	
NC02	4/3/2023 13:50	0.0	0.0	21.5	78.5	76.3	76.3	-3.8	-3.8	0.0	
NC03	4/3/2023 13:52	0.0	0.0	21.5	78.5	76.3	76.2	-41.7	-16.9	-21.0	
NC04	4/3/2023 13:54	0.0	0.0	21.4	78.6	76.5	76.4	-15.7	-15.7	0.0	
NC05	4/3/2023 13:55	0.0	0.0	21.4	78.7	76.6	76.7	4.9	4.9	-159.5	
NC06	4/3/2023 13:56	0.0	0.0	21.3	78.7	77.0	77.1		-15.7		
NC07	4/3/2023 13:58	60.8	23.1	1.0	15.1	77.3	77.3	-16.3	-16.6	0.0	
NC08	4/3/2023 13:59	51.5	30.6	4.1	13.9	77.3	77.3	-16.4	-16.5	0.0	
NC09	4/3/2023 14:00	54.9	32.2	2.0	11.0	77.6	77.5	-16.1	-16.7	0.0	
NC10	4/3/2023 14:01	3.5	11.8	19.4	65.4	77.6	77.6	-16.1	-16.1	0.0	

Appendix C

Semi-Monthly Temperature Update Memos

May 4, 2023
File No. 02218208.04

MEMORANDUM

TO: Kristin Hall, EPA Region III
Tracy Blalock, VDEQ-SWRO

FROM: D. Brandon King, SCS Engineers
Quinn Bernier, SCS Engineers

SUBJECT: Semi-Monthly Status Update – April 1st through April 15th, 2023
Bristol Integrated Waste Management Facility, Bristol, Virginia

SCS is submitting this semi-monthly status update to satisfy the conditions of compliance provision #2 of the Environmental Protection Agency (EPA) Region III letter, *Approval of Higher Operating Temperature Values for Landfill Gas Wells and Submission of Gas Treatment Alternatives at the Bristol Virginia Integrated Solid Waste Management Facility*, dated 8/23/21. Accordingly, this memo is a summary of temperature monitoring activities as well as work accomplished during the semi-monthly monitoring period of 4/1/23 through 4/15/23.

TEMPERATURE MONITORING

Automated Wellhead Temperature Measurements

Twenty-five (25) individual landfill gas (LFG) wellheads in the Permit #588 Landfill have automated temperature sensors installed. VDEQ and USEPA have been receiving Daily Gas Well Temperature Reports with data from these automated temperature sensors since 12/1/22.

The 25 wellheads have 2-inch automated sensors. SCS believes that the 2-inch sensors measure temperature with more accuracy than the 1-inch sensors that were used in the majority of the 25 wells prior to March 1, 2023, but we are still comparing with manual temperature to assess the validity.

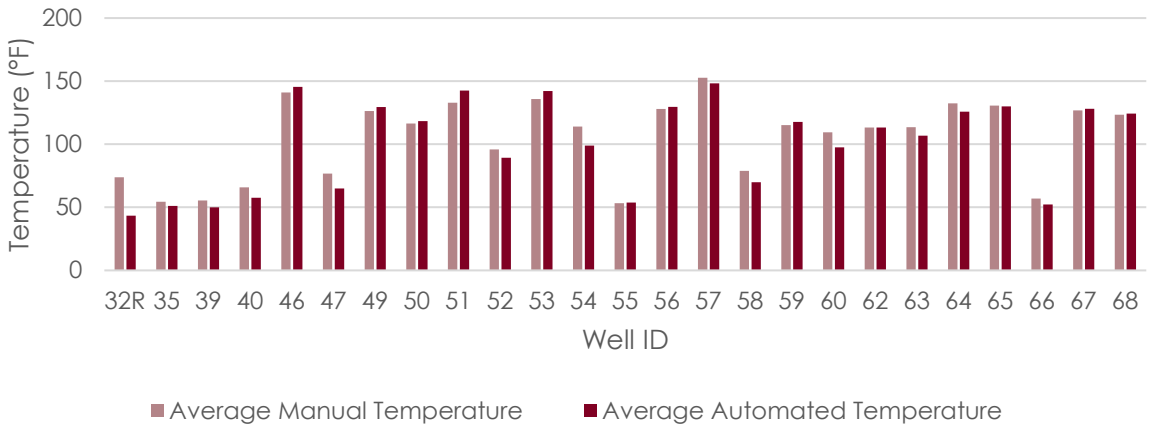
SCS reviewed the automated hourly temperature measurements from 4/1/23 to 4/15/23, and identified the following trends:

- **Temperatures over 145°F:** Temperatures over the NESHAP AAAA compliance threshold of 145°F were recorded at seven wells during this monitoring period. This represents a continuation of higher temperatures across the wellfield since mid-March 2023. Temperatures greater than 145°F were again recorded most consistently at EW-46, however the highest temperatures were measured at EW-51, EW-52, and EW-67 (greater than 170°F at times). Field staff believe that the general increase in wellfield temperatures suggests the wellfield may be over-tuned, meaning that applied vacuum at wellheads is greater than necessary, or simply that liquids removal from newly cleaned pumps is increasing LFG extraction as intended.
- **Low temperatures at certain wells:** Average temperatures between 50°F and 70°F at seven wells generally correlated with low LFG flow rates measured during monthly wellfield

monitoring events. These low temperatures are likely close to ambient because little to no LFG is passing through the wellhead where the sensors are placed.

- **Temperature Trends by Location:** Not all of the wells with the highest temperatures, for example over 145°F, were collocated. Of the wells with the highest temperatures during this monitoring period, EW-46, EW-51, and EW-67, were the closest to each other; generally located in the south-central portion of the landfill.

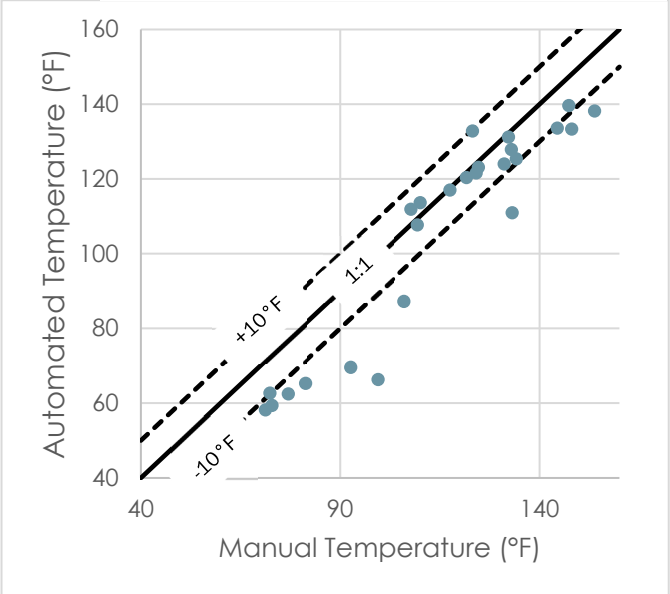
Figure 1. Average Daily Temperatures 4/1 to 4/15



Manual Daily Temperature Monitoring

Manual temperature measurements are being made daily by field staff with a GEM5000 or equivalent LFG analyzer. The manual measurements are used to verify the automated wellhead temperature sensors and to provide temperature data for the 13 wellheads without automated sensors.

Figure 2. Manual vs. Automated Temperature Comparison



Comparing the difference between manual temperature measurements and automated temperature measurements in Figure 2, the new 2-inch sensors appear to have generally satisfactory correlation with manual measurements. This supports SCS' belief that the 2-inch automated sensors are measuring temperature accurately.

During this monitoring period, the sensor in EW-32R appeared to be either malfunctioning or not successfully transmitting data because it recorded values of 0°F for hours at a time. Field staff and SCS RMC have been notified of this issue and are investigating potential causes. All daily temperatures recorded manually are provided in **Attachment A**.

Monthly Regulatory Wellhead Temperature Measurements

Routine monthly temperature monitoring for purposes of complying with 40 CFR 60.36f(a)(5) was conducted 4/3/23, with follow-up monitoring on several days after. During this monitoring period, temperature exceedances were resolved at EW-51, EW-53, and EW-57. See Table 2 for a list of the status of all exceedances recorded during this monitoring period.

Table 1. March Temperature Exceedance Summary

Well ID	Initial Exceedance Date	Last date/temperature measured	Duration of Exceedance	Status as of 4/15/23
EW-37	3/28/23	4/12/23 149.3°F	17 days	Ongoing, within 60-day timeline
EW-51	3/23/23	4/14/23[1] 82.2°F	13 days	Resolved within 15-day timeline
EW-52	4/11/23	4/12/23 153°F	5 days	Ongoing, within 15-day timeline
EW-53	4/4/23	4/11/23 141.8°F	12 days	Resolved within 15-day timeline
EW-54	4/11/23	4/12/23 170.8°F	5 days	Ongoing, within 15-day timeline
EW-57	3/15/23	4/4/23 144.3°F	12 days	Resolved within 15-day timeline
EW-57	4/11/23	4/12/23 152.7°F	5 days	Ongoing, within 15-day timeline
EW-67	4/4/23	4/12/23 180°F	12 days	Ongoing, within 15-day timeline

1 measurement that resolved exceedance recorded on 4/4/23

Work Accomplished During Monitoring Period

LFG Sampling

SCS collected LFG samples from wells EW-37 and EW-53 using 1.5-L Summa canisters on 3/16/23, and well EW-51 on 3/23/23 to fulfill the requirement in 40 CFR 63.1961(a)(5) for temperature exceedances lasting more than 7 days. The samples were sent to Enthalpy Analytical for lab analysis of carbon monoxide (CO) and hydrogen (H_2) content. Lab results are summarized in Table 3. Full laboratory analytical data is included in **Attachment B** for further detail.

Table 2. LFG Wellhead Sampling Summary

Sample Date		4/4/2023	4/12/2023
EW-37	CO (ppmv)	153	150
	H2 (Vol. %)	2.41	2.36
EW-52	CO (ppmv)		330
	H2 (Vol. %)		12.5
EW-53	CO (ppmv)	427	
	H2 (Vol. %)	6.64	
EW-54	CO (ppmv)		817
	H2 (Vol. %)		23.1
EW-57	CO (ppmv)		947
	H2 (Vol. %)		10.7
EW-67	CO (ppmv)	188	1080
	H2 (Vol. %)	2.77	24.6

The presence of hydrogen in all of the samples collected during this monitoring period indicates that combustion reactions are unlikely. The carbon monoxide measurements were all greater than 100 ppmv, indicating that continued weekly CO sampling should continue per 40 CFR 63.1961(a)(5)(viii) until the temperature exceedance is corrected or CO is less than 100 ppmv for four consecutive weekly samples.

Construction Activities

SCS-Field Services (SCS-FS) continued installation of the upper horizontal collector along the northern sections of the Sidewall Odor Mitigation System (SOMS) where liner installation has been completed. Chesapeake Containment Systems (Chesapeake) finished installation of the lower liner section along the northeast section of the quarry sidewall at the beginning of this reporting period. SCS-FS crew placed compacted cover soil on completed sections of the lower liner on the southwest portion and northern sections of the landfill. At the end of this reporting period, Shotcrete operations began at the northwest section of the sidewall odor mitigation system above the upper collector.

The drilling contractor continued drilling activities throughout this reporting period. The contractor drilled the remaining 13 CPVC LFG extraction wells during this monitoring period. The CPVC wells were drilled and installed in accordance with SCS Phase I LFG System drawing set. These wells will be connected to vacuum during the following reporting period.

Weekly SEM

SCS is continuing weekly surface emissions monitoring (SEM) per the Plan of Action Report dated 7/6/22. One exceedance of the 500-ppmv threshold were recorded during the weekly SEM event held on 4/4/23, and three exceedances were recorded during the weekly event conducted on 4/13/23. The exceedance detected on the event conducted on 3/29/23 passed the first 10-day retest.

The ongoing construction of new wells and the sidewall odor mitigation system, in addition to connection of new LFG collecting piping, is likely contributing to surface emissions exceedances in April. To a degree, increased emissions during the disturbance of the landfill surface, however SCS and the City continue to install well bore skirts at pipe penetration exceedances and placing additional cover in all exceedance areas as corrective actions.

LFG System O&M

The City's O&M contractor has installed a variety of replacement pump parts in the wellfield (e.g., new air hose and air regulators) as well as new QED wellheads and Solarguard flexible tubing. The O&M contractor reconfigured the pump discharge assembly at all wells equipped with pumps to include pressure gauges. Staff will now be able to monitor the buildup of air pressure on the forcemain piping at a wellhead, and release the excess when needed to maintain working conditions.

O&M continued pulling and cleaning five pumps each week with a focus on the south end of Permit #588 Landfill during this reporting period. SCS has observed a steady increase in total liquids removed from the wellfield since full-time O&M presence was established.

Please contact SCS or City personnel if you have any questions or require additional information.

cc: Randall Eads, City of Bristol
Jon Hayes, City of Bristol
Jeff Hurst, VDEQ-SWRO
Tom Lock, SCS Field Services
David Cochran, City of Bristol
Erin Willard, EPA Region III
Stacy Bowers, VDEQ-SWRO
Robert E. Dick, P.E., SCS Engineers

Attachment A

City of Bristol Daily LFG Well Temperature Readings

Month	April	April	April	April	April	April	April	April	April	April	April	April	April	April	April
Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Well Number															
35	63	62	60	79	71	77	72	75	76	70	49	86	90	80	84
39	62	62	59	78	66	70	69	71	67	82	50	84	91	77	81
40	71	72	68	87	75	79	76	75	80	145	78	146	151	145	145
46	147	148	147	147	147	148	146	147	148	147	148	148	146	147	149
47	100	97	69	88	84	88	86	88	83	101	88	105	107	103	103
29	98	100	100	108	115	119	116	105	112	106	92	108	107	108	103
30R	108	126	124	126	129	130	128	129	125	87	93	80	93	91	90
31R	132	133	128	128	132	131	130	129	126	109	125	116	120	117	116
32	80	81	88	89	99	100	91	99	97	76	56	76	91	75	70
33	124	124	127	129	132	130	128	130	127	121	120	122	122	122	122
34	116	115	120	122	122	124	120	122	120	123	111	129	127	127	123
36	74	75	76	77	82	80	79	80	77	81	44	76	79	73	69
37	149	149	150	150	150	149	151	150	148	149	148	149	148	149	149
38	101	102	100	102	106	110	108	105	102	112	95	105	104	100	102
41	73	70	77	79	80	82	79	81	77	100	70	96	101	95	100
42	110	108	162	163	108	108	140	120	126	111	112	112	112	111	111
48	61	63	68	77	79	77	75	76	70	75	38	86	92	72	72
32R	123	120	121	122	122	122	120	121	123	122	122	122	122	121	122
49	133	132	129	133	133	133	132	133	130	132	129	136	138	138	133
50	118	118	117	118	118	120	117	119	121	117	115	114	117	117	117
51	150	152	105	120	94	99	100	110	97	112	90	101	89	78	93
52	157	154	130	164	166	167	151	162	163	134	168	155	150	142	144
53	140	139	138	143	144	141	140	144	139	81	135	86	91	83	104
54	146	142	111	116	121	123	122	118	123	138	134	156	149	147	151
55	69	70	63	83	68	69	67	65	73	79	47	74	135	75	49
56	128	129	129	132	134	136	133	130	135	133	126	130	132	130	130
57	158	155	132	140	139	140	140	131	139	147	143	152	152	149	150
58	75	74	58	81	74	72	73	74	70	70	44	119	117	103	116
59	120	121	113	46	118	119	106	110	118	113	111	118	113	112	113
60	110	110	107	109	110	116	112	110	107	109	107	107	110	107	109
61	133	135	134	127	125	127	129	126	131	141	135	150	157	163	145
62	114	112	112	114	113	112	113	111	113	112	110	113	112	43	112
63	125	126	123	126	127	120	122	124	120	126	124	127	127	128	125
64	130	132	130	132	133	134	131	131	134	137	137	138	138	138	138
65	131	134	132	133	133	128	130	130	131	133	131	134	134	135	134
66	74	69	62	87	72	74	73	75	71	82	57	88	97	86	88
67	127	125	135	176	153	150	152	160	154	118	160	172	137	132	170
68	124	125	124	125	125	126	123	126	124	123	123	123	127	121	123

Attachment B

Laboratory Analytical Reports

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 5, 2023 11:05
	4330 Lewis Road, Suite 1	Date Issued:	April 12, 2023 15:11
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485
Client Site I.D.:	Bristol		

Enclosed are the results of analyses for samples received by the laboratory on 04/05/2023 11:05. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

TNI Accredited
VELAP ID 460021

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 5, 2023 11:05
	4330 Lewis Road, Suite 1	Date Issued:	April 12, 2023 15:11
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
37	23D0256-01	Air	04/04/2023 14:53	04/05/2023 11:05
53	23D0256-02	Air	04/04/2023 15:03	04/05/2023 11:05
67	23D0256-03	Air	04/04/2023 15:10	04/05/2023 11:05

ENTHALPY ANALYTICAL

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 37

Sample ID: 23D0256-01

Sample Matrix: Air

Sampled: 4/4/2023 14:53

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00223::10095

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 6.4

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	153	90.0	90.0		9	1	4/10/23 14:02	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	9.32	0.45	0.45		9	1	4/10/23 14:02	MER
Carbon dioxide, as received	24.0	0.45	0.45		9	1	4/10/23 14:02	MER
Oxygen (O2), as received	7.01	0.45	0.45		9	1	4/10/23 14:02	MER
Hydrogen (H2), as received	2.41	0.18	0.18		9	1	4/10/23 14:02	MER
Nitrogen (N2), as received	47.8	18.0	18.0		18	1	4/10/23 16:39	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	4/10/23 14:02	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	95100	1560	3890		300000	5000	12000	7780	1	4/11/23 10:50	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	94.4	80-120	4/11/23 10:50

ENTHALPY ANALYTICAL

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 53

Sample ID: 23D0256-02

Sample Matrix: Air

Sampled: 4/4/2023 15:03

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00183::12064

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 6.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	427	90.0	90.0		9	1	4/10/23 14:58	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	23.2	0.45	0.45		9	1	4/10/23 14:58	MER
Carbon dioxide, as received	52.1	0.45	0.45		9	1	4/10/23 14:58	MER
Oxygen (O2), as received	2.32	0.45	0.45		9	1	4/10/23 14:58	MER
Hydrogen (H2), as received	6.64	0.54	0.54		27	1	4/10/23 16:55	MER
Nitrogen (N2), as received	9.05	9.00	9.00		9	1	4/10/23 14:58	MER
Carbon Monoxide, as received	0.04	0.009	0.009		9	1	4/10/23 14:58	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	216000	3500	8750		690000	11000	28000	17500	1	4/11/23 13:32	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	96.0	80-120	4/11/23 13:32

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ANALYTICAL RESULTS

Project Location:

Field Sample #: 67

Sample ID: 23D0256-03

Sample Matrix: Air

Sampled: 4/4/2023 15:10

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00094::12458

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 6.0

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	188	90.0	90.0		9	1	4/10/23 15:49	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	ND	0.45	0.45		9	1	4/10/23 15:49	MER
Carbon dioxide, as received	5.44	0.45	0.45		9	1	4/10/23 15:49	MER
Oxygen (O2), as received	17.1	0.45	0.45		9	1	4/10/23 15:49	MER
Hydrogen (H2), as received	2.77	0.18	0.18		9	1	4/10/23 15:49	MER
Nitrogen (N2), as received	63.0	27.0	27.0		27	1	4/10/23 17:10	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	4/10/23 15:49	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	51800	1170	2920		170000	3700	9300	5830	1	4/11/23 12:18	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	97.8	80-120	4/11/23 12:18

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Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			**Preparation Method:**	**No Prep VOC GC Air**	
23D0256-01	1.00 mL / 1.00 mL	ALT-145	BGD0285	SGD0308	AG00026
23D0256-02	1.00 mL / 1.00 mL	ALT-145	BGD0285	SGD0308	AG00026
23D0256-03	1.00 mL / 1.00 mL	ALT-145	BGD0285	SGD0308	AG00026
23D0256-01	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026
23D0256-01RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026
23D0256-02	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026
23D0256-02RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026
23D0256-03	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026
23D0256-03RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0285	SGD0308	AG00026

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**No Prep VOC Air**	
23D0256-01	400 mL / 400 mL	EPA TO-15	BGD0267	SGD0343	AC30195
23D0256-02	400 mL / 400 mL	EPA TO-15	BGD0267	SGD0343	AC30195
23D0256-03	400 mL / 400 mL	EPA TO-15	BGD0267	SGD0343	AC30195

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0267 - No Prep VOC Air										
Blank (BGD0267-BLK1)					Prepared & Analyzed: 04/10/2023					
Benzene	<	0.50	ppbv							
Surr: 4-Bromofluorobenzene (Surr)	*4.76*		ppbv	*5.00*		*95.2*	*80-120*			
LCS (BGD0267-BS1)					Prepared & Analyzed: 04/10/2023					
1,1,1-Trichloroethane	5.24	0.5	ppbv	5.00		105	70-130			
1,1,2,2-Tetrachloroethane	5.52	0.5	ppbv	5.00		110	70-130			
1,1,2-Trichloro-1,2,2-trifluoroethane	4.85	0.5	ppbv	5.00		97.0	70-130			
1,1,2-Trichloroethane	5.30	0.5	ppbv	5.00		106	70-130			
1,1-Dichloroethane	4.83	0.5	ppbv	5.00		96.6	70-130			
1,1-Dichloroethylene	4.89	0.5	ppbv	5.00		97.8	70-130			
1,2,4-Trimethylbenzene	5.46	0.5	ppbv	5.00		109	70-130			
1,2-Dibromoethane (EDB)	5.36	0.5	ppbv	5.00		107	70-130			
1,2-Dichlorobenzene	5.68	0.5	ppbv	5.00		114	70-130			
1,2-Dichloroethane	5.21	0.5	ppbv	5.00		104	70-130			
1,2-Dichloropropane	5.22	0.5	ppbv	5.00		104	70-130			
1,2-Dichlorotetrafluoroethane	5.48	0.5	ppbv	5.00		110	70-130			
1,3,5-Trimethylbenzene	5.44	0.5	ppbv	5.00		109	70-130			
1,3-Butadiene	5.13	0.5	ppbv	5.00		103	70-130			
1,3-Dichlorobenzene	5.63	0.5	ppbv	5.00		113	70-130			
1,4-Dichlorobenzene	5.64	0.5	ppbv	5.00		113	70-130			
1,4-Dioxane	5.71	0.5	ppbv	5.00		114	70-130			
2-Butanone (MEK)	4.73	0.5	ppbv	5.00		94.6	70-130			
4-Methyl-2-pentanone (MIBK)	5.36	0.5	ppbv	5.00		107	70-130			
Allyl chloride	4.72	0.5	ppbv	5.00		94.4	70-130			
Benzene	5.25	0.5	ppbv	5.00		105	70-130			
Benzyl Chloride	5.06	0.5	ppbv	5.00		101	70-130			
Bromodichloromethane	4.84	0.5	ppbv	5.00		96.8	70-130			
Bromoform	0.79	0.5	ppbv	5.00		15.8	70-130			L
Bromomethane	5.96	0.5	ppbv	5.00		119	70-130			
Carbon Disulfide	4.80	0.5	ppbv	5.00		96.0	70-130			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0267 - No Prep VOC Air										
LCS (BGD0267-BS1)				Prepared & Analyzed: 04/10/2023						
Carbon Tetrachloride	5.17	0.5	ppbv	5.00		103	70-130			
Chlorobenzene	5.32	0.5	ppbv	5.00		106	70-130			
Chloroethane	5.65	0.5	ppbv	5.00		113	70-130			
Chloroform	4.86	0.5	ppbv	5.00		97.2	70-130			
Chloromethane	5.20	0.5	ppbv	5.00		104	70-130			
cis-1,2-Dichloroethylene	4.88	0.5	ppbv	5.00		97.6	70-130			
cis-1,3-Dichloropropene	5.42	0.5	ppbv	5.00		108	70-130			
Cyclohexane	5.22	0.5	ppbv	5.00		104	70-130			
Dichlorodifluoromethane	4.93	0.5	ppbv	5.00		98.6	70-130			
Ethyl acetate	5.07	0.5	ppbv	5.00		101	70-130			
Ethylbenzene	5.43	0.5	ppbv	5.00		109	70-130			
Heptane	5.07	0.5	ppbv	5.00		101	70-130			
Hexane	5.06	0.5	ppbv	5.00		101	70-130			
m+p-Xylenes	10.8	1	ppbv	10.0		108	70-130			
Methylene chloride	5.24	1	ppbv	5.00		105	70-130			
Methyl-t-butyl ether (MTBE)	4.93	0.5	ppbv	5.00		98.6	70-130			
Naphthalene	4.52	0.5	ppbv	5.00		90.4	60-140			
o-Xylene	5.30	0.5	ppbv	5.00		106	70-130			
Propylene	4.98	1	ppbv	5.00		99.6	70-130			
Styrene	5.39	0.5	ppbv	5.00		108	70-130			
Tetrachloroethylene (PCE)	5.25	0.5	ppbv	5.00		105	70-130			
Tetrahydrofuran	5.20	0.5	ppbv	5.00		104	70-130			
Toluene	5.26	0.5	ppbv	5.00		105	70-130			
trans-1,2-Dichloroethylene	4.93	0.5	ppbv	5.00		98.6	70-130			
trans-1,3-Dichloropropene	5.51	0.5	ppbv	5.00		110	70-130			
Trichloroethylene	5.23	0.5	ppbv	5.00		105	70-130			
Trichlorofluoromethane	5.31	0.5	ppbv	5.00		106	70-130			
Vinyl acetate	4.88	0.5	ppbv	5.00		97.6	70-130			
Vinyl bromide	5.78	0.5	ppbv	5.00		116	70-130			
Vinyl chloride	5.40	0.5	ppbv	5.00		108	70-130			
Surr: 4-Bromofluorobenzene (Surr)	*4.96*		ppbv	*5.00*		*99.2*	*70-130*			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0267 - No Prep VOC Air										
LCS Dup (BGD0267-BSD1)					Prepared & Analyzed: 04/10/2023					
1,1,1-Trichloroethane	5.19	0.5	ppbv	5.00		104	70-130	0.959	25	
1,1,2,2-Tetrachloroethane	5.46	0.5	ppbv	5.00		109	70-130	1.09	25	
1,1,2-Trichloro-1,2,2-trifluoroethane	4.81	0.5	ppbv	5.00		96.2	70-130	0.828	25	
1,1,2-Trichloroethane	5.23	0.5	ppbv	5.00		105	70-130	1.33	25	
1,1-Dichloroethane	4.73	0.5	ppbv	5.00		94.6	70-130	2.09	25	
1,1-Dichloroethylene	4.85	0.5	ppbv	5.00		97.0	70-130	0.821	25	
1,2,4-Trimethylbenzene	5.38	0.5	ppbv	5.00		108	70-130	1.48	25	
1,2-Dibromoethane (EDB)	5.32	0.5	ppbv	5.00		106	70-130	0.749	25	
1,2-Dichlorobenzene	5.67	0.5	ppbv	5.00		113	70-130	0.176	25	
1,2-Dichloroethane	5.14	0.5	ppbv	5.00		103	70-130	1.35	25	
1,2-Dichloropropane	5.13	0.5	ppbv	5.00		103	70-130	1.74	25	
1,2-Dichlorotetrafluoroethane	5.35	0.5	ppbv	5.00		107	70-130	2.40	25	
1,3,5-Trimethylbenzene	5.38	0.5	ppbv	5.00		108	70-130	1.11	25	
1,3-Butadiene	5.00	0.5	ppbv	5.00		100	70-130	2.57	25	
1,3-Dichlorobenzene	5.55	0.5	ppbv	5.00		111	70-130	1.43	25	
1,4-Dichlorobenzene	5.57	0.5	ppbv	5.00		111	70-130	1.25	25	
1,4-Dioxane	5.71	0.5	ppbv	5.00		114	70-130	0.00	25	
2-Butanone (MEK)	4.66	0.5	ppbv	5.00		93.2	70-130	1.49	25	
4-Methyl-2-pentanone (MIBK)	5.42	0.5	ppbv	5.00		108	70-130	1.11	25	
Allyl chloride	4.64	0.5	ppbv	5.00		92.8	70-130	1.71	25	
Benzene	5.17	0.5	ppbv	5.00		103	70-130	1.54	25	
Benzyl Chloride	5.07	0.5	ppbv	5.00		101	70-130	0.197	25	
Bromodichloromethane	4.79	0.5	ppbv	5.00		95.8	70-130	1.04	25	
Bromoform	0.78	0.5	ppbv	5.00		15.6	70-130	1.27	25	L
Bromomethane	5.64	0.5	ppbv	5.00		113	70-130	5.52	25	
Carbon Disulfide	4.72	0.5	ppbv	5.00		94.4	70-130	1.68	25	
Carbon Tetrachloride	5.11	0.5	ppbv	5.00		102	70-130	1.17	25	
Chlorobenzene	5.24	0.5	ppbv	5.00		105	70-130	1.52	25	
Chloroethane	5.40	0.5	ppbv	5.00		108	70-130	4.52	25	
Chloroform	4.85	0.5	ppbv	5.00		97.0	70-130	0.206	25	
Chloromethane	5.16	0.5	ppbv	5.00		103	70-130	0.772	25	
cis-1,2-Dichloroethylene	4.91	0.5	ppbv	5.00		98.2	70-130	0.613	25	
cis-1,3-Dichloropropene	5.35	0.5	ppbv	5.00		107	70-130	1.30	25	

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0267 - No Prep VOC Air										
LCS Dup (BGD0267-BSD1)					Prepared & Analyzed: 04/10/2023					
Cyclohexane	5.12	0.5	ppbv	5.00		102	70-130	1.93	25	
Dichlorodifluoromethane	4.85	0.5	ppbv	5.00		97.0	70-130	1.64	25	
Ethyl acetate	4.95	0.5	ppbv	5.00		99.0	70-130	2.40	25	
Ethylbenzene	5.31	0.5	ppbv	5.00		106	70-130	2.23	25	
Heptane	4.94	0.5	ppbv	5.00		98.8	70-130	2.60	25	
Hexane	5.01	0.5	ppbv	5.00		100	70-130	0.993	25	
m+p-Xylenes	10.7	1	ppbv	10.0		107	70-130	1.58	25	
Methylene chloride	5.11	1	ppbv	5.00		102	70-130	2.51	25	
Methyl-t-butyl ether (MTBE)	4.86	0.5	ppbv	5.00		97.2	70-130	1.43	25	
Naphthalene	4.49	0.5	ppbv	5.00		89.8	60-140	0.666	25	
o-Xylene	5.27	0.5	ppbv	5.00		105	70-130	0.568	25	
Propylene	4.94	1	ppbv	5.00		98.8	70-130	0.806	25	
Styrene	5.30	0.5	ppbv	5.00		106	70-130	1.68	25	
Tetrachloroethylene (PCE)	5.22	0.5	ppbv	5.00		104	70-130	0.573	25	
Tetrahydrofuran	5.08	0.5	ppbv	5.00		102	70-130	2.33	25	
Toluene	5.19	0.5	ppbv	5.00		104	70-130	1.34	25	
trans-1,2-Dichloroethylene	4.86	0.5	ppbv	5.00		97.2	70-130	1.43	25	
trans-1,3-Dichloropropene	5.43	0.5	ppbv	5.00		109	70-130	1.46	25	
Trichloroethylene	5.16	0.5	ppbv	5.00		103	70-130	1.35	25	
Trichlorofluoromethane	5.19	0.5	ppbv	5.00		104	70-130	2.29	25	
Vinyl acetate	4.78	0.5	ppbv	5.00		95.6	70-130	2.07	25	
Vinyl bromide	5.89	0.5	ppbv	5.00		118	70-130	1.89	25	
Vinyl chloride	5.26	0.5	ppbv	5.00		105	70-130	2.63	25	
Surr: 4-Bromofluorobenzene (Surr)	*4.98*		ppbv	*5.00*		*99.6*	*70-130*			

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Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0285 - No Prep VOC GC Air										
Blank (BGD0285-BLK1)						Prepared & Analyzed: 04/10/2023				
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	10.0	ppmv							
Carbon Monoxide	<	0.001	Vol%							
LCS (BGD0285-BS1)						Prepared & Analyzed: 04/10/2023				
Methane	4350	500	ppmv	5000		87.1	0-200			
Methane	4350	0.05	ppmv	5000		87.1	80-120			
Carbon dioxide	5880	500	ppmv	5000		118	0-200			
Carbon dioxide	5880	0.05	ppmv	5000		118	80-120			
Oxygen (O2)	5180	500	ppmv	5000		104	0-200			
Oxygen (O2)	5180	0.05	ppmv	5000		104	80-120			
Nitrogen (N2)	5450	2000	ppmv	5000		109	0-200			
Nitrogen (N2)	5450	1	ppmv	5000		109	80-120			
Hydrogen (H2)	5940	200	ppmv	5100		117	0-200			
Hydrogen (H2)	5940	0.02	ppmv	5100		117	80-120			
Carbon Monoxide	4930	10	ppmv	5000		98.6	0-200			
Carbon Monoxide	4930	0.001	ppmv	5000		98.6	80-120			
Duplicate (BGD0285-DUP1)					**Source: 23D0078-01**	Prepared & Analyzed: 04/10/2023				
Methane	212000	4500	ppmv		211000			0.718	25	
Methane	21.2	0.45	Vol%		21.1			0.718	5	
Carbon dioxide	235000	4500	ppmv		234000			0.294	25	
Carbon dioxide	23.5	0.45	Vol%		23.4			0.294	5	
Oxygen (O2)	26300	4500	ppmv		26400			0.0447	25	
Oxygen (O2)	2.63	0.45	Vol%		2.64			0.0447	5	
Hydrogen (H2)	<	1800	ppmv		<1800			NA	25	
Hydrogen (H2)	<	0.18	Vol%		<0.18			NA	5	
Nitrogen (N2)	471000	18000	ppmv		468000			0.523	25	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0285 - No Prep VOC GC Air										
Duplicate (BGD0285-DUP2)				**Source: 23D0256-01**	Prepared & Analyzed: 04/10/2023					
Methane	92900	4500	ppmv		93200			0.364	25	
Methane	9.29	0.45	Vol%		9.32			0.364	5	
Carbon dioxide	239000	4500	ppmv		240000			0.351	25	
Carbon dioxide	23.9	0.45	Vol%		24.0			0.351	5	
Oxygen (O2)	7.02	0.45	Vol%		7.01			0.141	5	
Oxygen (O2)	70200	4500	ppmv		70100			0.141	25	
Nitrogen (N2)	473000	18000	ppmv		473000			0.00668	25	
Hydrogen (H2)	24600	1800	ppmv		24100			1.84	25	
Hydrogen (H2)	2.46	0.18	Vol%		2.41			1.84	5	
Carbon Monoxide	156	90.0	ppmv		153			1.63	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			1.63	5	
Duplicate (BGD0285-DUP3)				**Source: 23D0256-02**	Prepared & Analyzed: 04/10/2023					
Methane	235000	4500	ppmv		232000			1.23	25	
Methane	23.5	0.45	Vol%		23.2			1.23	5	
Carbon dioxide	525000	4500	ppmv		521000			0.884	25	
Carbon dioxide	52.5	0.45	Vol%		52.1			0.884	5	
Oxygen (O2)	23400	4500	ppmv		23200			0.884	25	
Oxygen (O2)	2.34	0.45	Vol%		2.32			0.884	5	
Hydrogen (H2)	67600	1800	ppmv		66700			1.31	25	
Nitrogen (N2)	91400	18000	ppmv		90500			0.950	25	
Nitrogen (N2)	9.14	9.00	Vol%		9.05			0.950	5	
Carbon Monoxide	424	90.0	ppmv		427			0.867	25	
Carbon Monoxide	0.04	0.009	Vol%		0.04			0.867	5	
Duplicate (BGD0285-DUP4)				**Source: 23D0256-03**	Prepared & Analyzed: 04/10/2023					
Methane	<	4500	ppmv		<4500			NA	25	
Methane	<	0.45	Vol%		<0.45			NA	5	
Carbon dioxide	56100	4500	ppmv		54400			3.02	25	
Carbon dioxide	5.61	0.45	Vol%		5.44			3.02	5	
Oxygen (O2)	172000	4500	ppmv		171000			0.331	25	
Oxygen (O2)	17.2	0.45	Vol%		17.1			0.331	5	
Hydrogen (H2)	28100	1800	ppmv		27700			1.47	25	
Hydrogen (H2)	2.81	0.18	Vol%		2.77			1.47	5	
Nitrogen (N2)	641000	18000	ppmv		641000			0.00257	25	

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0285 - No Prep VOC GC Air										
Duplicate (BGD0285-DUP4)				**Source: 23D0256-03**	Prepared & Analyzed: 04/10/2023					
Carbon Monoxide	182	90.0	ppmv		188			3.20	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			3.20	5	

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		
EPA TO-15 in Air			
Benzene	VELAP		

Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

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Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Qualifiers and Definitions

L	LCS recovery is outside of established acceptance limits
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
PF	Preparation Factor
MDL	Method Detection Limit
LOQ	Limit of Quantitation
ppbv	parts per billion by volume
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside ± 10% of the absolute.

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formerly Air, Water & Soil Laboratories

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RICHMOND, VIRGINIA 23237
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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 4/11/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: BRISTOL
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): Logan Culhane	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

PWS I.D. #:

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas (LV=Landfill/Vent Gas) OT=Other_____

063-23C-0004

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information — Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information — Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	37			10095	1.4	230307-01	30	6.4	4/4	2:51	25	149.8	4/4	2:53	10	149.9	LG	x	x	x
2)	53			12064	1.4	230307-01	30	6.2	4/4	3:01	27	145.9	4/4	3:03	10	146.1	LG	x	x	x
3)	67			12458	1.4	230307-01	30	6.0	4/4	3:08	28	172.3	4/4	3:10	10	172.7	LG	x	x	x
4)																				

RRE

RELINQUISHED:	RECEIVED: DATE / TIME	QC Data Package	LAB USE ONLY
RELINQUISHED: DATE / TIME 4/4 4:00pm	RECEIVED: DATE / TIME FedEx GT	Level I ☐ Level II	SCS Field Services 23D0256 Bristol
RELINQUISHED: DATE / TIME FedEx GT	RECEIVED: DATE / TIME [illegible] 4/5/23 1105	Level III Level IV	Recd: 04/05/2023 Due: 04/12/2023

v130325002

277
20.9°C
310
Noice
NOSeal

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0256

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 5, 2023 11:05 April 12, 2023 15:11
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Sample Conditions Checklist

Samples Received at:	**20.90°C**
How were samples received?	FedEx Ground
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Work Order Comments

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 13, 2023 10:43
	4330 Lewis Road, Suite 1	Date Issued:	April 20, 2023 14:49
	Harrisburg, PA 17111	Project Number:	072223016
Submitted To:	Tom Lock	Purchase Order:	07-SO04485
Client Site I.D.:	Bristol		

Enclosed are the results of analyses for samples received by the laboratory on 04/13/2023 10:43. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

TNI Accredited
VELAP ID 460021

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 13, 2023 10:43
	4330 Lewis Road, Suite 1	Date Issued:	April 20, 2023 14:49
	Harrisburg, PA 17111	Project Number:	072223016
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
67	23D0696-01	Air	04/12/2023 13:01	04/13/2023 10:43
54	23D0696-02	Air	04/12/2023 13:09	04/13/2023 10:43
57	23D0696-03	Air	04/12/2023 13:16	04/13/2023 10:43
37	23D0696-04	Air	04/12/2023 12:37	04/13/2023 10:43
52	23D0696-05	Air	04/12/2023 12:50	04/13/2023 10:43

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 67

Sample ID: 23D0696-01

Sample Matrix: Air

Sampled: 4/12/2023 13:01

Sample Type: LG

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00176::10094

Canister Size: 1.4

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 5.4

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	1080	90.0	90.0		9	1	4/17/23 14:43	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	9.59	0.45	0.45		9	1	4/17/23 14:43	MER
Carbon dioxide, as received	63.5	0.45	0.45		9	1	4/17/23 14:43	MER
Oxygen (O2), as received	0.47	0.45	0.45		9	1	4/17/23 14:43	MER
Hydrogen (H2), as received	24.6	1.62	1.62		81	1	4/19/23 10:08	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/17/23 14:43	MER
Carbon Monoxide, as received	0.11	0.009	0.009		9	1	4/17/23 14:43	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	483000	10500	26200		1500000	34000	84000	52500	1	4/19/23 16:34	DFH

Surrogate(s)	% Recovery	% Recovery Limits		
4-Bromofluorobenzene (Surr)	90.8	80-120	4/19/23 16:34	

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 54

Sample ID: 23D0696-02

Sample Matrix: Air

Sampled: 4/12/2023 13:09

Sample Type: LG

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00186::12853

Canister Size: 1.4

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 6.0

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	817	90.0	90.0		9	1	4/17/23 15:42	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	6.59	0.45	0.45		9	1	4/17/23 15:42	MER
Carbon dioxide, as received	52.6	0.45	0.45		9	1	4/17/23 15:42	MER
Oxygen (O2), as received	2.76	0.45	0.45		9	1	4/17/23 15:42	MER
Hydrogen (H2), as received	23.1	1.62	1.62		81	1	4/19/23 10:33	MER
Nitrogen (N2), as received	10.1	9.00	9.00		9	1	4/17/23 15:42	MER
Carbon Monoxide, as received	0.08	0.009	0.009		9	1	4/17/23 15:42	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	493000	10500	26200		1600000	34000	84000	52500	1	4/19/23 17:18	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	95.8	80-120	4/19/23 17:18

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 57

Sample ID: 23D0696-03

Sample Matrix: Air

Sampled: 4/12/2023 13:16

Sample Type: LG

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00270::13369

Canister Size: 1.4

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 5.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	947	90.0	90.0		9	1	4/17/23 16:33	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	22.1	0.45	0.45		9	1	4/17/23 16:33	MER
Carbon dioxide, as received	59.3	0.45	0.45		9	1	4/17/23 16:33	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	4/17/23 16:33	MER
Hydrogen (H2), as received	10.7	1.08	1.08		54	1	4/19/23 10:49	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/17/23 16:33	MER
Carbon Monoxide, as received	0.09	0.009	0.009		9	1	4/17/23 16:33	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	349000	7000	17500		1100000	22000	56000	35000	1	4/19/23 18:03	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	95.2	80-120	4/19/23 18:03

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Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 37

Sample ID: 23D0696-04

Sample Matrix: Air

Sampled: 4/12/2023 12:37

Sample Type: LG

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00197::11322

Canister Size: 1.4

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.6

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	150	90.0	90.0		9	1	4/17/23 17:24	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	8.64	0.45	0.45		9	1	4/17/23 17:24	MER
Carbon dioxide, as received	22.2	0.45	0.45		9	1	4/17/23 17:24	MER
Oxygen (O2), as received	7.10	0.45	0.45		9	1	4/17/23 17:24	MER
Hydrogen (H2), as received	2.36	0.18	0.18		9	1	4/17/23 17:24	MER
Nitrogen (N2), as received	46.4	27.0	27.0		27	1	4/19/23 11:04	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	4/17/23 17:24	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	77100	1560	3890		250000	5000	12000	7780	1	4/19/23 15:04	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	94.6	80-120	4/19/23 15:04

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Certificate of Analysis

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Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 52

Sample ID: 23D0696-05

Sample Matrix: Air

Sampled: 4/12/2023 12:50

Sample Type: LG

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00107::12782

Canister Size: 1.4

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 5.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	330	90.0	90.0		9	1	4/19/23 9:17	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	25.7	0.45	0.45		9	1	4/19/23 9:17	MER
Carbon dioxide, as received	46.9	0.45	0.45		9	1	4/19/23 9:17	MER
Oxygen (O2), as received	1.38	0.45	0.45		9	1	4/19/23 9:17	MER
Hydrogen (H2), as received	12.5	0.36	0.36		18	1	4/19/23 11:20	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/19/23 9:17	MER
Carbon Monoxide, as received	0.03	0.009	0.009		9	1	4/19/23 9:17	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	112000	1560	3890		360000	5000	12000	7780	1	4/19/23 15:49	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	94.2	80-120	4/19/23 15:49

ENTHALPY ANALYTICAL

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			**Preparation Method:**	**No Prep VOC GC Air**	
23D0696-01	1.00 mL / 1.00 mL	ALT-145	BGD0597	SGD0603	AG00026
23D0696-02	1.00 mL / 1.00 mL	ALT-145	BGD0597	SGD0603	AG00026
23D0696-03	1.00 mL / 1.00 mL	ALT-145	BGD0597	SGD0603	AG00026
23D0696-04	1.00 mL / 1.00 mL	ALT-145	BGD0597	SGD0603	AG00026
23D0696-05	1.00 mL / 1.00 mL	ALT-145	BGD0597	SGD0694	AG00026
23D0696-01	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0603	AG00026
23D0696-01RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026
23D0696-02	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0603	AG00026
23D0696-02RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026
23D0696-03	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0603	AG00026
23D0696-03RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026
23D0696-04	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0603	AG00026
23D0696-04RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026
23D0696-05	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026
23D0696-05RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0597	SGD0694	AG00026

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**No Prep VOC Air**	
23D0696-01	400 mL / 400 mL	EPA TO-15	BGD0664	SGD0680	AC30195
23D0696-02	400 mL / 400 mL	EPA TO-15	BGD0664	SGD0680	AC30195
23D0696-03	400 mL / 400 mL	EPA TO-15	BGD0664	SGD0680	AC30195
23D0696-04	400 mL / 400 mL	EPA TO-15	BGD0664	SGD0680	AC30195
23D0696-05	400 mL / 400 mL	EPA TO-15	BGD0664	SGD0680	AC30195

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Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0664 - No Prep VOC Air										
Blank (BGD0664-BLK1)				Prepared & Analyzed: 04/18/2023						
Benzene	<	0.50	ppbv							
Surr: 4-Bromofluorobenzene (Surr)	*4.70*		ppbv	*5.00*		*94.0*	*80-120*			
LCS (BGD0664-BS1)				Prepared & Analyzed: 04/18/2023						
1,1,1-Trichloroethane	5.53	0.5	ppbv	5.00		111	70-130			
1,1,2,2-Tetrachloroethane	5.89	0.5	ppbv	5.00		118	70-130			
1,1,2-Trichloro-1,2,2-trifluoroethane	5.09	0.5	ppbv	5.00		102	70-130			
1,1,2-Trichloroethane	5.70	0.5	ppbv	5.00		114	70-130			
1,1-Dichloroethane	5.06	0.5	ppbv	5.00		101	70-130			
1,1-Dichloroethylene	5.14	0.5	ppbv	5.00		103	70-130			
1,2,4-Trimethylbenzene	5.72	0.5	ppbv	5.00		114	70-130			
1,2-Dibromoethane (EDB)	5.63	0.5	ppbv	5.00		113	70-130			
1,2-Dichlorobenzene	6.01	0.5	ppbv	5.00		120	70-130			
1,2-Dichloroethane	5.54	0.5	ppbv	5.00		111	70-130			
1,2-Dichloropropane	5.60	0.5	ppbv	5.00		112	70-130			
1,2-Dichlorotetrafluoroethane	6.30	0.5	ppbv	5.00		126	70-130			
1,3,5-Trimethylbenzene	5.71	0.5	ppbv	5.00		114	70-130			
1,3-Butadiene	4.82	0.5	ppbv	5.00		96.4	70-130			
1,3-Dichlorobenzene	5.98	0.5	ppbv	5.00		120	70-130			
1,4-Dichlorobenzene	5.92	0.5	ppbv	5.00		118	70-130			
1,4-Dioxane	6.14	0.5	ppbv	5.00		123	70-130			
2-Butanone (MEK)	4.95	0.5	ppbv	5.00		99.0	70-130			
4-Methyl-2-pentanone (MIBK)	5.83	0.5	ppbv	5.00		117	70-130			
Allyl chloride	4.88	0.5	ppbv	5.00		97.6	70-130			
Benzene	5.56	0.5	ppbv	5.00		111	70-130			
Benzyl Chloride	5.43	0.5	ppbv	5.00		109	70-130			
Bromodichloromethane	5.16	0.5	ppbv	5.00		103	70-130			
Bromoform	0.75	0.5	ppbv	5.00		15.0	70-130			L
Bromomethane	6.90	0.5	ppbv	5.00		138	70-130			L
Carbon Disulfide	5.11	0.5	ppbv	5.00		102	70-130			

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Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0664 - No Prep VOC Air										
LCS (BGD0664-BS1)				Prepared & Analyzed: 04/18/2023						
Carbon Tetrachloride	5.50	0.5	ppbv	5.00		110	70-130			
Chlorobenzene	5.62	0.5	ppbv	5.00		112	70-130			
Chloroethane	6.37	0.5	ppbv	5.00		127	70-130			
Chloroform	5.16	0.5	ppbv	5.00		103	70-130			
Chloromethane	5.75	0.5	ppbv	5.00		115	70-130			
cis-1,2-Dichloroethylene	5.16	0.5	ppbv	5.00		103	70-130			
cis-1,3-Dichloropropene	5.69	0.5	ppbv	5.00		114	70-130			
Cyclohexane	5.52	0.5	ppbv	5.00		110	70-130			
Dichlorodifluoromethane	5.13	0.5	ppbv	5.00		103	70-130			
Ethyl acetate	5.27	0.5	ppbv	5.00		105	70-130			
Ethylbenzene	5.57	0.5	ppbv	5.00		111	70-130			
Heptane	5.40	0.5	ppbv	5.00		108	70-130			
Hexane	5.32	0.5	ppbv	5.00		106	70-130			
m+p-Xylenes	11.3	1	ppbv	10.0		113	70-130			
Methylene chloride	5.56	1	ppbv	5.00		111	70-130			
Methyl-t-butyl ether (MTBE)	5.00	0.5	ppbv	5.00		100	70-130			
Naphthalene	4.67	0.5	ppbv	5.00		93.4	60-140			
o-Xylene	5.62	0.5	ppbv	5.00		112	70-130			
Propylene	5.30	1	ppbv	5.00		106	70-130			
Styrene	5.57	0.5	ppbv	5.00		111	70-130			
Tetrachloroethylene (PCE)	5.46	0.5	ppbv	5.00		109	70-130			
Tetrahydrofuran	5.47	0.5	ppbv	5.00		109	70-130			
Toluene	5.64	0.5	ppbv	5.00		113	70-130			
trans-1,2-Dichloroethylene	5.14	0.5	ppbv	5.00		103	70-130			
trans-1,3-Dichloropropene	5.81	0.5	ppbv	5.00		116	70-130			
Trichloroethylene	5.62	0.5	ppbv	5.00		112	70-130			
Trichlorofluoromethane	5.89	0.5	ppbv	5.00		118	70-130			
Vinyl acetate	5.04	0.5	ppbv	5.00		101	70-130			
Vinyl bromide	6.73	0.5	ppbv	5.00		135	70-130			L
Vinyl chloride	6.20	0.5	ppbv	5.00		124	70-130			
Surr: 4-Bromofluorobenzene (Surr)	*4.85*		ppbv	*5.00*		*97.0*	*70-130*			

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Submitted To:	Tom Lock	Project Number:	072223016
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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0664 - No Prep VOC Air										
LCS Dup (BGD0664-BSD1)				Prepared & Analyzed: 04/18/2023						
1,1,1-Trichloroethane	5.48	0.5	ppbv	5.00		110	70-130	0.908	25	
1,1,2,2-Tetrachloroethane	5.94	0.5	ppbv	5.00		119	70-130	0.845	25	
1,1,2-Trichloro-1,2,2-trifluoroethane	5.01	0.5	ppbv	5.00		100	70-130	1.58	25	
1,1,2-Trichloroethane	5.70	0.5	ppbv	5.00		114	70-130	0.00	25	
1,1-Dichloroethane	4.97	0.5	ppbv	5.00		99.4	70-130	1.79	25	
1,1-Dichloroethylene	5.07	0.5	ppbv	5.00		101	70-130	1.37	25	
1,2,4-Trimethylbenzene	5.78	0.5	ppbv	5.00		116	70-130	1.04	25	
1,2-Dibromoethane (EDB)	5.62	0.5	ppbv	5.00		112	70-130	0.178	25	
1,2-Dichlorobenzene	6.03	0.5	ppbv	5.00		121	70-130	0.332	25	
1,2-Dichloroethane	5.49	0.5	ppbv	5.00		110	70-130	0.907	25	
1,2-Dichloropropane	5.50	0.5	ppbv	5.00		110	70-130	1.80	25	
1,2-Dichlorotetrafluoroethane	6.10	0.5	ppbv	5.00		122	70-130	3.23	25	
1,3,5-Trimethylbenzene	5.73	0.5	ppbv	5.00		115	70-130	0.350	25	
1,3-Butadiene	5.03	0.5	ppbv	5.00		101	70-130	4.26	25	
1,3-Dichlorobenzene	6.01	0.5	ppbv	5.00		120	70-130	0.500	25	
1,4-Dichlorobenzene	5.94	0.5	ppbv	5.00		119	70-130	0.337	25	
1,4-Dioxane	6.14	0.5	ppbv	5.00		123	70-130	0.00	25	
2-Butanone (MEK)	4.89	0.5	ppbv	5.00		97.8	70-130	1.22	25	
4-Methyl-2-pentanone (MIBK)	5.77	0.5	ppbv	5.00		115	70-130	1.03	25	
Allyl chloride	4.85	0.5	ppbv	5.00		97.0	70-130	0.617	25	
Benzene	5.58	0.5	ppbv	5.00		112	70-130	0.359	25	
Benzyl Chloride	5.47	0.5	ppbv	5.00		109	70-130	0.734	25	
Bromodichloromethane	5.14	0.5	ppbv	5.00		103	70-130	0.388	25	
Bromoform	0.76	0.5	ppbv	5.00		15.2	70-130	1.32	25	L
Bromomethane	6.78	0.5	ppbv	5.00		136	70-130	1.75	25	L
Carbon Disulfide	5.01	0.5	ppbv	5.00		100	70-130	1.98	25	
Carbon Tetrachloride	5.50	0.5	ppbv	5.00		110	70-130	0.00	25	
Chlorobenzene	5.68	0.5	ppbv	5.00		114	70-130	1.06	25	
Chloroethane	6.22	0.5	ppbv	5.00		124	70-130	2.38	25	
Chloroform	5.09	0.5	ppbv	5.00		102	70-130	1.37	25	
Chloromethane	5.67	0.5	ppbv	5.00		113	70-130	1.40	25	
cis-1,2-Dichloroethylene	5.05	0.5	ppbv	5.00		101	70-130	2.15	25	
cis-1,3-Dichloropropene	5.66	0.5	ppbv	5.00		113	70-130	0.529	25	

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Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0664 - No Prep VOC Air										
LCS Dup (BGD0664-BSD1)				Prepared & Analyzed: 04/18/2023						
Cyclohexane	5.50	0.5	ppbv	5.00		110	70-130	0.363	25	
Dichlorodifluoromethane	5.11	0.5	ppbv	5.00		102	70-130	0.391	25	
Ethyl acetate	5.22	0.5	ppbv	5.00		104	70-130	0.953	25	
Ethylbenzene	5.65	0.5	ppbv	5.00		113	70-130	1.43	25	
Heptane	5.36	0.5	ppbv	5.00		107	70-130	0.743	25	
Hexane	5.23	0.5	ppbv	5.00		105	70-130	1.71	25	
m+p-Xylenes	11.3	1	ppbv	10.0		113	70-130	0.265	25	
Methylene chloride	5.45	1	ppbv	5.00		109	70-130	2.00	25	
Methyl-t-butyl ether (MTBE)	5.02	0.5	ppbv	5.00		100	70-130	0.399	25	
Naphthalene	4.67	0.5	ppbv	5.00		93.4	60-140	0.00	25	
o-Xylene	5.65	0.5	ppbv	5.00		113	70-130	0.532	25	
Propylene	5.21	1	ppbv	5.00		104	70-130	1.71	25	
Styrene	5.52	0.5	ppbv	5.00		110	70-130	0.902	25	
Tetrachloroethylene (PCE)	5.52	0.5	ppbv	5.00		110	70-130	1.09	25	
Tetrahydrofuran	5.54	0.5	ppbv	5.00		111	70-130	1.27	25	
Toluene	5.64	0.5	ppbv	5.00		113	70-130	0.00	25	
trans-1,2-Dichloroethylene	5.01	0.5	ppbv	5.00		100	70-130	2.56	25	
trans-1,3-Dichloropropene	5.80	0.5	ppbv	5.00		116	70-130	0.172	25	
Trichloroethylene	5.57	0.5	ppbv	5.00		111	70-130	0.894	25	
Trichlorofluoromethane	5.75	0.5	ppbv	5.00		115	70-130	2.41	25	
Vinyl acetate	4.99	0.5	ppbv	5.00		99.8	70-130	0.997	25	
Vinyl bromide	6.63	0.5	ppbv	5.00		133	70-130	1.50	25	L
Vinyl chloride	6.08	0.5	ppbv	5.00		122	70-130	1.95	25	
Surr: 4-Bromofluorobenzene (Surr)	*4.94*		ppbv	*5.00*		*98.8*	*70-130*			

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Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0597 - No Prep VOC GC Air										
Blank (BGD0597-BLK1)					Prepared & Analyzed: 04/17/2023					
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	10.0	ppmv							
Carbon Monoxide	<	0.001	Vol%							
LCS (BGD0597-BS1)					Prepared & Analyzed: 04/17/2023					
Methane	4340	500	ppmv	5000		86.8	0-200			
Methane	4340	0.05	ppmv	5000		86.8	80-120			
Carbon dioxide	5400	500	ppmv	5000		108	0-200			
Carbon dioxide	5400	0.05	ppmv	5000		108	80-120			
Oxygen (O2)	5070	500	ppmv	5000		101	0-200			
Oxygen (O2)	5070	0.05	ppmv	5000		101	80-120			
Hydrogen (H2)	5620	200	ppmv	5100		110	0-200			
Nitrogen (N2)	5330	1	ppmv	5000		107	80-120			
Nitrogen (N2)	5330	2000	ppmv	5000		107	0-200			
Hydrogen (H2)	5620	0.02	ppmv	5100		110	80-120			
Carbon Monoxide	4830	10	ppmv	5000		96.6	0-200			
Carbon Monoxide	4830	0.001	ppmv	5000		96.6	80-120			
Duplicate (BGD0597-DUP1)					**Source: 23D0696-01** Prepared & Analyzed: 04/17/2023					
Methane	95200	4500	ppmv		95900			0.740	25	
Methane	9.52	0.45	Vol%		9.59			0.740	5	
Carbon dioxide	635000	4500	ppmv		635000			0.0485	25	
Carbon dioxide	63.5	0.45	Vol%		63.5			0.0485	5	
Oxygen (O2)	4610	4500	ppmv		4680			1.56	25	
Oxygen (O2)	0.46	0.45	Vol%		0.47			1.56	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	257000	1800	ppmv		258000			0.157	25	
Carbon Monoxide	1090	90.0	ppmv		1080			0.698	25	
Carbon Monoxide	0.11	0.009	Vol%		0.11			0.698	5	

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Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0597 - No Prep VOC GC Air										
Duplicate (BGD0597-DUP2)				**Source: 23D0696-02**	Prepared & Analyzed: 04/17/2023					
Methane	65300	4500	ppmv		65900			0.966	25	
Methane	6.53	0.45	Vol%		6.59			0.966	5	
Carbon dioxide	52.2	0.45	Vol%		52.6			0.728	5	
Carbon dioxide	522000	4500	ppmv		526000			0.728	25	
Oxygen (O2)	2.72	0.45	Vol%		2.76			1.33	5	
Oxygen (O2)	27200	4500	ppmv		27600			1.33	25	
Hydrogen (H2)	248000	1800	ppmv		250000			0.667	25	
Nitrogen (N2)	10.0	9.00	Vol%		10.1			0.733	5	
Nitrogen (N2)	100000	18000	ppmv		101000			0.733	25	
Carbon Monoxide	0.08	0.009	Vol%		0.08			0.663	5	
Carbon Monoxide	812	90.0	ppmv		817			0.663	25	
Duplicate (BGD0597-DUP3)				**Source: 23D0696-03**	Prepared & Analyzed: 04/17/2023					
Methane	219000	4500	ppmv		221000			0.841	25	
Methane	21.9	0.45	Vol%		22.1			0.841	5	
Carbon dioxide	589000	4500	ppmv		593000			0.663	25	
Carbon dioxide	58.9	0.45	Vol%		59.3			0.663	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	110000	1800	ppmv		111000			1.18	25	
Carbon Monoxide	937	90.0	ppmv		947			1.16	25	
Carbon Monoxide	0.09	0.009	Vol%		0.09			1.16	5	
Duplicate (BGD0597-DUP4)				**Source: 23D0696-04**	Prepared & Analyzed: 04/17/2023					
Methane	85200	4500	ppmv		86400			1.37	25	
Methane	8.52	0.45	Vol%		8.64			1.37	5	
Carbon dioxide	218000	4500	ppmv		222000			1.58	25	
Carbon dioxide	21.8	0.45	Vol%		22.2			1.58	5	
Oxygen (O2)	70000	4500	ppmv		71000			1.34	25	
Oxygen (O2)	7.00	0.45	Vol%		7.10			1.34	5	
Hydrogen (H2)	23200	1800	ppmv		23600			1.85	25	
Nitrogen (N2)	463000	18000	ppmv		470000			1.40	25	
Hydrogen (H2)	2.32	0.18	Vol%		2.36			1.85	5	

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0597 - No Prep VOC GC Air										
Duplicate (BGD0597-DUP4)			**Source: 23D0696-04**		Prepared & Analyzed: 04/17/2023					
Carbon Monoxide	148	90.0	ppmv		150			1.63	25	
Carbon Monoxide	0.01	0.009	Vol%		0.02			1.63	5	
Duplicate (BGD0597-DUP5)			**Source: 23D0696-05**		Prepared & Analyzed: 04/19/2023					
Methane	257000	4500	ppmv		257000			0.0854	25	
Methane	25.7	0.45	Vol%		25.7			0.0854	5	
Carbon dioxide	47.2	0.45	Vol%		46.9			0.647	5	
Carbon dioxide	472000	4500	ppmv		469000			0.647	25	
Oxygen (O2)	1.36	0.45	Vol%		1.38			0.984	5	
Oxygen (O2)	13600	4500	ppmv		13800			0.984	25	
Hydrogen (H2)	127000	1800	ppmv		127000			0.506	25	
Nitrogen (N2)	46100	18000	ppmv		46500			0.751	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	333	90.0	ppmv		330			0.949	25	
Carbon Monoxide	0.03	0.009	Vol%		0.03			0.949	5	
Duplicate (BGD0597-DUP6)			**Source: 23D0813-01**		Prepared & Analyzed: 04/19/2023					
Methane	45.6	0.45	Vol%		45.0			1.41	5	
Methane	456000	4500	ppmv		450000			1.41	25	
Carbon dioxide	48.5	0.45	Vol%		47.8			1.32	5	
Carbon dioxide	485000	4500	ppmv		478000			1.32	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	<	0.18	Vol%		<0.18			NA	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	<	1800	ppmv		<1800			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		
EPA TO-15 in Air			
Benzene	VELAP		

Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

Qualifiers and Definitions

L	LCS recovery is outside of established acceptance limits
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
PF	Preparation Factor
MDL	Method Detection Limit
LOQ	Limit of Quantitation
ppbv	parts per billion by volume
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside ± 10% of the absolute.

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formerly Air, Water & Soil Laboratories

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RICHMOND, VIRGINIA 23237
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(804)358-8297 FAX

AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/9/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: BRISTOL
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): Logan Cullhane	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: **10** (**5 Days**) **or** __ **Day(s)**

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other LF

063-23C-0037

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
	Barometric Pres. (in Hg):								Barometric Pres. (in Hg): 30.33				Barometric Pres. (in Hg): 30.33							
1)	67			10094	1.4	230328-01	30	5.4	4/12/23	12:57	30	180	4/12/23	1:01 pm	10	180.1	LG	x	x	x
2)	54			12853	1.4	230328-01	30	6.0	4/12/23	1:05 pm	30	170.8	4/12/23	1:09 pm	9	170.4	LG	x	x	x
3)	57			13369	1.4	230328-01	30	5.2	4/12/23	1:13 pm	30	152.7	4/12/23	1:16 pm	10	152.7	LG	x	x	x
4)																				

19.8°C, 310, no ice, no seal

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME 4/12 3:00PM	RECEIVED: Fedex G	DATE / TIME
RELINQUISHED: Fedex G	DATE / TIME	RECEIVED: CanBel 4/13/23	DATE / TIME 1043

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

23D0696

SCS Field Services 23D0696
Bristol
Recd: 04/13/2023 Due: 04/20/2023

v130325002

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formerly *Air, Water & Soil Laboratories*

AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 3/9/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: Bristol
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	PWS I.D. #:
		Turn Around Time: Circle: 10 (5 Days) or __ Day

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other LF

063-23A-0033

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): 30.33 — Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): 30.33 — Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	37			11322	1.4	230119-01	21.0	4.6	4/12	1234	26	149.3	4/12	1237	10	149.3	LG	x	X	x
2)	52			12782	1.4	230119-01	21.0	5.2	4/12	1247	27	153	4/12	1250	10	153	LG	x	X	x
3)																	LG	x	X	
4)																	LG	x		

19.8°C, 310, no ice, no seal

RELINQUISHED:		RECEIVED: DATE / TIME	QC Data Package	LAB USE ONLY
RELINQUISHED: DATE / TIME 4/12 3:00pm		RECEIVED: Fedex G DATE / TIME	Level I ☐	
RELINQUISHED: Fedex G DATE / TIME		RECEIVED: DATE / TIME 4/13/23 1043	Level II ☐	
			Level III ☐	
			Level IV ☐	

23D0696

SCS Field Services 23D0696
Bristol
Recd: 04/13/2023 Due: 04/20/2023

v130325002

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Certificate of Analysis

Final Report

Laboratory Order ID 23D0696

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 13, 2023 10:43 April 20, 2023 14:49
Submitted To:	Tom Lock	Project Number:	072223016
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Sample Conditions Checklist

Samples Received at:	**19.80°C**
How were samples received?	FedEx Express
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Work Order Comments

May 10, 2023
File No. 02218208.04

MEMORANDUM

TO: Kristin Hall, EPA Region III
Tracy Blalock, VDEQ-SWRO

FROM: D. Brandon King, SCS Engineers
Quinn Bernier, SCS Engineers

SUBJECT: Semi-Monthly Status Update – April 16th through April 30th, 2023
Bristol Integrated Waste Management Facility, Bristol, Virginia

SCS is submitting this semi-monthly status update to satisfy the conditions of compliance provision #2 of the Environmental Protection Agency (EPA) Region III letter, *Approval of Higher Operating Temperature Values for Landfill Gas Wells and Submission of Gas Treatment Alternatives at the Bristol Virginia Integrated Solid Waste Management Facility*, dated 8/23/21. Accordingly, this memo is a summary of temperature monitoring activities as well as work accomplished during the semi-monthly monitoring period of 4/16/23 through 4/30/23.

TEMPERATURE MONITORING

Automated Wellhead Temperature Measurements

Twenty-five (25) individual landfill gas (LFG) wellheads in the Permit #588 Landfill have automated temperature sensors installed. VDEQ and USEPA have been receiving Daily Gas Well Temperature Reports with data from these automated temperature sensors since 12/1/22.

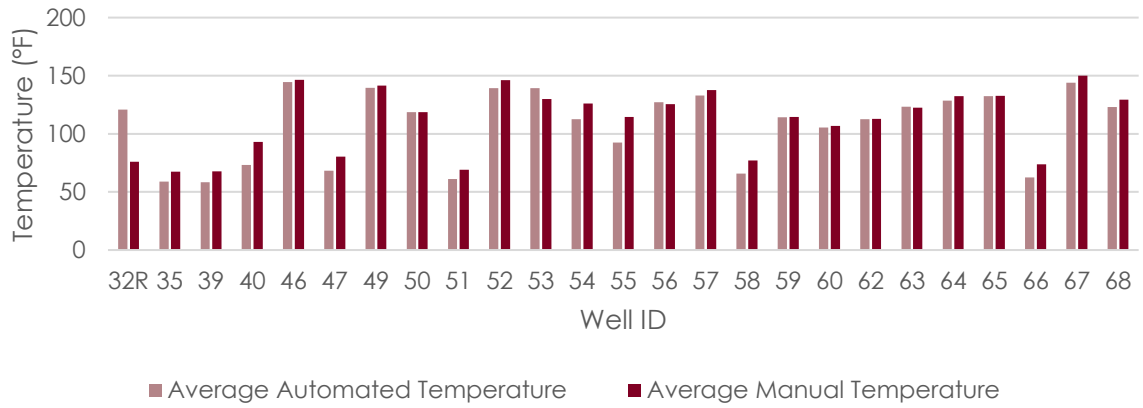
The 25 wellheads have 2-inch automated sensors. SCS believes that the 2-inch sensors measure temperature with more accuracy than the 1-inch sensors that were used in the majority of the 25 wells prior to March 1, 2023, but we are still comparing with manual temperature to assess the validity of this assertion.

SCS reviewed the automated hourly temperature measurements from 4/16/23 to 4/30/23, and identified the following trends:

- **Temperatures over 145°F:** Temperatures over the NESHAP AAAA compliance threshold of 145°F were recorded at seven wells during this monitoring period. This represents a continuation of higher temperatures across the wellfield since mid-March 2023. Temperatures greater than 145°F were again recorded most consistently at EW-46, however the highest temperatures were measured at EW-52, EW-55 (greater than 170°F at times) and EW-67 (greater than 180°F at times). Field staff believe that the general increase in wellfield temperatures suggests that, with the increase in pneumatic pump operation, the collection system is being successfully dewatered. Due to the increased perforations available from these efforts, the warmer landfill gases are being collected, thus the elevated average temperature.

- **Low temperatures at certain wells:** Average temperatures between 50°F and 80°F at seven wells generally correlated with low LFG flow rates measured during monthly wellfield monitoring events. These low temperatures are likely close to ambient because little to no LFG is passing through the wellhead where the sensors are placed.
- **Temperature Trends by Location:** Not all wells with the highest temperatures, for example over 145°F, were collocated. Of the wells with the highest temperatures during this monitoring period, EW-46, EW-52, and EW-67, were the closest to each other; generally located in the south-central portion of the landfill.

Figure 1. Average Daily Temperatures 4/16 to 4/30



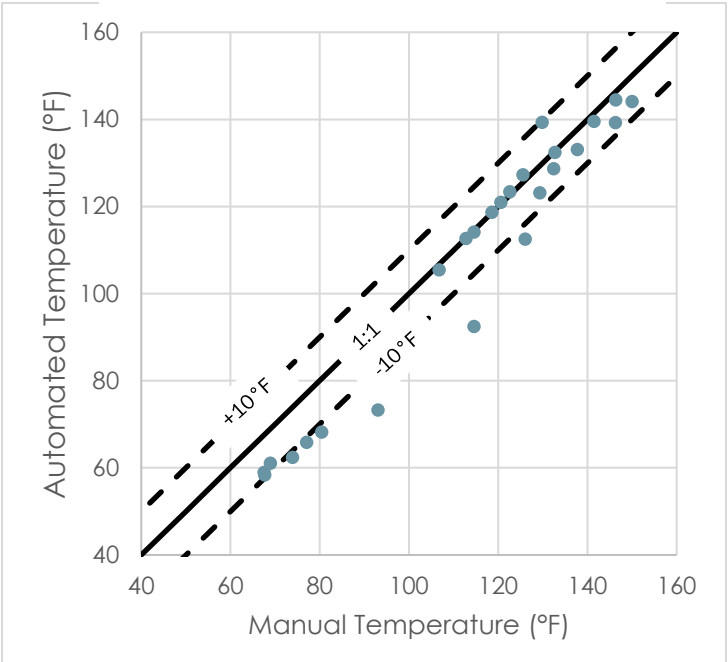
Manual Daily Temperature Monitoring

Manual temperature measurements are being made daily by field staff with a GEM5000 or equivalent LFG analyzer. The manual measurements are used to verify the automated wellhead temperature sensors and to provide temperature data for the 13 wellheads without automated sensors.

Comparing the difference between manual temperature measurements and automated temperature measurements in Figure 2, the new 2-inch sensors appear to have satisfactory correlation with manual measurements, with a few outliers. This supports SCS' belief that the 2-inch automated sensors are measuring temperature accurately.

All daily temperatures recorded manually are provided in **Attachment A**.

Figure 2. Manual vs. Automated Temperature Comparison



Monthly Regulatory Wellhead Temperature Measurements

Routine monthly temperature monitoring for purposes of complying with 40 CFR 60.36f(a)(5) was conducted 4/3/23, with follow-up monitoring on several days after. During this monitoring period, temperature exceedances were resolved at EW-52, EW-54, EW-55, EW-57, EW-61 and EW-67. See Table 1 for a list of the status of all exceedances recorded during this monitoring period.

Table 1. April Temperature Exceedance Summary

Well ID	Initial Exceedance Date	Last date/temperature measured	Duration of Exceedance	Status as of 4/30/23
EW-37	3/28/23	4/27/23 149.2°F	30 days	Ongoing, within 60-day timeline
EW-52	4/11/23	4/17/23 122.6°F	6 days	Resolved within 15-day timeline
EW-52	4/24/23	4/27/23 143.2°F	3 days	Resolved within 15-day timeline
EW-54	4/11/23	4/17/23 143.6°F	6 days	Resolved within 15-day timeline
EW-55	4/24/23	4/27/23 143.5°	3 days	Resolved within 15-day timeline
EW-57	4/11/23	4/17/23 138.4°F	6 days	Resolved within 15-day timeline
EW-61	4/17/23	4/27/23 143.9°	10 days	Resolved within 15-day timeline
EW-67	4/4/23	4/17/23 115.6°F	13 days	Resolved within 15-day timeline
EW-84	4/18/23	4/27/23 189.2°	12 days	Ongoing, within 15-day timeline
EW-86	4/18/23	4/27/23 175.8°	12 days	Ongoing, within 15-day timeline
EW-90	4/18/23	4/27/23 161.7	12 days	Ongoing, within 15-day timeline
EW-100	4/20/23	4/27/23 157.4°	10 days	Ongoing, within 15-day timeline

Work Accomplished During Monitoring Period

LFG Sampling

SCS collected LFG samples from wells EW-37, EW-61, EW-84, EW-86 and EW-90 using 1.5-L Summa canisters on 4/19/23 and EW-37, EW-84, EW-86, EW-90, and EW-100 on 4/27/23 to fulfill the requirement in 40 CFR 63.1961(a)(5) for temperature exceedances lasting more than 7 days. The samples were sent to Enthalpy Analytical for lab analysis of carbon monoxide (CO) and hydrogen (H_2) content. Lab results are summarized in Table 2. Full laboratory analytical data is included in **Attachment B** for further detail.

Table 2. LFG Wellhead Sampling Summary

Sample Date		4/19/2023	4/27/2023
EW-37	CO (ppmv)	165	153
	H2 (Vol. %)	2.41	2.71
EW-61	CO (ppmv)	571	--
	H2 (Vol. %)	14.9	--
EW-84	CO (ppmv)	1150	650
	H2 (Vol. %)	25.6	15.1
EW-86	CO (ppmv)	463	277
	H2 (Vol. %)	10.8	6.23
EW-90	CO (ppmv)	713	171
	H2 (Vol. %)	14.2	3.59
EW-100	CO (ppmv)	--	ND
	H2 (Vol. %)	--	4.79

The presence of hydrogen in all of the samples collected during this monitoring period indicates that combustion reactions are unlikely. The carbon monoxide measurements were greater than 100 ppmv in all but EW-100, indicating that continued weekly CO sampling should continue per 40 CFR 63.1961(a)(5)(viii) until the temperature exceedance is corrected or CO is less than 100 ppmv for four consecutive weekly samples.

Construction Activities

SCS-Field Services (SCS-FS) completed installation of the upper horizontal collector along the northern sections of the Sidewall Odor Mitigation System (SOMS) where liner installation has been completed up to the final 300-foot section of eastern sidewall. The SOMS crew applied soil cover on the lower liner ahead of the Shotcrete crew on remaining sections of the SOMS at the beginning of this reporting period. Shotcrete operations continued in the northern, southwest, and eastern sections of the sidewall odor mitigation system above the upper collector.

The drilling contractor completed drilling of all 18 CPVC wells on 4/15/23. The drilling contractor demobilized during this reporting period, while SCS-FS awaited the first shipment of stainless steel pipe. SCS-FS Phase I LFG System crew connected all 18 CPVC wells to vacuum on or prior to 4/27/23. The Phase I LFG System crew fused a new 12-inch LFG header to traverse the northern section of the quarry from new well EW-69 to a new low point adjacent to well EW-36. The LFG System construction crew reconnected the northern 6-inch LFG header to the new 12-inch LFG header on 4/27/23, which is the day the first shipment of stainless-steel piping arrived for the dual phase LFG extraction interior deep wells.

Weekly SEM

SCS is continuing weekly surface emissions monitoring (SEM) per the Plan of Action Report dated 7/6/22. Five exceedances of the 500-ppmv threshold were recorded during the weekly SEM event held on 4/20/23, and four exceedances were recorded during the weekly event conducted on 4/27/23.

The ongoing construction of new wells and the sidewall odor mitigation system, in addition to connection of new LFG collecting piping, is likely contributing to surface emissions exceedances in April. To a degree, increased emissions during the disturbance of the landfill surface, however SCS and the City continue to install well bore skirts at pipe penetration exceedances where possible, and place additional cover in all exceedance areas as corrective actions.

LFG System O&M

The City's O&M contractor recorded LFG monitoring data on the 18 new CPVC wells during this reporting period. The O&M contractor placed a PVC well bore skirt around well EW-59, as well as replaced the well pump. O&M also replaced pumps in wells EW-49 and EW-53. Wellheads and kanaflex tubing was replaced at wells EW-41, EW-47, EW-54, and EW-57 with 2-inch QED Precision wellheads and Solarguard flexible tubing. In addition, the wellhead was replaced at EW-48. The dewatering system regulator and airline was replaced in well EW-52 and EW-68.

O&M continued regular well and pump maintenance during this reporting period. The O&M contractor shipped four pumps total to Pump One for repair and rebuild. O&M completed April LFG monthly wellfield retest monitoring during this period. In addition, O&M collected 11 samples total during this reporting period based on LFG wellhead temperatures recorded greater than 145ºF per NESHAP AAAA.

Please contact SCS or City personnel if you have any questions or require additional information.

cc: Randall Eads, City of Bristol
Jon Hayes, City of Bristol
Jeff Hurst, VDEQ-SWRO
Tom Lock, SCS Field Services
David Cochran, City of Bristol
Erin Willard, EPA Region III
Stacy Bowers, VDEQ-SWRO
Robert E. Dick, P.E., SCS Engineers

Attachment A

City of Bristol Daily LFG Well Temperature Readings

Month	April	April	April	April	April	April	April	April	April	April	April	April	April	April	April
Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Date	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Well Number															
35	81	61	69	78	86	81	58	43	62	67	62	64	74	63	64
39	82	69	70	81	88	83	54	39	61	65	61	66	75	61	60
40	145	77	78	94	99	95	132	84	84	88	93	73	84	85	85
46	146	148	147	147	147	147	146	147	145	145	147	147	146	145	145
47	103	86	76	86	91	85	84	77	67	71	90	74	84	65	67
29	103	99	98	99	100	95	90	42	80	88	96	95	97	80	81
30R	90	125	126	129	128	126	55	92	88	91	127	127	125	89	89
31R	115	133	130	130	132	130	65	117	110	108	135	136	135	110	111
32	70	65	67	68	66	65	82	82	80	82	80	84	88	80	81
33	120	121	122	125	124	122	122	121	122	122	122	122	120	122	122
34	122	122	120	124	124	124	34	125	128	126	130	132	132	127	126
36	70	67	67	70	72	71	66	63	55	52	56	69	68	55	55
37	150	149	149	150	149	150	148	148	149	150	149	149	149	149	150
38	101	95	95	97	98	99	95	95	96	99	100	98	100	46	47
41	98	85	87	89	88	86	88	125	120	116	76	78	77	120	121
42	111	110	111	114	112	113	113	104	100	101	100	112	114	101	101
48	73	62	68	68	69	67	53	40	50	55	60	63	60	58	57
32R	121	121	120	122	121	120	120	121	120	120	121	121	120	120	121
49	133	135	131	135	142	145	146	134	146	138	150	148	147	146	146
50	115	121	118	120	124	118	116	116	115	120	123	122	119	116	116
51	93	68	69	81	87	82	56	44	60	69	61	64	78	61	62
52	145	130	117	134	138	168	149	136	169	156	144	150	137	160	161
53	105	140	140	143	145	145	70	61	141	145	145	140	143	141	143
54	151	136	108	119	125	119	140	141	117	114	146	126	132	108	108
55	50	126	167	103	157	113	70	54	160	84	72	151	88	160	163
56	130	126	129	130	129	129	122	121	123	126	119	124	130	123	122
57	151	140	135	139	142	139	141	139	137	133	133	124	139	137	137
58	116	60	77	102	103	94	84	61	64	64	64	67	70	65	65
59	115	111	112	112	116	118	118	110	115	115	112	117	120	115	112
60	109	108	107	108	107	109	103	104	105	107	107	108	107	106	106
61	146	154	155	152	150	145	155	154	155	148	140	106	112	155	155
62	113	112	112	113	113	114	111	111	113	112	114	113	114	113	113
63	125	112	112	126	125	126	123	122	123	124	124	124	126	123	124
64	138	137	128	130	131	131	138	137	128	129	137	137	130	127	128
65	135	132	132	133	133	133	133	132	132	132	133	133	133	132	132
66	88	68	76	88	94	89	58	46	70	75	67	70	78	70	71
67	169	177	179	165	157	168	150	148	139	139	126	117	140	138	138
68	120	124	124	124	125	125	168	168	123	123	123	123	123	123	124

Attachment B

Laboratory Analytical Reports

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D1115

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 20, 2023 15:53
	4330 Lewis Road, Suite 1	Date Issued:	April 28, 2023 17:44
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485
Client Site I.D.:	Bristol		

Enclosed are the results of analyses for samples received by the laboratory on 04/20/2023 15:53. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

TNI Accredited
VELAP ID 460021

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Final Report

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	4330 Lewis Road, Suite 1	Date Issued:	April 28, 2023 17:44
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
86	23D1115-01	Air	04/19/2023 10:40	04/20/2023 15:53
84	23D1115-02	Air	04/19/2023 10:52	04/20/2023 15:53

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Certificate of Analysis

Final Report

Laboratory Order ID 23D1115

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:44
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 86

Sample ID: 23D1115-01

Sample Matrix: Air

Sampled: 4/19/2023 10:40

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00116::292

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 5.6

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	463	90.0	90.0		9	1	4/27/23 10:20	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	26.0	0.45	0.45		9	1	4/27/23 10:20	MER
Carbon dioxide, as received	55.4	0.45	0.45		9	1	4/27/23 10:20	MER
Oxygen (O2), as received	0.51	0.45	0.45		9	1	4/27/23 10:20	MER
Hydrogen (H2), as received	10.8	1.08	1.08		54	1	4/27/23 12:02	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/27/23 10:20	MER
Carbon Monoxide, as received	0.05	0.009	0.009		9	1	4/27/23 10:20	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	254000	4670	11700		810000	15000	37000	23300	1	4/28/23 14:52	DFH

Surrogate(s)	% Recovery			% Recovery Limits		
4-Bromofluorobenzene (Surr)	130	*	S	80-120		4/28/23 14:52

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Certificate of Analysis

Final Report

Laboratory Order ID 23D1115

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:44
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 84

Sample ID: 23D1115-02

Sample Matrix: Air

Sampled: 4/19/2023 10:52

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00100::00296

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 5.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	1150	90.0	90.0		9	1	4/27/23 11:11	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	5.27	0.45	0.45		9	1	4/27/23 11:11	MER
Carbon dioxide, as received	62.2	0.45	0.45		9	1	4/27/23 11:11	MER
Oxygen (O2), as received	1.04	0.45	0.45		9	1	4/27/23 11:11	MER
Hydrogen (H2), as received	25.6	1.62	1.62		81	1	4/27/23 12:17	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/27/23 11:11	MER
Carbon Monoxide, as received	0.11	0.009	0.009		9	1	4/27/23 11:11	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	551000	9330	23300		1800000	30000	75000	46700	1	4/28/23 15:34	DFH

Surrogate(s)	% Recovery			% Recovery Limits		
4-Bromofluorobenzene (Surr)	124	*	S	80-120		4/28/23 15:34

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Certificate of Analysis

Final Report

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			**Preparation Method:**	**No Prep VOC GC Air**	
23D1115-01	1.00 mL / 1.00 mL	ALT-145	BGD0990	SGD1018	AG00026
23D1115-02	1.00 mL / 1.00 mL	ALT-145	BGD0990	SGD1018	AG00026
23D1115-01	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1018	AG00026
23D1115-01RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1018	AG00026
23D1115-02	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1018	AG00026
23D1115-02RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1018	AG00026

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**No Prep VOC Air**	
23D1115-01	400 mL / 400 mL	EPA TO-15	BGD0935	SGD1010	AC30133
23D1115-02	400 mL / 400 mL	EPA TO-15	BGD0935	SGD1010	AC30133

ENTHALPY ANALYTICAL

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Certificate of Analysis

Final Report

Laboratory Order ID 23D1115

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:44
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
Blank (BGD0935-BLK1)				Prepared & Analyzed: 04/26/2023						
Benzene	<	0.50	ppbv							
Surr: 4-Bromofluorobenzene (Surr)	*4.38*		ppbv	*5.00*		*87.6*	*80-120*			
LCS (BGD0935-BS1)				Prepared & Analyzed: 04/26/2023						
1,1,1-Trichloroethane	5.29	0.5	ppbv	5.00		106	70-130			
1,1,2,2-Tetrachloroethane	5.81	0.5	ppbv	5.00		116	70-130			
1,1,2-Trichloro-1,2,2-trifluoroethane	4.91	0.5	ppbv	5.00		98.2	70-130			
1,1,2-Trichloroethane	5.47	0.5	ppbv	5.00		109	70-130			
1,1-Dichloroethane	4.89	0.5	ppbv	5.00		97.8	70-130			
1,1-Dichloroethylene	4.90	0.5	ppbv	5.00		98.0	70-130			
1,2,4-Trimethylbenzene	5.61	0.5	ppbv	5.00		112	70-130			
1,2-Dibromoethane (EDB)	5.59	0.5	ppbv	5.00		112	70-130			
1,2-Dichlorobenzene	5.88	0.5	ppbv	5.00		118	70-130			
1,2-Dichloroethane	5.22	0.5	ppbv	5.00		104	70-130			
1,2-Dichloropropane	5.32	0.5	ppbv	5.00		106	70-130			
1,2-Dichlorotetrafluoroethane	6.04	0.5	ppbv	5.00		121	70-130			
1,3,5-Trimethylbenzene	5.58	0.5	ppbv	5.00		112	70-130			
1,3-Butadiene	5.55	0.5	ppbv	5.00		111	70-130			
1,3-Dichlorobenzene	5.85	0.5	ppbv	5.00		117	70-130			
1,4-Dichlorobenzene	5.76	0.5	ppbv	5.00		115	70-130			
1,4-Dioxane	5.95	0.5	ppbv	5.00		119	70-130			
2-Butanone (MEK)	4.80	0.5	ppbv	5.00		96.0	70-130			
4-Methyl-2-pentanone (MIBK)	5.49	0.5	ppbv	5.00		110	70-130			
Allyl chloride	4.68	0.5	ppbv	5.00		93.6	70-130			
Benzene	5.36	0.5	ppbv	5.00		107	70-130			
Benzyl Chloride	5.14	0.5	ppbv	5.00		103	70-130			
Bromodichloromethane	4.90	0.5	ppbv	5.00		98.0	70-130			
Bromoform	0.69	0.5	ppbv	5.00		13.8	70-130			L
Bromomethane	6.64	0.5	ppbv	5.00		133	70-130			L
Carbon Disulfide	4.92	0.5	ppbv	5.00		98.4	70-130			

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS (BGD0935-BS1)				Prepared & Analyzed: 04/26/2023						
Carbon Tetrachloride	5.25	0.5	ppbv	5.00		105	70-130			
Chlorobenzene	5.56	0.5	ppbv	5.00		111	70-130			
Chloroethane	6.14	0.5	ppbv	5.00		123	70-130			
Chloroform	4.99	0.5	ppbv	5.00		99.8	70-130			
Chloromethane	5.44	0.5	ppbv	5.00		109	70-130			
cis-1,2-Dichloroethylene	5.02	0.5	ppbv	5.00		100	70-130			
cis-1,3-Dichloropropene	5.38	0.5	ppbv	5.00		108	70-130			
Cyclohexane	5.29	0.5	ppbv	5.00		106	70-130			
Dichlorodifluoromethane	5.05	0.5	ppbv	5.00		101	70-130			
Ethyl acetate	5.05	0.5	ppbv	5.00		101	70-130			
Ethylbenzene	5.58	0.5	ppbv	5.00		112	70-130			
Heptane	5.12	0.5	ppbv	5.00		102	70-130			
Hexane	5.10	0.5	ppbv	5.00		102	70-130			
m+p-Xylenes	11.2	1	ppbv	10.0		112	70-130			
Methylene chloride	5.28	1	ppbv	5.00		106	70-130			
Methyl-t-butyl ether (MTBE)	4.86	0.5	ppbv	5.00		97.2	70-130			
Naphthalene	4.36	0.5	ppbv	5.00		87.2	60-140			
o-Xylene	5.56	0.5	ppbv	5.00		111	70-130			
Propylene	5.20	1	ppbv	5.00		104	70-130			
Styrene	5.51	0.5	ppbv	5.00		110	70-130			
Tetrachloroethylene (PCE)	5.46	0.5	ppbv	5.00		109	70-130			
Tetrahydrofuran	5.32	0.5	ppbv	5.00		106	70-130			
Toluene	5.42	0.5	ppbv	5.00		108	70-130			
trans-1,2-Dichloroethylene	4.95	0.5	ppbv	5.00		99.0	70-130			
trans-1,3-Dichloropropene	5.50	0.5	ppbv	5.00		110	70-130			
Trichloroethylene	5.40	0.5	ppbv	5.00		108	70-130			
Trichlorofluoromethane	4.91	0.5	ppbv	5.00		98.2	70-130			
Vinyl acetate	4.83	0.5	ppbv	5.00		96.6	70-130			
Vinyl bromide	6.35	0.5	ppbv	5.00		127	70-130			
Vinyl chloride	5.97	0.5	ppbv	5.00		119	70-130			
Surr: 4-Bromofluorobenzene (Surr)	*4.62*		ppbv	*5.00*		*92.4*	*70-130*			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS Dup (BGD0935-BSD1)				Prepared & Analyzed: 04/26/2023						
1,1,1-Trichloroethane	5.16	0.5	ppbv	5.00		103	70-130	2.49	25	
1,1,2,2-Tetrachloroethane	5.69	0.5	ppbv	5.00		114	70-130	2.09	25	
1,1,2-Trichloro-1,2,2-trifluoroethane	4.83	0.5	ppbv	5.00		96.6	70-130	1.64	25	
1,1,2-Trichloroethane	5.32	0.5	ppbv	5.00		106	70-130	2.78	25	
1,1-Dichloroethane	4.81	0.5	ppbv	5.00		96.2	70-130	1.65	25	
1,1-Dichloroethylene	4.87	0.5	ppbv	5.00		97.4	70-130	0.614	25	
1,2,4-Trimethylbenzene	5.54	0.5	ppbv	5.00		111	70-130	1.26	25	
1,2-Dibromoethane (EDB)	5.52	0.5	ppbv	5.00		110	70-130	1.26	25	
1,2-Dichlorobenzene	5.81	0.5	ppbv	5.00		116	70-130	1.20	25	
1,2-Dichloroethane	5.09	0.5	ppbv	5.00		102	70-130	2.52	25	
1,2-Dichloropropane	5.21	0.5	ppbv	5.00		104	70-130	2.09	25	
1,2-Dichlorotetrafluoroethane	5.79	0.5	ppbv	5.00		116	70-130	4.23	25	
1,3,5-Trimethylbenzene	5.53	0.5	ppbv	5.00		111	70-130	0.900	25	
1,3-Butadiene	4.28	0.5	ppbv	5.00		85.6	70-130	25.8	25	P
1,3-Dichlorobenzene	5.72	0.5	ppbv	5.00		114	70-130	2.25	25	
1,4-Dichlorobenzene	5.69	0.5	ppbv	5.00		114	70-130	1.22	25	
1,4-Dioxane	5.75	0.5	ppbv	5.00		115	70-130	3.42	25	
2-Butanone (MEK)	4.72	0.5	ppbv	5.00		94.4	70-130	1.68	25	
4-Methyl-2-pentanone (MIBK)	5.37	0.5	ppbv	5.00		107	70-130	2.21	25	
Allyl chloride	4.61	0.5	ppbv	5.00		92.2	70-130	1.51	25	
Benzene	5.18	0.5	ppbv	5.00		104	70-130	3.42	25	
Benzyl Chloride	5.11	0.5	ppbv	5.00		102	70-130	0.585	25	
Bromodichloromethane	4.77	0.5	ppbv	5.00		95.4	70-130	2.69	25	
Bromoform	0.67	0.5	ppbv	5.00		13.4	70-130	2.94	25	L
Bromomethane	6.31	0.5	ppbv	5.00		126	70-130	5.10	25	
Carbon Disulfide	4.83	0.5	ppbv	5.00		96.6	70-130	1.85	25	
Carbon Tetrachloride	5.06	0.5	ppbv	5.00		101	70-130	3.69	25	
Chlorobenzene	5.47	0.5	ppbv	5.00		109	70-130	1.63	25	
Chloroethane	5.85	0.5	ppbv	5.00		117	70-130	4.84	25	
Chloroform	4.92	0.5	ppbv	5.00		98.4	70-130	1.41	25	
Chloromethane	5.44	0.5	ppbv	5.00		109	70-130	0.00	25	
cis-1,2-Dichloroethylene	4.93	0.5	ppbv	5.00		98.6	70-130	1.81	25	
cis-1,3-Dichloropropene	5.28	0.5	ppbv	5.00		106	70-130	1.88	25	

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Certificate of Analysis

Final Report

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS Dup (BGD0935-BSD1)					Prepared & Analyzed: 04/26/2023					
Cyclohexane	5.16	0.5	ppbv	5.00		103	70-130	2.49	25	
Dichlorodifluoromethane	4.95	0.5	ppbv	5.00		99.0	70-130	2.00	25	
Ethyl acetate	5.20	0.5	ppbv	5.00		104	70-130	2.93	25	
Ethylbenzene	5.46	0.5	ppbv	5.00		109	70-130	2.17	25	
Heptane	5.01	0.5	ppbv	5.00		100	70-130	2.17	25	
Hexane	5.07	0.5	ppbv	5.00		101	70-130	0.590	25	
m+p-Xylenes	11.0	1	ppbv	10.0		110	70-130	1.26	25	
Methylene chloride	5.22	1	ppbv	5.00		104	70-130	1.14	25	
Methyl-t-butyl ether (MTBE)	4.83	0.5	ppbv	5.00		96.6	70-130	0.619	25	
Naphthalene	4.32	0.5	ppbv	5.00		86.4	60-140	0.922	25	
o-Xylene	5.43	0.5	ppbv	5.00		109	70-130	2.37	25	
Propylene	5.10	1	ppbv	5.00		102	70-130	1.94	25	
Styrene	5.42	0.5	ppbv	5.00		108	70-130	1.65	25	
Tetrachloroethylene (PCE)	5.37	0.5	ppbv	5.00		107	70-130	1.66	25	
Tetrahydrofuran	5.11	0.5	ppbv	5.00		102	70-130	4.03	25	
Toluene	5.21	0.5	ppbv	5.00		104	70-130	3.95	25	
trans-1,2-Dichloroethylene	4.89	0.5	ppbv	5.00		97.8	70-130	1.22	25	
trans-1,3-Dichloropropene	5.36	0.5	ppbv	5.00		107	70-130	2.58	25	
Trichloroethylene	5.20	0.5	ppbv	5.00		104	70-130	3.77	25	
Trichlorofluoromethane	4.81	0.5	ppbv	5.00		96.2	70-130	2.06	25	
Vinyl acetate	4.84	0.5	ppbv	5.00		96.8	70-130	0.207	25	
Vinyl bromide	6.17	0.5	ppbv	5.00		123	70-130	2.88	25	
Vinyl chloride	5.72	0.5	ppbv	5.00		114	70-130	4.28	25	
Surr: 4-Bromofluorobenzene (Surr)	*4.67*		ppbv	*5.00*		*93.4*	*70-130*			

ENTHALPY ANALYTICAL

1941 Reymet Road • Richmond, Virginia 23237 • Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D1115

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:44
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Blank (BGD0990-BLK1)						Prepared & Analyzed: 04/26/2023				
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	0.001	Vol%							
Carbon Monoxide	<	10.0	ppmv							
LCS (BGD0990-BS1)						Prepared & Analyzed: 04/26/2023				
Methane	4350	500	ppmv	5000		87.0	0-200			
Methane	4350	0.05	ppmv	5000		87.0	80-120			
Carbon dioxide	4440	500	ppmv	5000		88.7	0-200			
Carbon dioxide	4440	0.05	ppmv	5000		88.7	80-120			
Oxygen (O2)	5150	500	ppmv	5000		103	0-200			
Oxygen (O2)	5150	0.05	ppmv	5000		103	80-120			
Nitrogen (N2)	5410	2000	ppmv	5000		108	0-200			
Hydrogen (H2)	5830	200	ppmv	5100		114	0-200			
Nitrogen (N2)	5410	1	ppmv	5000		108	80-120			
Hydrogen (H2)	5830	0.02	ppmv	5100		114	80-120			
Carbon Monoxide	4900	10	ppmv	5000		98.1	0-200			
Carbon Monoxide	4900	0.001	ppmv	5000		98.1	80-120			
Duplicate (BGD0990-DUP1)					**Source: 23D1116-01**	Prepared & Analyzed: 04/26/2023				
Methane	9.59	0.45	Vol%		9.56			0.285	5	
Methane	95900	4500	ppmv		95600			0.285	25	
Carbon dioxide	23.7	0.45	Vol%		24.0			1.28	5	
Carbon dioxide	237000	4500	ppmv		240000			1.28	25	
Oxygen (O2)	7.52	0.45	Vol%		7.52			0.0206	5	
Oxygen (O2)	75200	4500	ppmv		75200			0.0206	25	
Hydrogen (H2)	2.42	0.18	Vol%		2.41			0.0805	5	
Hydrogen (H2)	24200	1800	ppmv		24100			0.0805	25	
Nitrogen (N2)	484000	18000	ppmv		487000			0.532	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			1.43	5	
Carbon Monoxide	163	90.0	ppmv		165			1.43	25	

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Client Name: SCS Field Services - Harrisburg, PA
4330 Lewis Road, Suite 1

Harrisburg, PA 17111

Date Received: April 20, 2023 15:53
Date Issued: April 28, 2023 17:44

Submitted To: Tom Lock
Client Site I.D.: Bristol

Project Number: 07223016.00
Purchase Order: 07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP2)				**Source: 23D1116-02**	Prepared & Analyzed: 04/26/2023					
Methane	174000	4500	ppmv		173000			0.505	25	
Methane	17.4	0.45	Vol%		17.3			0.505	5	
Carbon dioxide	644000	4500	ppmv		628000			2.60	25	
Carbon dioxide	64.4	0.45	Vol%		62.8			2.60	5	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	151000	1800	ppmv		151000			0.337	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	573	90.0	ppmv		571			0.283	25	
Carbon Monoxide	0.06	0.009	Vol%		0.06			0.283	5	
Duplicate (BGD0990-DUP3)				**Source: 23D1116-03**	Prepared & Analyzed: 04/26/2023					
Methane	205000	4500	ppmv		206000			0.674	25	
Methane	20.5	0.45	Vol%		20.6			0.674	5	
Carbon dioxide	610000	4500	ppmv		614000			0.771	25	
Carbon dioxide	61.0	0.45	Vol%		61.4			0.771	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Hydrogen (H2)	146000	1800	ppmv		146000			0.509	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	705	90.0	ppmv		713			1.00	25	
Carbon Monoxide	0.07	0.009	Vol%		0.07			1.00	5	
Duplicate (BGD0990-DUP4)				**Source: 23D1115-01**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	260000	4500	ppmv		260000			0.0171	25	
Methane	26.0	0.45	Vol%		26.0			0.0172	5	
Carbon dioxide	551000	4500	ppmv		554000			0.454	25	
Carbon dioxide	55.1	0.45	Vol%		55.4			0.454	5	
Oxygen (O2)	5130	4500	ppmv		5130			0.0544	25	
Oxygen (O2)	0.51	0.45	Vol%		0.51			0.0544	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	116000	1800	ppmv		116000			0.596	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	

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Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP4)			**Source: 23D1115-01**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Carbon Monoxide	470	90.0	ppmv		463			1.45	25	
Carbon Monoxide	0.05	0.009	Vol%		0.05			1.45	5	
Duplicate (BGD0990-DUP5)			**Source: 23D1115-02**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	52500	4500	ppmv		52700			0.482	25	
Methane	5.25	0.45	Vol%		5.27			0.482	5	
Carbon dioxide	61.8	0.45	Vol%		62.2			0.727	5	
Carbon dioxide	618000	4500	ppmv		622000			0.727	25	
Oxygen (O2)	10400	4500	ppmv		10400			0.0733	25	
Oxygen (O2)	1.04	0.45	Vol%		1.04			0.0732	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Nitrogen (N2)	36400	18000	ppmv		36800			1.06	25	
Hydrogen (H2)	271000	1800	ppmv		274000			0.868	25	
Carbon Monoxide	0.11	0.009	Vol%		0.11			0.236	5	
Carbon Monoxide	1140	90.0	ppmv		1150			0.236	25	
Duplicate (BGD0990-DUP6)			**Source: 23D1119-01**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	412000	4500	ppmv		407000			1.20	25	
Methane	41.2	0.45	Vol%		40.7			1.20	5	
Carbon dioxide	41.2	0.45	Vol%		40.8			1.06	5	
Carbon dioxide	412000	4500	ppmv		408000			1.06	25	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Nitrogen (N2)	48200	18000	ppmv		47900			0.578	25	
Hydrogen (H2)	77200	1800	ppmv		76300			1.21	25	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	

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Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP7)			**Source: 23D1119-02**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	46.6	0.45	Vol%		46.4			0.452	5	
Methane	466000	4500	ppmv		464000			0.452	25	
Carbon dioxide	448000	4500	ppmv		442000			1.15	25	
Carbon dioxide	44.8	0.45	Vol%		44.2			1.15	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	27800	1800	ppmv		27400			1.41	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	2.78	0.18	Vol%		2.74			1.41	5	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Duplicate (BGD0990-DUP8)			**Source: 23D1119-03**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	418000	4500	ppmv		421000			0.729	25	
Methane	41.8	0.45	Vol%		42.1			0.729	5	
Carbon dioxide	419000	4500	ppmv		421000			0.483	25	
Carbon dioxide	41.9	0.45	Vol%		42.1			0.483	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	24100	18000	ppmv		24200			0.561	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	88200	1800	ppmv		88800			0.709	25	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Duplicate (BGD0990-DUP9)			**Source: 23D1119-04**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	451000	4500	ppmv		453000			0.495	25	
Methane	45.1	0.45	Vol%		45.3			0.495	5	
Carbon dioxide	45.0	0.45	Vol%		45.2			0.287	5	
Carbon dioxide	450000	4500	ppmv		452000			0.287	25	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Hydrogen (H2)	50300	1800	ppmv		50000			0.431	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result		Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air											
Duplicate (BGD0990-DUP9)				**Source: 23D1119-04**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Nitrogen (N2)		<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide		<	0.009	Vol%		<0.009			NA	5	
Carbon Monoxide		<	90.0	ppmv		<90.0			NA	25	
Duplicate (BGD0990-DUPA)				**Source: 23D1119-05**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	350000		4500	ppmv		351000			0.260	25	
Methane	35.0		0.45	Vol%		35.1			0.260	5	
Carbon dioxide	585000		4500	ppmv		586000			0.274	25	
Carbon dioxide	58.5		0.45	Vol%		58.6			0.274	5	
Oxygen (O2)		<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)		<	4500	ppmv		<4500			NA	25	
Hydrogen (H2)	5090		1800	ppmv		5120			0.636	25	
Nitrogen (N2)		<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	0.51		0.18	Vol%		0.51			0.636	5	
Nitrogen (N2)		<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide		<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide		<	0.009	Vol%		<0.009			NA	5	

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		
EPA TO-15 in Air			
Benzene	VELAP		

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Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

Qualifiers and Definitions

L	LCS recovery is outside of established acceptance limits
P	Duplicate analysis does not meet the acceptance criteria for precision
S	Surrogate recovery was outside acceptance criteria
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
PF	Preparation Factor
MDL	Method Detection Limit
LOQ	Limit of Quantitation
ppbv	parts per billion by volume
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside ± 10% of the absolute.

ENTHALPY ANALYTICAL
formerly Air, Water & Soil Laboratories

1941 REYMET ROAD
RICHMOND, VIRGINIA 23237
(804) 358-8295 PHONE
(804)358-8297 FAX

AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/18/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: Bristol
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

PWS I.D. #:

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other LV

063-23D-0005

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	86			292	1.4	230408-01	30	5.6	4/19/23	10:37	30	187.1	4/19/23	10:40	10	187.1	LG	x	x	x
2)	84			296	1.4	230408-01	30	5.2	4/19/23	10:49	30	197	4/19/23	10:52	10	197.1	LG	x	x	x
3)	NOT SAMPLED			13953	1.4	230408-01	30										LG	x	x	x
4)																				

RELINQUISHED:		RECEIVED: DATE / TIME	QC Data Package
RELINQUISHED: DATE / TIME 4/19 4:00PM		RECEIVED: FedEx G DATE / TIME	Level I ☐
RELINQUISHED: FedEx G DATE / TIME		RECEIVED: DATE / TIME 4/20/23 15:53	Level II ☒
			Level III ☐
			Level IV ☐

LAB USE ONLY

SCS Field Services 23D1115
Bristol

Recd: 04/20/2023 Due: 04/27/2023

v130325002

310
19.6°C
Ice
No Seal

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1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Sample Conditions Checklist

Samples Received at:	**19.60°C**
How were samples received?	FedEx Ground
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Work Order Comments

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

Final Report

Laboratory Order ID 23D1116

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 20, 2023 15:53
	4330 Lewis Road, Suite 1	Date Issued:	April 28, 2023 17:43
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485
Client Site I.D.:	Bristol		

Enclosed are the results of analyses for samples received by the laboratory on 04/20/2023 15:53. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

TNI Accredited
VELAP ID 460021

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	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
37	23D1116-01	Air	04/19/2023 10:07	04/20/2023 15:53
61	23D1116-02	Air	04/19/2023 10:17	04/20/2023 15:53
90	23D1116-03	Air	04/19/2023 10:32	04/20/2023 15:53

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 37

Sample ID: 23D1116-01

Sample Matrix: Air

Sampled: 4/19/2023 10:07

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00276::13384

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	165	90.0	90.0		9	1	4/26/23 15:52	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	9.56	0.45	0.45		9	1	4/26/23 15:52	MER
Carbon dioxide, as received	24.0	0.45	0.45		9	1	4/26/23 15:52	MER
Oxygen (O2), as received	7.52	0.45	0.45		9	1	4/26/23 15:52	MER
Hydrogen (H2), as received	2.41	0.18	0.18		9	1	4/26/23 15:52	MER
Nitrogen (N2), as received	47.3	18.0	18.0		18	1	4/26/23 18:21	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	4/26/23 15:52	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	75000	1560	3890		240000	5000	12000	7780	1	4/28/23 10:34	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	119	80-120	4/28/23 10:34

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 61

Sample ID: 23D1116-02

Sample Matrix: Air

Sampled: 4/19/2023 10:17

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00380::13961

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	571	90.0	90.0		9	1	4/26/23 16:39	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	17.3	0.45	0.45		9	1	4/26/23 16:39	MER
Carbon dioxide, as received	62.8	0.45	0.45		9	1	4/26/23 16:39	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	4/26/23 16:39	MER
Hydrogen (H2), as received	14.9	1.08	1.08		54	1	4/26/23 18:37	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/26/23 16:39	MER
Carbon Monoxide, as received	0.06	0.009	0.009		9	1	4/26/23 16:39	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	195000	3110	7780		620000	9900	25000	15600	1	4/28/23 11:17	DFH

Surrogate(s)	% Recovery			% Recovery Limits		
4-Bromofluorobenzene (Surr)	123	*	S	80-120		4/28/23 11:17

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Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 90

Sample ID: 23D1116-03

Sample Matrix: Air

Sampled: 4/19/2023 10:32

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00354::13966

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.8

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	713	90.0	90.0		9	1	4/26/23 17:30	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	20.6	0.45	0.45		9	1	4/26/23 17:30	MER
Carbon dioxide, as received	61.4	0.45	0.45		9	1	4/26/23 17:30	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	4/26/23 17:30	MER
Hydrogen (H2), as received	14.2	1.08	1.08		54	1	4/26/23 18:52	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	4/26/23 17:30	MER
Carbon Monoxide, as received	0.07	0.009	0.009		9	1	4/26/23 17:30	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	471000	9330	23300		1500000	30000	75000	46700	1	4/28/23 11:59	DFH

Surrogate(s)	% Recovery			% Recovery Limits		
4-Bromofluorobenzene (Surr)	125	*	S	80-120		4/28/23 11:59

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Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			**Preparation Method:**	**No Prep VOC GC Air**	
23D1116-01	1.00 mL / 1.00 mL	ALT-145	BGD0990	SGD1005	AG00026
23D1116-02	1.00 mL / 1.00 mL	ALT-145	BGD0990	SGD1005	AG00026
23D1116-03	1.00 mL / 1.00 mL	ALT-145	BGD0990	SGD1005	AG00026
23D1116-01	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026
23D1116-01RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026
23D1116-02	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026
23D1116-02RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026
23D1116-03	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026
23D1116-03RE1	1.00 mL / 1.00 mL	EPA 3C	BGD0990	SGD1005	AG00026

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**No Prep VOC Air**	
23D1116-01	400 mL / 400 mL	EPA TO-15	BGD0935	SGD1010	AC30133
23D1116-02	400 mL / 400 mL	EPA TO-15	BGD0935	SGD1010	AC30133
23D1116-03	400 mL / 400 mL	EPA TO-15	BGD0935	SGD1010	AC30133

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
Blank (BGD0935-BLK1)				Prepared & Analyzed: 04/26/2023						
Benzene	<	0.50	ppbv							
Surr: 4-Bromofluorobenzene (Surr)	*4.38*		ppbv	*5.00*		*87.6*	*80-120*			
LCS (BGD0935-BS1)				Prepared & Analyzed: 04/26/2023						
1,1,1-Trichloroethane	5.29	0.5	ppbv	5.00		106	70-130			
1,1,2,2-Tetrachloroethane	5.81	0.5	ppbv	5.00		116	70-130			
1,1,2-Trichloro-1,2,2-trifluoroethane	4.91	0.5	ppbv	5.00		98.2	70-130			
1,1,2-Trichloroethane	5.47	0.5	ppbv	5.00		109	70-130			
1,1-Dichloroethane	4.89	0.5	ppbv	5.00		97.8	70-130			
1,1-Dichloroethylene	4.90	0.5	ppbv	5.00		98.0	70-130			
1,2,4-Trimethylbenzene	5.61	0.5	ppbv	5.00		112	70-130			
1,2-Dibromoethane (EDB)	5.59	0.5	ppbv	5.00		112	70-130			
1,2-Dichlorobenzene	5.88	0.5	ppbv	5.00		118	70-130			
1,2-Dichloroethane	5.22	0.5	ppbv	5.00		104	70-130			
1,2-Dichloropropane	5.32	0.5	ppbv	5.00		106	70-130			
1,2-Dichlorotetrafluoroethane	6.04	0.5	ppbv	5.00		121	70-130			
1,3,5-Trimethylbenzene	5.58	0.5	ppbv	5.00		112	70-130			
1,3-Butadiene	5.55	0.5	ppbv	5.00		111	70-130			
1,3-Dichlorobenzene	5.85	0.5	ppbv	5.00		117	70-130			
1,4-Dichlorobenzene	5.76	0.5	ppbv	5.00		115	70-130			
1,4-Dioxane	5.95	0.5	ppbv	5.00		119	70-130			
2-Butanone (MEK)	4.80	0.5	ppbv	5.00		96.0	70-130			
4-Methyl-2-pentanone (MIBK)	5.49	0.5	ppbv	5.00		110	70-130			
Allyl chloride	4.68	0.5	ppbv	5.00		93.6	70-130			
Benzene	5.36	0.5	ppbv	5.00		107	70-130			
Benzyl Chloride	5.14	0.5	ppbv	5.00		103	70-130			
Bromodichloromethane	4.90	0.5	ppbv	5.00		98.0	70-130			
Bromoform	0.69	0.5	ppbv	5.00		13.8	70-130			L
Bromomethane	6.64	0.5	ppbv	5.00		133	70-130			L
Carbon Disulfide	4.92	0.5	ppbv	5.00		98.4	70-130			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS (BGD0935-BS1)				Prepared & Analyzed: 04/26/2023						
Carbon Tetrachloride	5.25	0.5	ppbv	5.00		105	70-130			
Chlorobenzene	5.56	0.5	ppbv	5.00		111	70-130			
Chloroethane	6.14	0.5	ppbv	5.00		123	70-130			
Chloroform	4.99	0.5	ppbv	5.00		99.8	70-130			
Chloromethane	5.44	0.5	ppbv	5.00		109	70-130			
cis-1,2-Dichloroethylene	5.02	0.5	ppbv	5.00		100	70-130			
cis-1,3-Dichloropropene	5.38	0.5	ppbv	5.00		108	70-130			
Cyclohexane	5.29	0.5	ppbv	5.00		106	70-130			
Dichlorodifluoromethane	5.05	0.5	ppbv	5.00		101	70-130			
Ethyl acetate	5.05	0.5	ppbv	5.00		101	70-130			
Ethylbenzene	5.58	0.5	ppbv	5.00		112	70-130			
Heptane	5.12	0.5	ppbv	5.00		102	70-130			
Hexane	5.10	0.5	ppbv	5.00		102	70-130			
m+p-Xylenes	11.2	1	ppbv	10.0		112	70-130			
Methylene chloride	5.28	1	ppbv	5.00		106	70-130			
Methyl-t-butyl ether (MTBE)	4.86	0.5	ppbv	5.00		97.2	70-130			
Naphthalene	4.36	0.5	ppbv	5.00		87.2	60-140			
o-Xylene	5.56	0.5	ppbv	5.00		111	70-130			
Propylene	5.20	1	ppbv	5.00		104	70-130			
Styrene	5.51	0.5	ppbv	5.00		110	70-130			
Tetrachloroethylene (PCE)	5.46	0.5	ppbv	5.00		109	70-130			
Tetrahydrofuran	5.32	0.5	ppbv	5.00		106	70-130			
Toluene	5.42	0.5	ppbv	5.00		108	70-130			
trans-1,2-Dichloroethylene	4.95	0.5	ppbv	5.00		99.0	70-130			
trans-1,3-Dichloropropene	5.50	0.5	ppbv	5.00		110	70-130			
Trichloroethylene	5.40	0.5	ppbv	5.00		108	70-130			
Trichlorofluoromethane	4.91	0.5	ppbv	5.00		98.2	70-130			
Vinyl acetate	4.83	0.5	ppbv	5.00		96.6	70-130			
Vinyl bromide	6.35	0.5	ppbv	5.00		127	70-130			
Vinyl chloride	5.97	0.5	ppbv	5.00		119	70-130			
Surr: 4-Bromofluorobenzene (Surr)	*4.62*		ppbv	*5.00*		*92.4*	*70-130*			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS Dup (BGD0935-BSD1)					Prepared & Analyzed: 04/26/2023					
1,1,1-Trichloroethane	5.16	0.5	ppbv	5.00		103	70-130	2.49	25	
1,1,2,2-Tetrachloroethane	5.69	0.5	ppbv	5.00		114	70-130	2.09	25	
1,1,2-Trichloro-1,2,2-trifluoroethane	4.83	0.5	ppbv	5.00		96.6	70-130	1.64	25	
1,1,2-Trichloroethane	5.32	0.5	ppbv	5.00		106	70-130	2.78	25	
1,1-Dichloroethane	4.81	0.5	ppbv	5.00		96.2	70-130	1.65	25	
1,1-Dichloroethylene	4.87	0.5	ppbv	5.00		97.4	70-130	0.614	25	
1,2,4-Trimethylbenzene	5.54	0.5	ppbv	5.00		111	70-130	1.26	25	
1,2-Dibromoethane (EDB)	5.52	0.5	ppbv	5.00		110	70-130	1.26	25	
1,2-Dichlorobenzene	5.81	0.5	ppbv	5.00		116	70-130	1.20	25	
1,2-Dichloroethane	5.09	0.5	ppbv	5.00		102	70-130	2.52	25	
1,2-Dichloropropane	5.21	0.5	ppbv	5.00		104	70-130	2.09	25	
1,2-Dichlorotetrafluoroethane	5.79	0.5	ppbv	5.00		116	70-130	4.23	25	
1,3,5-Trimethylbenzene	5.53	0.5	ppbv	5.00		111	70-130	0.900	25	
1,3-Butadiene	4.28	0.5	ppbv	5.00		85.6	70-130	25.8	25	P
1,3-Dichlorobenzene	5.72	0.5	ppbv	5.00		114	70-130	2.25	25	
1,4-Dichlorobenzene	5.69	0.5	ppbv	5.00		114	70-130	1.22	25	
1,4-Dioxane	5.75	0.5	ppbv	5.00		115	70-130	3.42	25	
2-Butanone (MEK)	4.72	0.5	ppbv	5.00		94.4	70-130	1.68	25	
4-Methyl-2-pentanone (MIBK)	5.37	0.5	ppbv	5.00		107	70-130	2.21	25	
Allyl chloride	4.61	0.5	ppbv	5.00		92.2	70-130	1.51	25	
Benzene	5.18	0.5	ppbv	5.00		104	70-130	3.42	25	
Benzyl Chloride	5.11	0.5	ppbv	5.00		102	70-130	0.585	25	
Bromodichloromethane	4.77	0.5	ppbv	5.00		95.4	70-130	2.69	25	
Bromoform	0.67	0.5	ppbv	5.00		13.4	70-130	2.94	25	L
Bromomethane	6.31	0.5	ppbv	5.00		126	70-130	5.10	25	
Carbon Disulfide	4.83	0.5	ppbv	5.00		96.6	70-130	1.85	25	
Carbon Tetrachloride	5.06	0.5	ppbv	5.00		101	70-130	3.69	25	
Chlorobenzene	5.47	0.5	ppbv	5.00		109	70-130	1.63	25	
Chloroethane	5.85	0.5	ppbv	5.00		117	70-130	4.84	25	
Chloroform	4.92	0.5	ppbv	5.00		98.4	70-130	1.41	25	
Chloromethane	5.44	0.5	ppbv	5.00		109	70-130	0.00	25	
cis-1,2-Dichloroethylene	4.93	0.5	ppbv	5.00		98.6	70-130	1.81	25	
cis-1,3-Dichloropropene	5.28	0.5	ppbv	5.00		106	70-130	1.88	25	

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Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:43
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0935 - No Prep VOC Air										
LCS Dup (BGD0935-BSD1)					Prepared & Analyzed: 04/26/2023					
Cyclohexane	5.16	0.5	ppbv	5.00		103	70-130	2.49	25	
Dichlorodifluoromethane	4.95	0.5	ppbv	5.00		99.0	70-130	2.00	25	
Ethyl acetate	5.20	0.5	ppbv	5.00		104	70-130	2.93	25	
Ethylbenzene	5.46	0.5	ppbv	5.00		109	70-130	2.17	25	
Heptane	5.01	0.5	ppbv	5.00		100	70-130	2.17	25	
Hexane	5.07	0.5	ppbv	5.00		101	70-130	0.590	25	
m+p-Xylenes	11.0	1	ppbv	10.0		110	70-130	1.26	25	
Methylene chloride	5.22	1	ppbv	5.00		104	70-130	1.14	25	
Methyl-t-butyl ether (MTBE)	4.83	0.5	ppbv	5.00		96.6	70-130	0.619	25	
Naphthalene	4.32	0.5	ppbv	5.00		86.4	60-140	0.922	25	
o-Xylene	5.43	0.5	ppbv	5.00		109	70-130	2.37	25	
Propylene	5.10	1	ppbv	5.00		102	70-130	1.94	25	
Styrene	5.42	0.5	ppbv	5.00		108	70-130	1.65	25	
Tetrachloroethylene (PCE)	5.37	0.5	ppbv	5.00		107	70-130	1.66	25	
Tetrahydrofuran	5.11	0.5	ppbv	5.00		102	70-130	4.03	25	
Toluene	5.21	0.5	ppbv	5.00		104	70-130	3.95	25	
trans-1,2-Dichloroethylene	4.89	0.5	ppbv	5.00		97.8	70-130	1.22	25	
trans-1,3-Dichloropropene	5.36	0.5	ppbv	5.00		107	70-130	2.58	25	
Trichloroethylene	5.20	0.5	ppbv	5.00		104	70-130	3.77	25	
Trichlorofluoromethane	4.81	0.5	ppbv	5.00		96.2	70-130	2.06	25	
Vinyl acetate	4.84	0.5	ppbv	5.00		96.8	70-130	0.207	25	
Vinyl bromide	6.17	0.5	ppbv	5.00		123	70-130	2.88	25	
Vinyl chloride	5.72	0.5	ppbv	5.00		114	70-130	4.28	25	
Surr: 4-Bromofluorobenzene (Surr)	*4.67*		ppbv	*5.00*		*93.4*	*70-130*			

ENTHALPY ANALYTICAL

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Certificate of Analysis

Final Report

Laboratory Order ID 23D1116

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:43
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Blank (BGD0990-BLK1)						Prepared & Analyzed: 04/26/2023				
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	0.001	Vol%							
Carbon Monoxide	<	10.0	ppmv							
LCS (BGD0990-BS1)						Prepared & Analyzed: 04/26/2023				
Methane	4350	500	ppmv	5000		87.0	0-200			
Methane	4350	0.05	ppmv	5000		87.0	80-120			
Carbon dioxide	4440	500	ppmv	5000		88.7	0-200			
Carbon dioxide	4440	0.05	ppmv	5000		88.7	80-120			
Oxygen (O2)	5150	500	ppmv	5000		103	0-200			
Oxygen (O2)	5150	0.05	ppmv	5000		103	80-120			
Nitrogen (N2)	5410	2000	ppmv	5000		108	0-200			
Hydrogen (H2)	5830	200	ppmv	5100		114	0-200			
Nitrogen (N2)	5410	1	ppmv	5000		108	80-120			
Hydrogen (H2)	5830	0.02	ppmv	5100		114	80-120			
Carbon Monoxide	4900	10	ppmv	5000		98.1	0-200			
Carbon Monoxide	4900	0.001	ppmv	5000		98.1	80-120			
Duplicate (BGD0990-DUP1)					**Source: 23D1116-01**	Prepared & Analyzed: 04/26/2023				
Methane	9.59	0.45	Vol%		9.56			0.285	5	
Methane	95900	4500	ppmv		95600			0.285	25	
Carbon dioxide	23.7	0.45	Vol%		24.0			1.28	5	
Carbon dioxide	237000	4500	ppmv		240000			1.28	25	
Oxygen (O2)	7.52	0.45	Vol%		7.52			0.0206	5	
Oxygen (O2)	75200	4500	ppmv		75200			0.0206	25	
Hydrogen (H2)	2.42	0.18	Vol%		2.41			0.0805	5	
Hydrogen (H2)	24200	1800	ppmv		24100			0.0805	25	
Nitrogen (N2)	484000	18000	ppmv		487000			0.532	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			1.43	5	
Carbon Monoxide	163	90.0	ppmv		165			1.43	25	

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Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP2)				**Source: 23D1116-02**	Prepared & Analyzed: 04/26/2023					
Methane	174000	4500	ppmv		173000			0.505	25	
Methane	17.4	0.45	Vol%		17.3			0.505	5	
Carbon dioxide	644000	4500	ppmv		628000			2.60	25	
Carbon dioxide	64.4	0.45	Vol%		62.8			2.60	5	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	151000	1800	ppmv		151000			0.337	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	573	90.0	ppmv		571			0.283	25	
Carbon Monoxide	0.06	0.009	Vol%		0.06			0.283	5	
Duplicate (BGD0990-DUP3)				**Source: 23D1116-03**	Prepared & Analyzed: 04/26/2023					
Methane	205000	4500	ppmv		206000			0.674	25	
Methane	20.5	0.45	Vol%		20.6			0.674	5	
Carbon dioxide	610000	4500	ppmv		614000			0.771	25	
Carbon dioxide	61.0	0.45	Vol%		61.4			0.771	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Hydrogen (H2)	146000	1800	ppmv		146000			0.509	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	705	90.0	ppmv		713			1.00	25	
Carbon Monoxide	0.07	0.009	Vol%		0.07			1.00	5	
Duplicate (BGD0990-DUP4)				**Source: 23D1115-01**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	260000	4500	ppmv		260000			0.0171	25	
Methane	26.0	0.45	Vol%		26.0			0.0172	5	
Carbon dioxide	551000	4500	ppmv		554000			0.454	25	
Carbon dioxide	55.1	0.45	Vol%		55.4			0.454	5	
Oxygen (O2)	5130	4500	ppmv		5130			0.0544	25	
Oxygen (O2)	0.51	0.45	Vol%		0.51			0.0544	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	116000	1800	ppmv		116000			0.596	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	

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Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP4)				**Source: 23D1115-01**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Carbon Monoxide	470	90.0	ppmv		463			1.45	25	
Carbon Monoxide	0.05	0.009	Vol%		0.05			1.45	5	
Duplicate (BGD0990-DUP5)				**Source: 23D1115-02**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	52500	4500	ppmv		52700			0.482	25	
Methane	5.25	0.45	Vol%		5.27			0.482	5	
Carbon dioxide	61.8	0.45	Vol%		62.2			0.727	5	
Carbon dioxide	618000	4500	ppmv		622000			0.727	25	
Oxygen (O2)	10400	4500	ppmv		10400			0.0733	25	
Oxygen (O2)	1.04	0.45	Vol%		1.04			0.0732	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Nitrogen (N2)	36400	18000	ppmv		36800			1.06	25	
Hydrogen (H2)	271000	1800	ppmv		274000			0.868	25	
Carbon Monoxide	0.11	0.009	Vol%		0.11			0.236	5	
Carbon Monoxide	1140	90.0	ppmv		1150			0.236	25	
Duplicate (BGD0990-DUP6)				**Source: 23D1119-01**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	412000	4500	ppmv		407000			1.20	25	
Methane	41.2	0.45	Vol%		40.7			1.20	5	
Carbon dioxide	41.2	0.45	Vol%		40.8			1.06	5	
Carbon dioxide	412000	4500	ppmv		408000			1.06	25	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Nitrogen (N2)	48200	18000	ppmv		47900			0.578	25	
Hydrogen (H2)	77200	1800	ppmv		76300			1.21	25	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	

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Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP7)			**Source: 23D1119-02**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	46.6	0.45	Vol%		46.4			0.452	5	
Methane	466000	4500	ppmv		464000			0.452	25	
Carbon dioxide	448000	4500	ppmv		442000			1.15	25	
Carbon dioxide	44.8	0.45	Vol%		44.2			1.15	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	27800	1800	ppmv		27400			1.41	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	2.78	0.18	Vol%		2.74			1.41	5	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Duplicate (BGD0990-DUP8)			**Source: 23D1119-03**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	418000	4500	ppmv		421000			0.729	25	
Methane	41.8	0.45	Vol%		42.1			0.729	5	
Carbon dioxide	419000	4500	ppmv		421000			0.483	25	
Carbon dioxide	41.9	0.45	Vol%		42.1			0.483	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	24100	18000	ppmv		24200			0.561	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	88200	1800	ppmv		88800			0.709	25	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Duplicate (BGD0990-DUP9)			**Source: 23D1119-04**		Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	451000	4500	ppmv		453000			0.495	25	
Methane	45.1	0.45	Vol%		45.3			0.495	5	
Carbon dioxide	45.0	0.45	Vol%		45.2			0.287	5	
Carbon dioxide	450000	4500	ppmv		452000			0.287	25	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Hydrogen (H2)	50300	1800	ppmv		50000			0.431	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	

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Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0990 - No Prep VOC GC Air										
Duplicate (BGD0990-DUP9)				**Source: 23D1119-04**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Duplicate (BGD0990-DUPA)				**Source: 23D1119-05**	Prepared: 04/26/2023 Analyzed: 04/27/2023					
Methane	350000	4500	ppmv		351000			0.260	25	
Methane	35.0	0.45	Vol%		35.1			0.260	5	
Carbon dioxide	585000	4500	ppmv		586000			0.274	25	
Carbon dioxide	58.5	0.45	Vol%		58.6			0.274	5	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Hydrogen (H2)	5090	1800	ppmv		5120			0.636	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Hydrogen (H2)	0.51	0.18	Vol%		0.51			0.636	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		
EPA TO-15 in Air			
Benzene	VELAP		

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Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

Qualifiers and Definitions

L	LCS recovery is outside of established acceptance limits
P	Duplicate analysis does not meet the acceptance criteria for precision
S	Surrogate recovery was outside acceptance criteria
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
PF	Preparation Factor
MDL	Method Detection Limit
LOQ	Limit of Quantitation
ppbv	parts per billion by volume
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside ± 10% of the absolute.

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formerly Air, Water & Soil Laboratories

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RICHMOND, VIRGINIA 23237
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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/9/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: Bristol
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

PWS I.D. #:

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other LV

063-23C-0037

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	NOT RECEIVED			10094	1.4	230328-01	30										LG	x	x	x
2)				12853	1.4	230328-01	30										LG	x	x	x
3)				13369	1.4	230328-01	30										LG	x	x	x
4)	37			13384	1.4	230328-01	30	4.2	4/19/23	10:02	30	149	4/19/23	10:07	10	149	LG	x	x	x

RELINQUISHED:	RECEIVED: DATE / TIME	QC Data Package: Level I ☐
RELINQUISHED: DATE / TIME 4/19 4:00pm	RECEIVED: DATE / TIME Fedex G	Level II ☐
RELINQUISHED: Fedex G DATE / TIME	RECEIVED: DATE / TIME 4/20/23 1553	Level III ☐ Level IV ☐

LAB USE ONLY

310 19.6°C
No ice
No seal

SCS Field Services 23D1116
Bristol

Recd: 04/20/2023 Due: 04/27/2023

v130325002

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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/9/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME:
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER:
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

PWS I.D. #:

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other LV

063-23C-0037

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	61			13961	1.4	230328-01	30	4.2	4/19/23	10:13	30	155	4/19/23	10:17	10	155	LG	x	x	x
2)	[redacted]90			13966	1.4	230328-01	30	4.8	4/19/23	10:28	30	180.9	4/19/23	10:32	10	181.2	LG	x	x	x
3)																				
4)																				

RELINQUISHED:	DATE / TIME	RECEIVED: DATE / TIME	QC Data Package
RELINQUISHED:	DATE / TIME 4/19 4:00 pm	RECEIVED: FedEx G DATE / TIME	Level I ☐
RELINQUISHED: FedEx G	DATE / TIME	RECEIVED: DATE / TIME 4/20/23 1553	Level II ☐
			Level III ☐
			Level IV ☐

LAB USE ONLY

SCS Field Services **23D1116**
Bristol

Recd: 04/20/2023 **Due: 04/27/2023**

v130325002

310
19.6°C
No ice
No seal

ENTHALPY ANALYTICAL

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Certificate of Analysis

Final Report

Laboratory Order ID 23D1116

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 20, 2023 15:53 April 28, 2023 17:43
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Sample Conditions Checklist

Samples Received at:	**19.60°C**
How were samples received?	FedEx Ground
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	Yes

Work Order Comments

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Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 28, 2023 9:52
	4330 Lewis Road, Suite 1	Date Issued:	May 4, 2023 16:19
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

Enclosed are the results of analyses for samples received by the laboratory on 04/28/2023 09:52. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

Ted Soyars

Technical Director

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

TNI Accredited
VELAP ID 460021

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA	Date Received:	April 28, 2023 9:52
	4330 Lewis Road, Suite 1	Date Issued:	May 4, 2023 16:19
	Harrisburg, PA 17111	Project Number:	07223016.00
Submitted To:	Tom Lock	Purchase Order:	07-SO04485

Client Site I.D.: Bristol

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
84	23E0004-01	Air	04/27/2023 09:08	04/28/2023 09:52
86	23E0004-02	Air	04/27/2023 09:28	04/28/2023 09:52
37	23E0004-03	Air	04/27/2023 10:52	04/28/2023 09:52
100	23E0004-04	Air	04/27/2023 09:56	04/28/2023 09:52
90	23E0004-05	Air	04/27/2023 09:40	04/28/2023 09:52

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 84

Sample ID: 23E0004-01

Sample Matrix: Air

Sampled: 4/27/2023 09:08

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00224::12854

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.0

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	650	90.0	90.0		9	1	5/2/23 13:47	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	15.3	0.45	0.45		9	1	5/2/23 13:47	MER
Carbon dioxide, as received	55.9	0.45	0.45		9	1	5/2/23 13:47	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	5/2/23 13:47	MER
Hydrogen (H2), as received	15.1	1.08	1.08		54	1	5/2/23 17:00	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	5/2/23 13:47	MER
Carbon Monoxide, as received	0.07	0.009	0.009		9	1	5/2/23 13:47	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	429000	9330	23300		1400000	30000	75000	46700	1	5/3/23 10:03	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	85.2	80-120	5/3/23 10:03

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 86

Sample ID: 23E0004-02

Sample Matrix: Air

Sampled: 4/27/2023 09:28

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00369::13962

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 6.2

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	277	90.0	90.0		9	1	5/2/23 14:40	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	34.4	0.45	0.45		9	1	5/2/23 14:40	MER
Carbon dioxide, as received	44.2	0.45	0.45		9	1	5/2/23 14:40	MER
Oxygen (O2), as received	1.66	0.45	0.45		9	1	5/2/23 14:40	MER
Hydrogen (H2), as received	6.23	0.36	0.36		18	1	5/2/23 17:15	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	5/2/23 14:40	MER
Carbon Monoxide, as received	0.03	0.009	0.009		9	1	5/2/23 14:40	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	231000	4670	11700		740000	15000	37000	23300	1	5/3/23 13:48	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	86.2	80-120	5/3/23 13:48

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 37

Sample ID: 23E0004-03

Sample Matrix: Air

Sampled: 4/27/2023 10:52

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00051::12415

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 4.0

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	153	90.0	90.0		9	1	5/2/23 15:32	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	9.59	0.45	0.45		9	1	5/2/23 15:32	MER
Carbon dioxide, as received	24.2	0.45	0.45		9	1	5/2/23 15:32	MER
Oxygen (O2), as received	7.04	0.45	0.45		9	1	5/2/23 15:32	MER
Hydrogen (H2), as received	2.71	0.18	0.18		9	1	5/2/23 15:32	MER
Nitrogen (N2), as received	47.2	18.0	18.0		18	1	5/2/23 17:31	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	5/2/23 15:32	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	88600	1560	3890		280000	5000	12000	7780	1	5/3/23 12:19	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	81.6	80-120	5/3/23 12:19

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 100

Sample ID: 23E0004-04

Sample Matrix: Air

Sampled: 4/27/2023 09:56

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00070::12467

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 3.6

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	ND	90.0	90.0		9	1	5/2/23 16:23	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	40.1	0.45	0.45		9	1	5/2/23 16:23	MER
Carbon dioxide, as received	44.4	0.45	0.45		9	1	5/2/23 16:23	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	5/2/23 16:23	MER
Hydrogen (H2), as received	4.79	0.36	0.36		18	1	5/2/23 17:47	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	5/2/23 16:23	MER
Carbon Monoxide, as received	ND	0.009	0.009		9	1	5/2/23 16:23	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	41100	583	1460		130000	1900	4700	2920	1	5/3/23 15:19	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	89.6	80-120	5/3/23 15:19

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

ANALYTICAL RESULTS

Project Location:

Field Sample #: 90

Sample ID: 23E0004-05

Sample Matrix: Air

Sampled: 4/27/2023 09:40

Sample Type: LV

Sample Description/Location:

Sub Description/Location:

Canister ID: 063-00005::12664

Canister Size: 1.4L

Initial Vacuum(in Hg): 30

Final Vacuum(in Hg): 3.8

Receipt Vacuum(in Hg):

Flow Controller Type: Passive

Flow Controller ID:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
ALT-145

Analyte	ppmv Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Carbon Monoxide, as received	171	90.0	90.0		9	1	5/3/23 10:17	MER

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis
EPA 3C

Analyte	Vol% Result	MDL	LOQ	Flag/Qual	Dilution	PF	Date/Time Analyzed	Analyst
Methane, as received	36.8	0.45	0.45		9	1	5/3/23 10:17	MER
Carbon dioxide, as received	50.4	0.45	0.45		9	1	5/3/23 10:17	MER
Oxygen (O2), as received	ND	0.45	0.45		9	1	5/3/23 10:17	MER
Hydrogen (H2), as received	3.59	0.18	0.18		9	1	5/3/23 10:17	MER
Nitrogen (N2), as received	ND	9.00	9.00		9	1	5/3/23 10:17	MER
Carbon Monoxide, as received	0.02	0.009	0.009		9	1	5/3/23 10:17	MER

Volatile Organic Compounds by GCMS
EPA TO-15

Analyte	ppbv Results	MDL	LOQ	Flag/Qual	ug/M³ Results	MDL	LOQ	Dilution	PF	Date/Time Analyzed	Analyst
Benzene	250000	10500	26200		800000	34000	84000	52500	1	5/3/23 14:32	DFH

Surrogate(s)	% Recovery	% Recovery Limits	
4-Bromofluorobenzene (Surr)	82.8	80-120	5/3/23 14:32

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Certificate of Analysis

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			**Preparation Method:**	**No Prep VOC GC Air**	
23E0004-01	1.00 mL / 1.00 mL	ALT-145	BGE0110	SGE0105	AG00026
23E0004-02	1.00 mL / 1.00 mL	ALT-145	BGE0110	SGE0105	AG00026
23E0004-03	1.00 mL / 1.00 mL	ALT-145	BGE0110	SGE0105	AG00026
23E0004-04	1.00 mL / 1.00 mL	ALT-145	BGE0110	SGE0105	AG00026
23E0004-05	1.00 mL / 1.00 mL	ALT-145	BGE0110	SGE0123	AG00026
23E0004-01	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-01RE1	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-02	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-02RE1	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-03	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-03RE1	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-04	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-04RE1	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0105	AG00026
23E0004-05	1.00 mL / 1.00 mL	EPA 3C	BGE0110	SGE0123	AG00026

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**No Prep VOC Air**	
23E0004-01	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195
23E0004-02	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195
23E0004-03	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195
23E0004-04	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195
23E0004-04RE1	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195
23E0004-05	400 mL / 400 mL	EPA TO-15	BGE0119	SGE0113	AC30195

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGE0119 - No Prep VOC Air										
Blank (BGE0119-BLK1)					Prepared & Analyzed: 05/02/2023					
Benzene	<	0.50	ppbv							
Surr: 4-Bromofluorobenzene (Surr)	*4.04*		ppbv	*5.00*		*80.8*	*80-120*			
LCS (BGE0119-BS1)					Prepared & Analyzed: 05/02/2023					
Benzene	5.51	0.5	ppbv	5.00		110	70-130			
Surr: 4-Bromofluorobenzene (Surr)	*4.32*		ppbv	*5.00*		*86.4*	*70-130*			
LCS Dup (BGE0119-BSD1)					Prepared & Analyzed: 05/02/2023					
Benzene	5.55	0.5	ppbv	5.00		111	70-130	0.723	25	
Surr: 4-Bromofluorobenzene (Surr)	*4.32*		ppbv	*5.00*		*86.4*	*70-130*			

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Final Report

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Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGE0110 - No Prep VOC GC Air										
Blank (BGE0110-BLK1)							Prepared & Analyzed: 05/02/2023			
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	0.001	Vol%							
Carbon Monoxide	<	10.0	ppmv							
LCS (BGE0110-BS1)							Prepared & Analyzed: 05/02/2023			
Methane	4230	500	ppmv	5000		84.7	0-200			
Methane	4230	0.05	ppmv	5000		84.7	80-120			
Carbon dioxide	5480	500	ppmv	5000		110	0-200			
Carbon dioxide	5480	0.05	ppmv	5000		110	80-120			
Oxygen (O2)	5060	500	ppmv	5000		101	0-200			
Oxygen (O2)	5060	0.05	ppmv	5000		101	80-120			
Nitrogen (N2)	5330	2000	ppmv	5000		107	0-200			
Nitrogen (N2)	5330	1	ppmv	5000		107	80-120			
Hydrogen (H2)	5690	0.02	ppmv	5100		112	80-120			
Hydrogen (H2)	5690	200	ppmv	5100		112	0-200			
Carbon Monoxide	4820	10	ppmv	5000		96.5	0-200			
Carbon Monoxide	4820	0.001	ppmv	5000		96.5	80-120			
Duplicate (BGE0110-DUP1)					**Source: 23E0004-01**		Prepared & Analyzed: 05/02/2023			
Methane	154000	4500	ppmv		153000			0.514	25	
Methane	15.4	0.45	Vol%		15.3			0.514	5	
Carbon dioxide	563000	4500	ppmv		559000			0.710	25	
Carbon dioxide	56.3	0.45	Vol%		55.9			0.710	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Hydrogen (H2)	161000	1800	ppmv		159000			1.08	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Nitrogen (N2)	70500	18000	ppmv		70100			0.539	25	
Carbon Monoxide	659	90.0	ppmv		650			1.28	25	
Carbon Monoxide	0.07	0.009	Vol%		0.07			1.28	5	

ENTHALPY ANALYTICAL

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGE0110 - No Prep VOC GC Air										
Duplicate (BGE0110-DUP2)				**Source: 23E0004-02**	Prepared & Analyzed: 05/02/2023					
Methane	34.4	0.45	Vol%		34.4			0.0493	5	
Methane	344000	4500	ppmv		344000			0.0493	25	
Carbon dioxide	44.1	0.45	Vol%		44.2			0.219	5	
Carbon dioxide	441000	4500	ppmv		442000			0.219	25	
Oxygen (O2)	16500	4500	ppmv		16600			0.468	25	
Oxygen (O2)	1.65	0.45	Vol%		1.66			0.468	5	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	64200	1800	ppmv		63600			1.05	25	
Nitrogen (N2)	63000	18000	ppmv		63100			0.147	25	
Carbon Monoxide	0.03	0.009	Vol%		0.03			0.554	5	
Carbon Monoxide	275	90.0	ppmv		277			0.554	25	
Duplicate (BGE0110-DUP3)				**Source: 23E0004-03**	Prepared & Analyzed: 05/02/2023					
Methane	97400	4500	ppmv		95900			1.56	25	
Methane	9.74	0.45	Vol%		9.59			1.56	5	
Carbon dioxide	241000	4500	ppmv		242000			0.258	25	
Carbon dioxide	24.1	0.45	Vol%		24.2			0.258	5	
Oxygen (O2)	71200	4500	ppmv		70400			1.14	25	
Oxygen (O2)	7.12	0.45	Vol%		7.04			1.14	5	
Hydrogen (H2)	27400	1800	ppmv		27100			1.14	25	
Nitrogen (N2)	469000	18000	ppmv		465000			0.965	25	
Hydrogen (H2)	2.74	0.18	Vol%		2.71			1.14	5	
Carbon Monoxide	159	90.0	ppmv		153			4.04	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			4.04	5	
Duplicate (BGE0110-DUP4)				**Source: 23E0004-04**	Prepared & Analyzed: 05/02/2023					
Methane	40.1	0.45	Vol%		40.1			0.0897	5	
Methane	401000	4500	ppmv		401000			0.0897	25	
Carbon dioxide	44.4	0.45	Vol%		44.4			0.0392	5	
Carbon dioxide	444000	4500	ppmv		444000			0.0392	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	49100	1800	ppmv		48900			0.426	25	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGE0110 - No Prep VOC GC Air										
Duplicate (BGE0110-DUP4)				**Source: 23E0004-04**	Prepared & Analyzed: 05/02/2023					
Carbon Monoxide	<	90.0	ppmv		<90.0			NA	25	
Carbon Monoxide	<	0.009	Vol%		<0.009			NA	5	
Duplicate (BGE0110-DUP5)				**Source: 23E0004-05**	Prepared & Analyzed: 05/03/2023					
Methane	365000	4500	ppmv		368000			0.866	25	
Methane	36.5	0.45	Vol%		36.8			0.866	5	
Carbon dioxide	499000	4500	ppmv		504000			0.953	25	
Carbon dioxide	49.9	0.45	Vol%		50.4			0.953	5	
Oxygen (O2)	<	4500	ppmv		<4500			NA	25	
Oxygen (O2)	<	0.45	Vol%		<0.45			NA	5	
Nitrogen (N2)	<	18000	ppmv		<18000			NA	25	
Nitrogen (N2)	<	9.00	Vol%		<9.00			NA	5	
Hydrogen (H2)	3.56	0.18	Vol%		3.59			0.966	5	
Hydrogen (H2)	35600	1800	ppmv		35900			0.966	25	
Carbon Monoxide	174	90.0	ppmv		171			1.73	25	
Carbon Monoxide	0.02	0.009	Vol%		0.02			1.73	5	

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		
EPA TO-15 in Air			
Benzene	VELAP		

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Final Report

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Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

Qualifiers and Definitions

RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
PF	Preparation Factor
MDL	Method Detection Limit
LOQ	Limit of Quantitation
ppbv	parts per billion by volume

TIC — Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside ± 10% of the absolute.

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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/25/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME:
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas (LV=Landfill/Vent Gas) OT=Other_____

063-23D-0011

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	84			12854	1.4	230411-01	30	4.0	4/27	9:03	30	189.2	4/27	9:08	10	189.2	LG	x	x	x
2)	86			13962	1.4	230411-01	30	6.2	4/27	9:23	30	175.8	4/27	9:28	10	175.8	LG	x	x	x
3)																	LG	x	x	x
4)																	LG	x	x	x

SCS Field Services 23E0004
Bristol
Recd: 04/28/2023 Due: 05/05/2023
v130325002

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
RELINQUISHED:	DATE / TIME 4/27 5:00	RECEIVED: FedEx E	DATE / TIME
RELINQUISHED: FedEx E	DATE / TIME	RECEIVED: [illegible] 4/28/23 0952	DATE / TIME

QC Data Package
- Level I ☐
- Level II ☐
- Level III ☐
- Level IV ☐

LAB USE ONLY

50% rush surcharge

310
20.0°C
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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/25/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME: BRISTOL
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER: 07223016.00
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? (YES) NO	**Regulatory State:** VA	Is sample from a chlorinated supply? YES (NO)
SAMPLER NAME (PRINT): LOGAN CULHANE	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: 10 (5 Days) or __ Day(s)

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas (LV=Landfill/Vent Gas) OT=Other_____

063-23D-0011

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)	NOT SAMPLED			11325	1.4	230411-01	30										LG	x	x	x
2)	37			12415	1.4	230411-01	30	4.0	4/27	10:46	30	149.2	4/27	10:52	10	149.2	LG	x	x	x
3)	100			12467	1.4	230411-01	30	3.6	4/27	9:52	30	157.3	4/27	9:56	10	157.4	LG	x	x	x
4)	90			12664	1.4	230411-01	30	3.8	4/27	9:34	30	161.8	4/27	9:40	10	161.7	LG	x	x	x

RELINQUISHED:	DATE / TIME	RECEIVED: DATE / TIME	QC Data Package
RELINQUISHED:	4/27 5:00	RECEIVED: FedEx	Level I ☐
RELINQUISHED: FedEx E	DATE / TIME	RECEIVED: 4/28/23 0952	Level II ☐
			Level III ☐
			Level IV ☐

LAB USE ONLY

50% rush surcharge

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SCS Field Services 23E0004
Bristol
Recd: 04/28/2023 Due: 05/05/2023

v130325002

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AIR ANALYSIS
CHAIN OF CUSTODY

Equipment due 5/25/2023

COMPANY NAME: SCS Field Services - Harrisburg	INVOICE TO: **Same**	PROJECT NAME/Quote #: **Bristol**
CONTACT:	INVOICE CONTACT:	SITE NAME:
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER:
PHONE #:	INVOICE PHONE #:	P.O. #:
FAX #: EMAIL:		Pretreatment Program:
Is sample for compliance reporting? YES NO	**Regulatory State:** Is sample from a chlorinated supply? YES NO	PWS I.D. #:
SAMPLER NAME (PRINT):	SAMPLER SIGNATURE:	**Turn Around Time:** Circle: **10** **5 Days** **or** __ Day(s)

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other_____

063-23D-0011

	CLIENT SAMPLE I.D.	Regulator Info: Flow Controller ID	Regulator Info: Cal Flow (mL/min)	Canister Information: Canister ID	Canister Information: Size (L)	Canister Information: Cleaning Batch ID	Canister Information: LAB Outgoing Canister Vacuum (in Hg)	Canister Information: LAB Receiving Canister Vacuum (in Hg)	Sampling Start Information: Barometric Pres. (in Hg): Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Sampling Stop Information: Barometric Pres. (in Hg): Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Codes)	ANALYSIS: Alt 145 CO	3C	TO-15 Benzene only
1)				289	1.4	230411-01											LG	x	x	x
2)				10042	1.4	230411-01											LG	x	x	x
3)				11079	1.4	230411-01											LG	x	x	x
4)				11081	1.4	230411-01											LG	x	x	x

NOT SAMPLED

SCS Field Services 23E0004
Bristol
Recd: 04/28/2023 Due: 05/05/2023
v130325002

RELINQUISHED:	DATE / TIME	RECEIVED: DATE / TIME	QC Data Package: Level I ☐
RELINQUISHED:	DATE / TIME 4/27 5:00	RECEIVED: FedEx DATE / TIME	Level II ☐
RELINQUISHED: FedEx	DATE / TIME	RECEIVED: 4/28/23 0952 DATE / TIME	Level III ☐
			Level IV ☐

LAB USE ONLY

50% rush surcharge

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Certificate of Analysis

Final Report

Laboratory Order ID 23E0004

Client Name:	SCS Field Services - Harrisburg, PA 4330 Lewis Road, Suite 1 Harrisburg, PA 17111	Date Received: Date Issued:	April 28, 2023 9:52 May 4, 2023 16:19
Submitted To:	Tom Lock	Project Number:	07223016.00
Client Site I.D.:	Bristol	Purchase Order:	07-SO04485

Sample Conditions Checklist

Samples Received at:	**20.00°C**
How were samples received?	FedEx Express
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	No
Are all volatile organic and TOX containers free of headspace?	NA
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	NA
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	No

Work Order Comments

Appendix D

Solid Waste Permit 588 Daily Borehole Temperature Averages

Solid Waste Permit 588 Daily Borehole Temperature Averages

SCS ENGINEERS

02218208.05 | May 10, 2023

15521 Midlothian Turnpike
Midlothian, VA 23113
804-378-7440

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 1

	Depth from Surface					
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft
1-Apr	197.9	207.0	207.1	207.1	207.5	242.4
2-Apr	206.0	207.0	207.0	207.0	207.0	241.0
3-Apr	207.0	207.0	207.0	207.0	208.0	242.0
4-Apr	207.0	208.0	208.0	208.0	208.0	243.0
5-Apr	207.2	207.8	207.9	207.8	208.4	243.7
6-Apr	207.4	208.0	208.2	208.2	208.0	244.0
7-Apr	191.0	207.1	207.5	207.5	208.0	244.0
8-Apr	204.1	207.0	207.3	207.3	207.9	244.3
9-Apr	206.9	207.5	207.6	207.6	208.0	245.0
10-Apr	206.9	207.8	208.0	207.8	208.0	245.9
11-Apr	207.0	208.0	208.0	208.0	208.0	246.0
12-Apr	207.0	208.0	208.0	208.0	207.9	246.0
13-Apr	206.8	207.5	207.7	207.5	208.2	247.0
14-Apr	206.4	207.4	207.3	207.3	208.3	247.4
15-Apr	206.5	207.3	207.3	207.4	208.1	248.1
16-Apr	206.5	207.4	207.4	207.4	208.5	249.1
17-Apr	206.1	206.8	206.8	206.8	208.3	248.9
18-Apr	206.5	207.1	207.2	207.1	208.4	249.5
19-Apr	207.0	207.8	207.8	207.7	209.0	250.1
20-Apr	207.1	208.0	208.0	207.8	209.3	250.8
21-Apr	206.8	207.5	207.6	207.5	209.3	251.1
22-Apr	206.0	206.9	207.0	206.9	208.3	250.8
23-Apr	206.5	207.0	207.1	207.0	208.6	250.5
24-Apr	206.7	207.2	207.4	207.4	209.0	250.7
25-Apr	206.7	207.3	207.5	207.5	209.2	251.1
26-Apr	206.5	207.3	207.5	207.4	209.1	251.5
27-Apr	206.3	207.3	207.3	207.3	209.4	251.6
28-Apr	206.3	207.3	207.3	207.2	209.6	251.8
29-Apr	206.4	207.3	207.3	207.3	209.3	251.7
30-Apr	205.9	206.2	206.3	206.2	209.3	251.5
Average	**205.7**	**207.4**	**207.4**	**207.4**	**208.5**	**247.7**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 2

	Depth from Surface					
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft
1-Apr	157.5	236.1	237.9	268.4	256.8	268.6
2-Apr	157.4	235.8	237.1	268.2	256.6	268.5
3-Apr	157.0	236.1	237.7	268.1	256.5	268.5
4-Apr	157.0	237.0	239.0	269.0	257.0	269.0
5-Apr	157.0	238.0	239.0	269.0	257.0	269.0
6-Apr	157.0	238.0	239.0	268.0	257.0	269.0
7-Apr	156.6	237.5	238.9	268.0	256.0	268.1
8-Apr	156.1	238.7	239.8	267.9	256.0	268.1
9-Apr	157.0	240.0	241.0	268.0	257.0	269.0
10-Apr	156.7	239.7	240.8	268.2	256.7	269.0
11-Apr	156.6	240.7	241.5	268.2	256.5	269.0
12-Apr	157.0	241.0	242.0	268.0	256.0	269.0
13-Apr	156.7	241.6	242.0	268.3	256.7	269.1
14-Apr	157.0	241.6	242.1	268.0	256.0	269.0
15-Apr	156.6	241.5	242.2	268.4	256.6	268.8
16-Apr	156.6	241.5	242.3	268.6	256.7	269.2
17-Apr	156.3	241.3	241.8	268.1	256.1	268.7
18-Apr	156.1	241.5	241.9	268.1	256.3	268.8
19-Apr	156.0	242.0	242.0	268.0	257.0	269.0
20-Apr	156.0	242.0	242.0	269.0	257.0	269.1
21-Apr	156.3	241.6	242.9	268.5	256.8	269.1
22-Apr	155.8	241.2	241.4	268.0	256.2	268.5
23-Apr	155.7	240.8	241.6	267.8	256.2	268.6
24-Apr	155.6	240.8	241.4	267.8	256.2	268.6
25-Apr	155.7	240.9	241.3	267.9	256.1	268.6
26-Apr	155.6	240.7	241.2	267.9	256.1	268.5
27-Apr	155.7	240.5	241.0	267.7	256.0	268.5
28-Apr	156.1	240.5	241.0	268.3	256.4	268.8
29-Apr	156.2	240.1	241.0	268.3	256.3	269.0
30-Apr	155.8	239.9	240.3	268.1	256.1	268.8
Average	**156.4**	**240.0**	**240.8**	**268.2**	**256.5**	**268.8**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 3

	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	207.3	214.8	229.2	253.9	264.2	270.5	271.6	256.1
2-Apr	207.1	217.2	219.4	253.2	263.6	269.9	271.1	255.7
3-Apr	207	207.1	207.7	253.2	263.4	270.0	271.2	255.7
4-Apr	206.9	206.9	208.1	253.1	263.8	269.9	270.9	256.0
5-Apr	207.5	207.7	208.1	253.4	263.9	270.0	271.2	256.0
6-Apr	207.4	207.4	208.3	253.1	263.8	269.9	270.8	254.8
7-Apr	207.5	208.0	207.9	253.3	263.5	270.0	271.0	253.5
8-Apr	207.3	207.6	207.5	253.1	263.1	270.0	271.0	253.2
9-Apr	207.6	215.6	215.8	252.3	263.8	270.2	271.5	253.6
10-Apr	207.8	213.6	214.0	251.5	264.0	270.2	271.5	253.8
11-Apr	207.4	216.5	219.5	250.3	263.8	270.0	271.0	253.5
12-Apr	207.5	207.8	227.3	253.3	263.8	270.2	271.4	253.8
13-Apr	207.8	221.8	225.0	254.3	264.4	271.0	272.1	254.0
14-Apr	206.9	207.1	208.1	251.1	263.9	270.0	271.0	253.6
15-Apr	206.9	216.0	216.0	253.2	264.0	270.0	271.1	253.4
16-Apr	207.4	215.1	216.4	254.0	264.5	270.7	271.8	253.7
17-Apr	206.4	215.8	217.0	253.0	263.8	269.7	270.7	253.4
18-Apr	207.2	221.5	230.6	253.9	264.3	270.5	271.8	253.8
19-Apr	207.3	207.4	218.0	251.2	264.1	270.1	271.3	253.9
20-Apr	208.0	224.3	232.4	254.3	264.9	270.9	272.1	254.0
21-Apr	207.5	207.8	211.8	253.4	264.7	270.4	271.5	254.1
22-Apr	206.8	206.8	207.4	246.4	264.1	270.0	271.1	253.4
23-Apr	207.3	218.5	222.7	253.4	264.2	270.3	271.4	253.5
24-Apr	206.9	207.0	208.4	251.5	263.7	269.6	270.7	253.8
25-Apr	206.3	206.6	207.9	250.0	263.3	269.0	270.3	253.6
26-Apr	206.3	206.5	207.6	251.6	263.3	268.9	270.4	253.5
27-Apr	207.1	219.7	219.5	253.3	264.2	270.1	271.3	253.6
28-Apr	206.8	207.1	207.5	253.5	264.4	270.2	271.3	254.0
29-Apr	207.0	219.2	219.0	253.3	264.3	270.3	271.4	254.4
30-Apr	206.0	206.4	206.8	252.5	263.8	269.7	270.8	253.8
Average	**207.1**	**212.2**	**215.2**	**252.6**	**264.0**	**270.1**	**271.2**	**254.1**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 4

	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	205.4	207.1	207.0	207.3	217.4	254.1	246.0	173.2
2-Apr	207.1	207.0	206.8	207.3	207.5	252.2	245.7	172.8
3-Apr	207.0	207.0	206.5	207.4	208.0	250.3	245.8	173.0
4-Apr	207.5	207.5	207.4	207.6	216.4	248.3	246.3	173.4
5-Apr	207.7	207.7	207.9	207.9	212.1	244.7	246.5	172.6
6-Apr	208.0	207.8	208.2	208.7	209.3	229.2	246.4	172.5
7-Apr	207.6	207.0	207.8	207.9	208.1	211.3	245.6	172.0
8-Apr	207.1	207.0	207.1	208.9	208.0	210.2	245.3	172.0
9-Apr	207.5	207.5	207.1	207.7	208.5	211.5	245.7	172.6
10-Apr	207.8	207.7	207.2	207.9	208.8	209.2	245.8	173.0
11-Apr	207.7	207.6	207.1	207.8	211.1	209.1	245.8	173.3
12-Apr	207.5	207.5	207.1	207.6	210.5	208.8	246.0	173.4
13-Apr	207.6	207.4	207.0	207.4	209.0	208.6	246.0	173.1
14-Apr	207.3	207.3	207.1	207.0	208.2	208.3	246.0	173.3
15-Apr	207.4	207.5	206.8	207.3	208.1	208.4	246.1	173.6
16-Apr	207.3	207.3	206.7	207.0	207.9	208.3	245.1	173.8
17-Apr	206.9	206.8	206.4	206.6	207.6	207.9	245.6	173.6
18-Apr	207.0	206.9	206.7	206.9	207.8	208.7	245.8	173.9
19-Apr	207.7	207.3	207.2	207.2	208.3	210.1	246.1	173.0
20-Apr	207.9	207.6	207.5	207.9	208.9	209.6	246.2	173.0
21-Apr	207.5	207.3	207.2	208.0	209.3	208.7	246.2	173.2
22-Apr	207.1	206.6	206.5	207.7	208.0	208.2	246.0	173.1
23-Apr	206.9	206.7	206.7	207.5	207.9	208.2	245.8	173.0
24-Apr	207.3	206.9	206.8	207.7	207.8	208.1	245.7	173.0
25-Apr	207.5	207.0	207.0	207.8	207.9	207.9	245.8	173.1
26-Apr	207.5	207.1	207.1	207.7	208.2	207.9	245.6	173.3
27-Apr	207.3	206.9	206.8	207.5	207.7	207.7	245.7	173.5
28-Apr	207.2	206.8	206.7	207.5	207.5	207.5	244.8	173.9
29-Apr	207.3	207.0	206.8	207.5	207.4	207.5	237.6	174.1
30-Apr	206.3	206.2	206.1	206.7	206.6	206.9	220.1	173.9
Average	**207.3**	**207.2**	**207.0**	**207.6**	**209.0**	**216.2**	**244.7**	**173.2**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 5

	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	143.0	207.0	207.1	207.2	226.3	241.9	249.1	190.5
2-Apr	143.0	207.0	207.2	207.5	226.3	241.4	248.8	190.4
3-Apr	143.2	206.9	207.1	207.5	226.0	240.9	248.9	190.5
4-Apr	143.5	207.5	207.5	207.8	226.3	241.1	249.3	190.7
5-Apr	143.8	207.7	207.7	208.0	226.5	241.4	249.3	190.9
6-Apr	144.1	207.8	207.9	208.2	226.3	241.1	249.1	190.7
7-Apr	143.0	207.1	207.4	208.0	226.0	240.2	248.3	190.0
8-Apr	143.0	207.0	207.1	207.8	226.0	240.0	248.0	190.0
9-Apr	143.5	207.5	207.5	207.7	226.1	240.5	248.3	190.4
10-Apr	143.8	207.6	207.7	207.9	225.9	240.4	248.5	190.6
11-Apr	143.8	207.6	207.7	207.9	226.5	240.8	248.6	190.6
12-Apr	143.9	207.5	207.5	207.6	226.6	241.1	248.6	190.6
13-Apr	144.1	207.5	207.5	207.8	226.3	241.1	248.6	190.9
14-Apr	143.5	207.3	207.3	207.5	226.1	240.6	248.5	191.1
15-Apr	143.1	207.3	207.4	207.5	226.2	240.6	248.4	191.1
16-Apr	143.1	207.3	207.3	207.4	226.4	241.1	248.5	191.0
17-Apr	142.5	206.7	206.7	207.0	226.3	241.0	247.9	190.7
18-Apr	142.5	207.1	207.1	207.5	226.5	241.4	248.1	190.8
19-Apr	142.5	207.5	207.6	207.8	226.2	241.0	248.4	190.8
20-Apr	142.4	207.8	207.8	207.9	226.0	240.8	248.6	191.2
21-Apr	142.4	207.4	207.4	207.7	225.7	240.4	248.5	191.1
22-Apr	141.9	206.9	207.1	207.2	225.3	240.2	248.1	191.0
23-Apr	141.4	206.8	207.0	207.5	225.5	240.3	247.8	190.8
24-Apr	141.5	207.3	207.4	207.6	225.2	239.9	247.7	190.7
25-Apr	141.5	207.3	207.4	207.5	225.2	239.5	247.7	190.8
26-Apr	141.5	207.4	207.4	207.5	225.5	239.6	247.6	190.6
27-Apr	141.3	207.1	207.2	207.3	225.5	239.9	247.6	190.8
28-Apr	141.5	206.9	207.2	207.3	225.8	240.3	248.1	191.3
29-Apr	141.5	207.0	207.2	207.3	225.5	240.0	248.1	191.2
30-Apr	141.2	206.1	206.3	206.6	225.0	239.8	247.7	191.1
Average	**142.7**	**207.2**	**207.3**	**207.6**	**226.0**	**240.6**	**248.4**	**190.8**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 6

	Depth from Surface				
Date	25 ft	50 ft	75 ft	100 ft	125 ft
1-Apr	206.7	237.4	237.4	240.0	241.2
2-Apr	207.3	236.8	236.8	239.6	240.7
3-Apr	207.0	236.8	236.8	239.6	240.7
4-Apr	207.6	237.3	237.3	240.0	241.1
5-Apr	207.8	237.4	237.5	240.0	241.1
6-Apr	208.0	237.2	237.3	239.8	240.7
7-Apr	207.3	236.5	236.8	239.0	240.0
8-Apr	207.7	236.0	236.2	239.0	240.0
9-Apr	208.1	236.7	236.6	239.2	240.4
10-Apr	208.2	236.7	236.7	239.1	240.6
11-Apr	208.4	236.7	236.7	239.1	240.5
12-Apr	208.5	236.8	236.8	239.3	240.6
13-Apr	207.7	237.0	237.0	239.6	240.8
14-Apr	207.2	237.1	237.2	239.5	240.4
15-Apr	207.3	236.7	236.9	239.4	240.3
16-Apr	207.9	236.9	237.1	239.3	240.4
17-Apr	207.6	236.5	236.5	239.1	240.2
18-Apr	207.4	236.6	236.7	239.1	240.5
19-Apr	207.8	236.8	236.8	239.2	240.6
20-Apr	207.8	236.8	236.8	239.1	240.5
21-Apr	207.5	236.4	236.7	239.0	240.3
22-Apr	207.3	236.3	236.3	238.5	239.8
23-Apr	207.6	235.7	236.2	238.4	239.4
24-Apr	207.8	235.7	235.8	238.4	239.5
25-Apr	207.8	235.4	235.5	238.3	239.3
26-Apr	207.6	235.5	235.5	237.5	238.7
27-Apr	207.7	235.3	235.3	237.7	239.0
28-Apr	208.2	235.5	235.9	238.1	239.4
29-Apr	208.2	235.5	235.7	238.2	239.2
30-Apr	207.6	235.3	235.4	237.8	238.9
Average	**207.7**	**236.4**	**236.5**	**239.0**	**240.2**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 7

	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	164.0	225.4	226.0	240.3	244.5	242.4	235.3	224.5
2-Apr	163.3	225.2	225.5	239.8	244.5	242.3	234.8	224.2
3-Apr	164.8	225.5	225.7	239.9	244.5	242.2	234.9	224.1
4-Apr	165.4	225.8	226.2	240.5	244.8	242.6	235.4	224.5
5-Apr	165.5	225.7	226.3	240.5	244.8	242.6	235.5	224.5
6-Apr	165.0	225.6	226.0	240.4	244.8	242.5	235.3	224.3
7-Apr	163.5	225.0	225.5	240.0	244.0	242.0	234.7	223.6
8-Apr	161.8	225.0	225.4	240.0	244.0	241.9	234.2	223.2
9-Apr	163.6	225.8	225.9	240.7	244.8	242.4	234.8	223.9
10-Apr	163.6	225.6	225.8	240.5	244.6	242.1	234.8	223.6
11-Apr	163.5	225.6	225.8	240.5	244.6	242.1	234.8	223.6
12-Apr	163.8	225.1	225.7	240.8	244.8	242.5	235.0	223.9
13-Apr	163.6	225.1	225.8	240.9	244.9	242.5	234.9	223.8
14-Apr	163.8	225.5	226.1	240.9	245.1	242.4	235.2	223.4
15-Apr	163.3	225.4	226.0	241.0	245.0	242.2	235.2	223.6
16-Apr	164.0	225.4	225.6	241.3	244.9	242.5	235.2	223.5
17-Apr	163.5	224.8	225.5	240.9	244.6	242.3	234.6	223.0
18-Apr	163.8	225.0	225.7	240.9	244.6	242.1	234.6	222.9
19-Apr	164.2	225.7	225.9	241.3	244.8	242.7	234.8	223.0
20-Apr	164.3	226.0	226.6	241.1	244.8	242.6	234.7	222.8
21-Apr	164.2	225.7	226.1	241.0	245.0	242.3	234.6	222.5
22-Apr	163.9	225.4	226.2	240.9	244.6	242.1	234.1	222.0
23-Apr	163.7	225.7	226.6	240.6	244.6	241.8	233.8	221.8
24-Apr	163.5	226.1	226.8	240.7	244.6	242.0	234.0	222.0
25-Apr	163.3	225.5	225.5	240.4	244.5	241.8	233.8	221.8
26-Apr	163.5	225.5	225.7	240.4	244.5	241.7	233.7	221.5
27-Apr	163.4	225.3	225.7	240.3	244.4	241.9	233.7	221.4
28-Apr	163.4	224.1	224.4	240.5	244.8	242.2	233.8	221.3
29-Apr	163.7	221.0	221.3	240.5	245.2	242.2	233.7	220.9
30-Apr	162.9	212.7	213.1	240.7	245.0	241.7	233.1	220.0
Average	**163.8**	**224.8**	**225.3**	**240.6**	**244.7**	**242.2**	**234.6**	**223.0**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 8

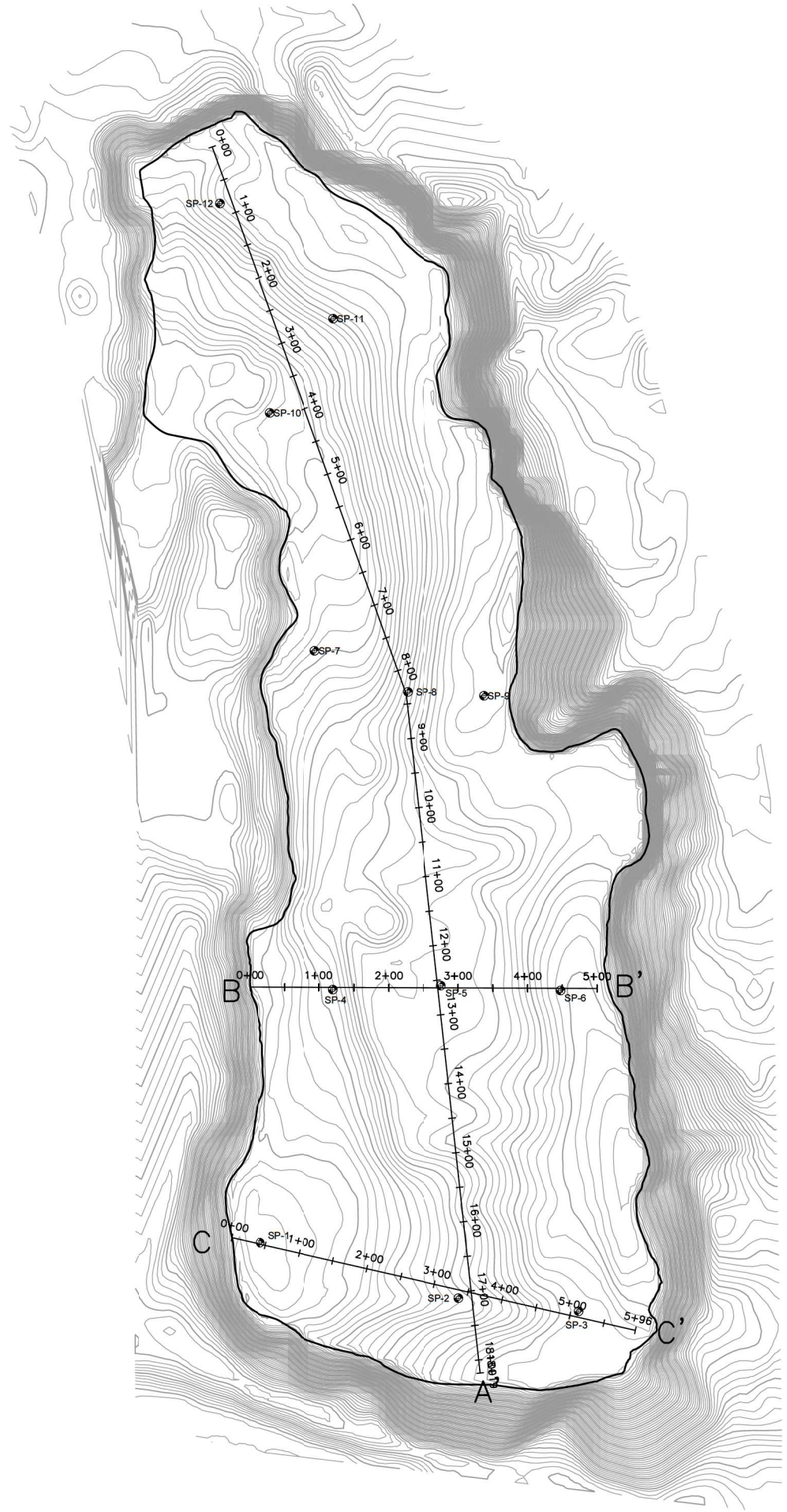
	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	172.9	176.4	176.5	176.8	178.9	182.1	182.2	180.2
2-Apr	173.2	176.3	176.4	176.5	178.6	181.7	182.1	180.1
3-Apr	173.1	176.4	176.5	176.6	178.7	181.7	182.0	179.9
4-Apr	173.3	176.6	176.9	177.0	179.3	182.3	182.5	180.4
5-Apr	173.3	176.8	177.1	177.3	179.5	182.5	182.6	180.6
6-Apr	173.4	177.0	177.0	177.1	179.4	182.3	182.4	180.5
7-Apr	173.0	176.2	176.9	177.0	179.0	182.0	182.0	180.0
8-Apr	172.9	176.4	176.8	177.0	179.2	182.0	182.0	180.0
9-Apr	173.0	176.5	176.7	177.3	179.6	182.5	182.5	180.5
10-Apr	173.2	176.7	176.8	177.3	179.7	182.6	182.6	180.5
11-Apr	173.2	176.8	177.1	177.4	179.9	182.8	182.6	180.6
12-Apr	173.1	177.0	177.2	177.4	179.9	182.8	182.8	180.7
13-Apr	173.5	177.1	177.3	177.3	179.7	182.7	182.8	180.8
14-Apr	173.4	177.0	177.2	177.2	179.8	182.8	183.0	181.0
15-Apr	173.5	177.2	177.2	177.3	179.8	182.8	183.0	180.9
16-Apr	173.1	177.3	177.3	177.4	179.9	182.8	182.7	180.3
17-Apr	173.4	176.9	177.1	177.2	179.5	182.5	182.6	179.5
18-Apr	173.4	177.0	177.2	177.3	179.6	182.6	182.6	177.9
19-Apr	173.7	177.3	177.5	177.5	179.6	182.7	182.7	178.0
20-Apr	173.9	177.5	177.5	177.5	179.8	182.7	182.8	178.5
21-Apr	173.7	177.5	177.5	177.5	179.8	182.7	182.8	178.4
22-Apr	173.4	177.2	177.3	177.6	179.5	182.5	182.6	177.9
23-Apr	173.5	178.1	177.3	178.2	180.3	182.5	182.5	178.6
24-Apr	174.0	177.3	177.3	177.4	179.5	182.5	182.5	178.0
25-Apr	174.4	177.3	177.3	177.4	179.3	182.4	182.5	177.8
26-Apr	174.5	177.3	177.4	177.5	179.4	182.4	182.5	177.5
27-Apr	174.4	177.2	177.2	177.5	179.1	182.2	182.3	177.0
28-Apr	174.2	177.3	177.3	177.5	179.3	182.4	182.5	177.3
29-Apr	174.6	177.4	177.4	177.4	179.1	182.2	182.5	177.2
30-Apr	174.1	177.2	177.2	177.3	179.1	182.2	182.3	177.3
Average	**173.5**	**177.0**	**177.1**	**177.3**	**179.5**	**182.4**	**182.5**	**179.3**

Solid Waste Permit 588 Daily Borehole Temperature Averages for Borehole 9

	Depth from Surface							
Date	25 ft	50 ft	75 ft	100 ft	125 ft	150 ft	175 ft	200 ft
1-Apr	123.3	147.3	145.7	151.2	150.3	132.8	118.8	108.8
2-Apr	123.6	147.9	146.7	151.1	149.7	132.5	118.7	108.6
3-Apr	124.0	148.5	147.5	151.9	149.9	132.5	118.7	108.4
4-Apr	124.3	149.8	148.9	152.4	150.3	133.1	119.2	109.2
5-Apr	124.5	149.9	148.9	152.6	150.1	133.1	119.3	109.2
6-Apr	124.5	150.4	149.5	152.5	149.9	133.0	119.3	108.9
7-Apr	123.8	150.0	149.0	152.0	149.0	132.0	118.2	108.0
8-Apr	123.3	149.5	148.7	152.0	149.0	132.0	118.2	108.0
9-Apr	124.0	149.7	148.9	152.2	149.3	132.5	118.7	108.2
10-Apr	124.2	150.1	149.4	152.4	149.4	132.7	118.9	108.2
11-Apr	124.1	150.4	149.6	152.6	149.5	132.7	118.9	108.4
12-Apr	124.3	150.1	149.1	152.7	149.7	132.9	119.2	108.7
13-Apr	124.5	150.3	149.5	152.9	150.0	133.0	119.3	108.7
14-Apr	124.4	150.4	149.6	152.7	150.3	133.0	119.4	108.7
15-Apr	124.4	150.5	149.5	152.5	150.3	132.6	119.4	108.7
16-Apr	124.5	150.4	149.4	152.6	150.0	132.7	119.3	108.5
17-Apr	124.0	149.9	148.9	152.2	149.5	132.5	118.8	108.2
18-Apr	124.4	150.4	149.5	152.6	149.7	132.6	118.9	108.3
19-Apr	124.8	150.9	150.0	152.8	150.0	132.9	119.3	108.6
20-Apr	124.9	151.0	150.1	153.0	150.0	132.9	119.3	108.5
21-Apr	125.5	152.2	149.9	152.9	150.0	134.0	120.3	109.2
22-Apr	124.4	150.5	149.6	152.5	149.7	132.5	119.1	108.1
23-Apr	124.0	150.5	149.6	152.5	149.5	132.3	118.8	107.8
24-Apr	124.2	150.7	149.9	152.5	149.4	132.2	118.8	107.8
25-Apr	124.0	150.8	149.9	152.5	149.3	132.2	118.7	107.6
26-Apr	124.1	150.5	149.7	152.5	149.3	132.2	118.6	107.5
27-Apr	124.0	150.4	149.7	152.4	149.4	132.3	118.7	107.4
28-Apr	124.1	150.5	149.8	152.6	149.6	132.5	119.3	107.8
29-Apr	124.3	150.8	150.2	152.8	149.7	132.6	119.4	107.9
30-Apr	123.7	150.4	149.5	152.5	149.4	132.3	119.0	107.8
Average	**124.2**	**150.2**	**149.2**	**152.4**	**149.7**	**132.6**	**119.0**	**108.3**

Appendix E

Monthly Topography Analysis



LEGEND

- MAJOR CONTOURS (EVERY 10')
- MINOR CONTOURS (EVERY 2')
- APPROXIMATE SIDEWALL LOCATION
- SP-9 SETTLEMENT PLATE

NOTES:

1. GRADES SHOWN AS CONTOUR LINES ONLY WITHIN THE PERMIT 588 BOUNDARY REPRESENTS THE TOPOGRAPHY CAPTURED ON APRIL 11, 2023 BY SCS ENGINEERS.
2. ANY DETERMINATION OF TOPOGRAPHY OR CONTOURS, OR ANY DEPICTION OF PHYSICAL IMPROVEMENTS, PROPERTY LINES, OR BOUNDARIES IS FOR GENERAL INFORMATION ONLY AND SHALL NOT BE USED FOR DESIGN, MODIFICATION, OR CONSTRUCTION OF IMPROVEMENTS TO REAL PROPERTY OR FOR FLOOD PLAIN DETERMINATION.
3. THE HORIZONTAL DATUM IS STATE PLANE VIRGINIA SOUTH ZONE NAD-83 (2011)
4. THE VERTICAL DATUM IS BASED UPON NAVD-88.

100 50 0 100 200

SCALE: 1"=100'

NO.	REVISION	DATE

SHEET TITLE: **APRIL 2023 LANDFILL TOPOGRAPHY**

PROJECT TITLE: **MONTHLY TOPOGRAPHY ANALYSIS SOLID WASTE PERMIT #588**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
55 SOUTH LAKE STREET, SUITE 4, HEDFORD, NJ 08055
PH. (609) 654-4000 SCSENGINEERS.COM

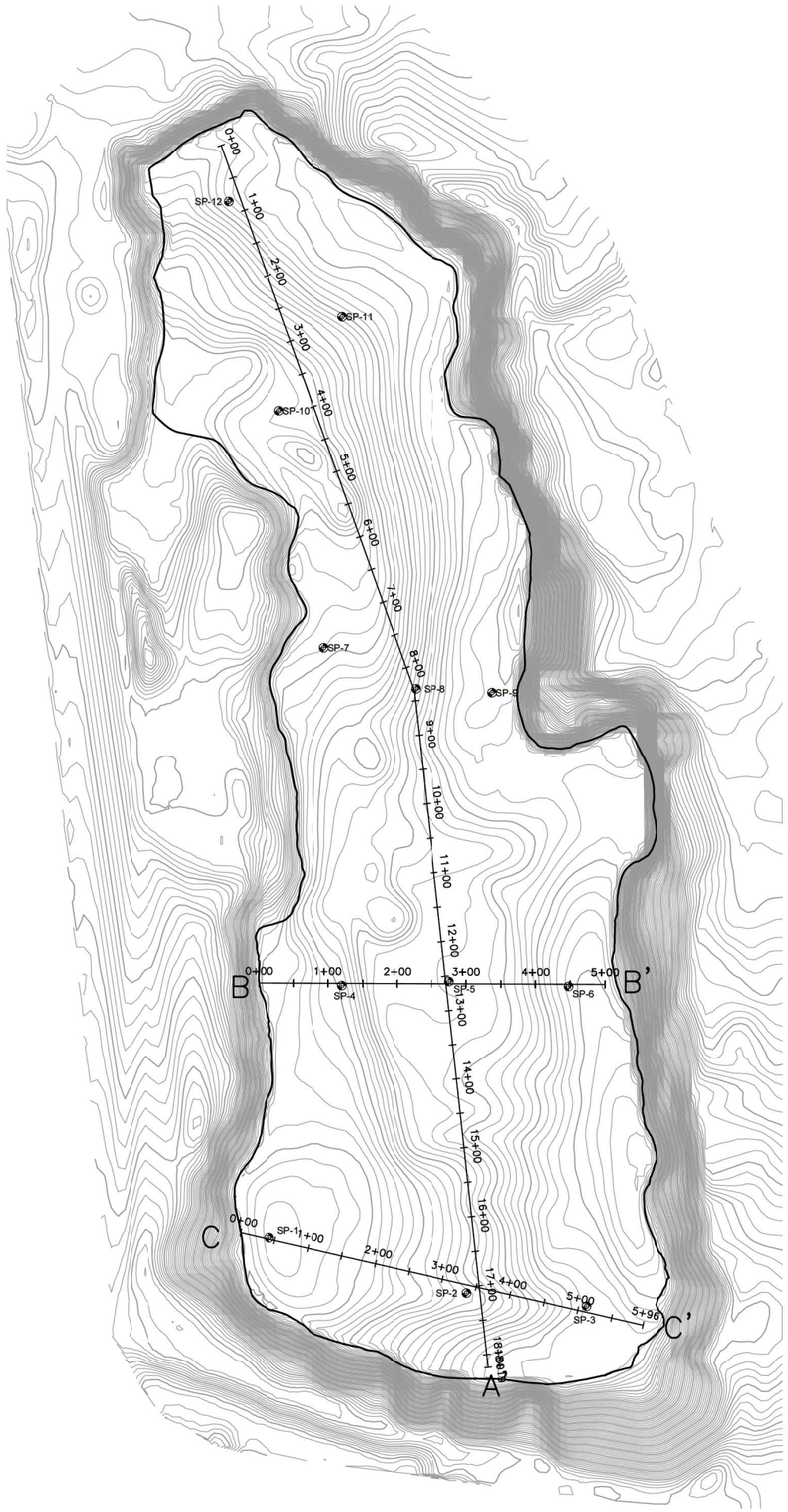
PROJ. NO. 02218208.05
DSN. BY: SRB
DWN. BY: CMW
CHK. BY: CJW
QA/QC BY: CJW
APP. BY: CJW

CADD FILE: SURF COMP

DATE: 5/8/2023

SCALE: 1" = 100'

DRAWING NO. **1** of **5**



LEGEND

- MAJOR CONTOURS (EVERY 10')
- MINOR CONTOURS (EVERY 2')
- APPROXIMATE SIDEWALL LOCATION
- SP-9 SETTLEMENT PLATE

NOTES:

1. GRADES SHOWN AS CONTOUR LINES ONLY WITHIN THE PERMIT 588 BOUNDARY REPRESENTS THE TOPOGRAPHY CAPTURED ON MARCH 9, 2023 BY SCS ENGINEERS.
2. ANY DETERMINATION OF TOPOGRAPHY OR CONTOURS, OR ANY DEPICTION OF PHYSICAL IMPROVEMENTS, PROPERTY LINES, OR BOUNDARIES IS FOR GENERAL INFORMATION ONLY AND SHALL NOT BE USED FOR DESIGN, MODIFICATION, OR CONSTRUCTION OF IMPROVEMENTS TO REAL PROPERTY OR FOR FLOOD PLAIN DETERMINATION.
3. THE HORIZONTAL DATUM IS STATE PLANE VIRGINIA SOUTH ZONE NAD-83 (2011)
4. THE VERTICAL DATUM IS BASED UPON NAVD-88.

100 50 0 100 200
SCALE: 1"=100'

NO.	REVISION	DATE

SHEET TITLE: **MARCH 2023 LANDFILL TOPO**

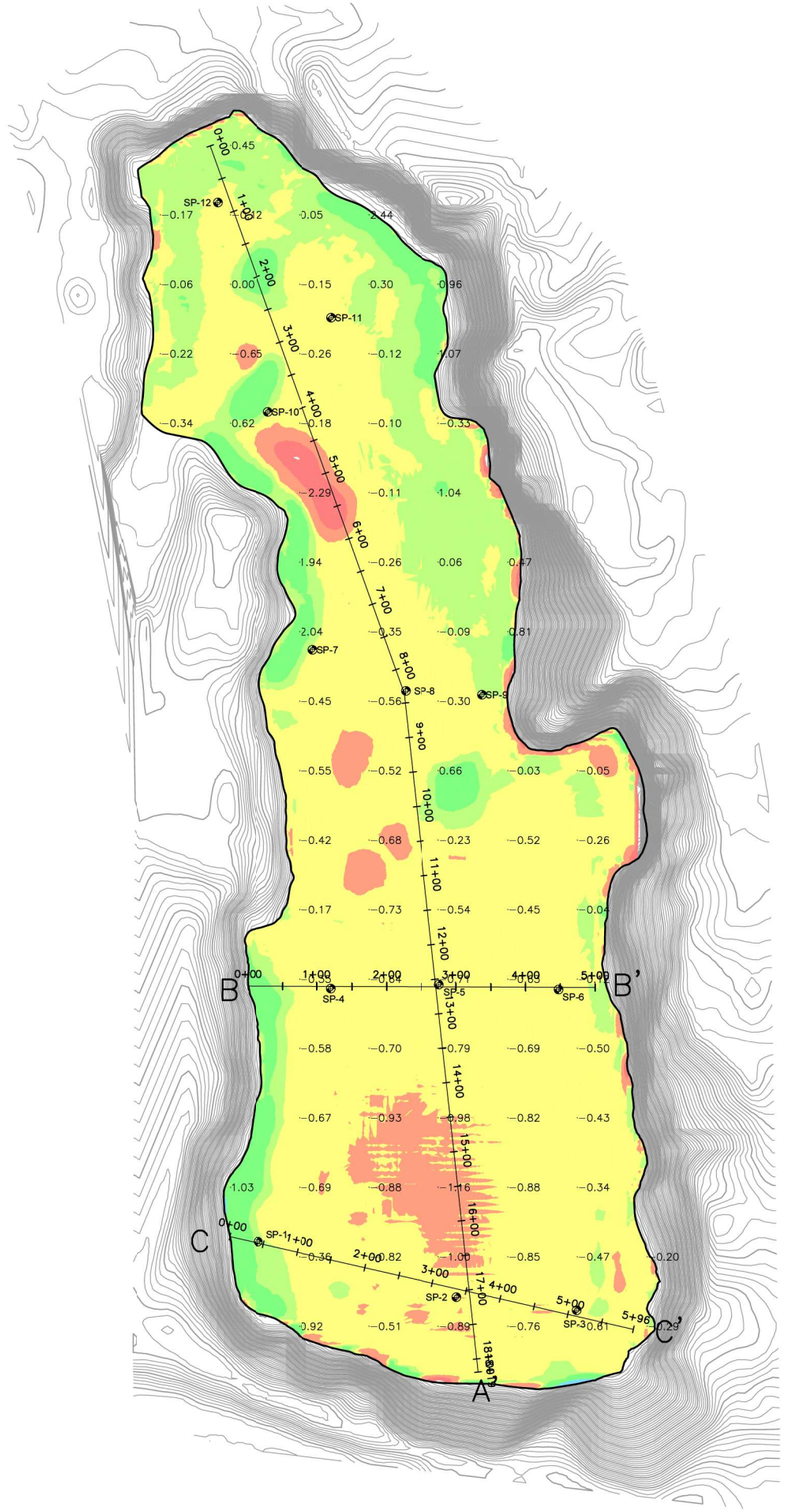
PROJECT TITLE: **MONTHLY TOPOGRAPHY ANALYSIS SOLID WASTE PERMIT #588**

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
53 SOUTH MAIN STREET, SUITE A, MEDFORD, NJ 08055
PH. (609) 654-4000 SCSENGINEERS.COM

PROJ. NO. 02224208.05
DSN. BY: SRB
DWN. BY: CMW
CHK. BY: CJW
Q/A RVW. BY: CMW
APP. BY: CJW

CADD FILE: SURF COMP
DATE: 5/8/2023
SCALE: 1" = 100'
DRAWING NO. **2** of **5**



LEGEND

———	MAJOR CONTOURS (EVERY 10')
———	MINOR CONTOURS (EVERY 2')
———	APPROXIMATE SIDEWALL LOCATION
SP-9	SETTLEMENT PLATE
-0.39	SPOT ELEVATION ON 100' GRID

Volume

Base Surface TOPO – MAR 9, 2023
Comparison Surface TOPO – APR 11, 2023

Cut Volume 15248.51 Cu. Yd.
Fill Volume 5371.80 Cu. Yd.
Net Cut 9876.71 Cu. Yd.

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	-10.000	-5.000	
2	-5.000	-1.000	
3	-1.000	0.000	
4	0.000	1.000	
5	1.000	5.000	
6	5.000	10.000	

NOTES:

1. THE ELEVATION CHANGES ARE CALCULATED BETWEEN THE AERIAL TOPOGRAPHY DATA CAPTURED ON MARCH 9, 2023 AND APRIL 11, 2023 BY SCS ENGINEERS. POSITIVE VALUES (+) INDICATE AREAS OF FILL AND NEGATIVE VALUES (-) INDICATE AREAS OF CUT (SETTLEMENT). VALUES ARE ROUNDED TO THE NEAREST FOOT
2. ANY DETERMINATION OF TOPOGRAPHY OR CONTOURS, OR ANY DEPICTION OF PHYSICAL IMPROVEMENTS, PROPERTY LINES, OR BOUNDARIES IS FOR GENERAL INFORMATION ONLY AND SHALL NOT BE USED FOR DESIGN, MODIFICATION, OR CONSTRUCTION OF IMPROVEMENTS TO REAL PROPERTY OR FOR FLOOD PLAIN DETERMINATION.
3. THE HORIZONTAL DATUM IS STATE PLANE VIRGINIA SOUTH ZONE NAD-83 (2011)
4. THE VERTICAL DATUM IS BASED UPON NAVD-88.

100 50 0 100 200
SCALE: 1"=100'

NO.	REVISION	DATE

SHEET TITLE: APRIL VOLUME CHANGE MARCH 2023 TO APRIL 2023

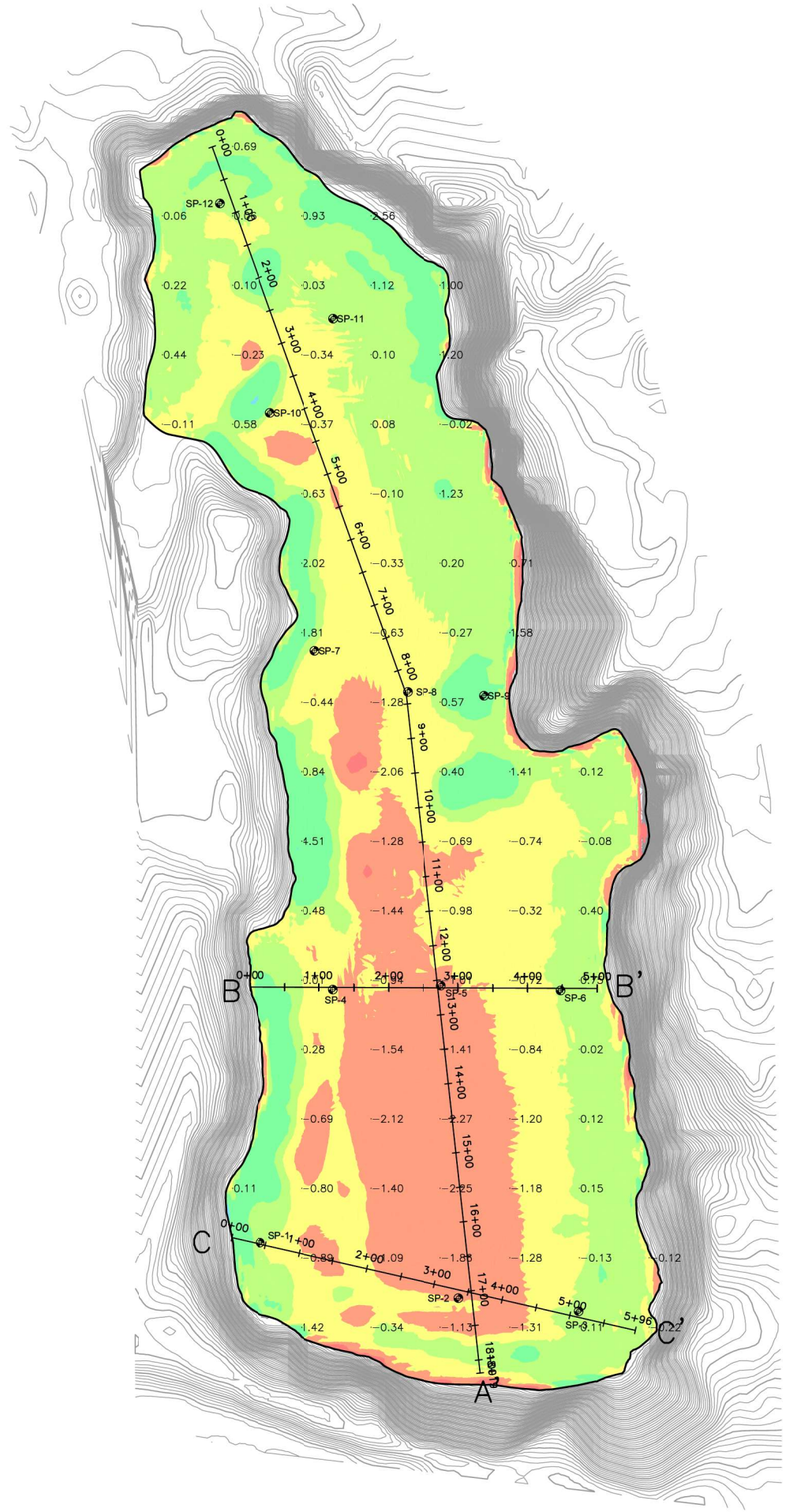
PROJECT TITLE: MONTHLY TOPOGRAPHY ANALYSIS SOLID WASTE PERMIT #588

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
53 SOUTH MAIN STREET, MEDFORD, NJ 08055
PH. (609) 654-4000 SCSENGINEERS.COM

PROJ. NO. 02218208.05
DSN. BY: SRB
DWN. BY: CMW
CHK. BY: CJW
Q/A RVW. BY: CMW
APP. BY: CJW

CADD FILE: SURF COMP
DATE: 5/8/2023
SCALE: 1" = 100'
DRAWING NO. 3 of 5



LEGEND

———	MAJOR CONTOURS (EVERY 10')
———	MINOR CONTOURS (EVERY 2')
———	APPROXIMATE SIDEWALL LOCATION
SP-9	SETTLEMENT PLATE
−0.39	SPOT ELEVATION ON 100' GRID

Volume

Base Surface TOPO – JAN 10, 2023
Comparison Surface TOPO – APR 11, 2023

Cut Volume	16330.66 Cu. Yd.
Fill Volume	9896.35 Cu. Yd.
Net Cut	6434.31 Cu. Yd.

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	−10.000	−5.000	
2	−5.000	−1.000	
3	−1.000	0.000	
4	0.000	1.000	
5	1.000	5.000	
6	5.000	10.000	

NOTES:

1. THE ELEVATION CHANGES ARE CALCULATED BETWEEN THE AERIAL TOPOGRAPHY DATA CAPTURED ON JANUARY 10, 2023 AND APRIL 11, 2023 BY SCS ENGINEERS. POSITIVE VALUES (+) INDICATE AREAS OF FILL AND NEGATIVE VALUES (−) INDICATE AREAS OF CUT (SETTLEMENT). VALUES ARE ROUNDED TO THE NEAREST FOOT
2. ANY DETERMINATION OF TOPOGRAPHY OR CONTOURS, OR ANY DEPICTION OF PHYSICAL IMPROVEMENTS, PROPERTY LINES, OR BOUNDARIES IS FOR GENERAL INFORMATION ONLY AND SHALL NOT BE USED FOR DESIGN, MODIFICATION, OR CONSTRUCTION OF IMPROVEMENTS TO REAL PROPERTY OR FOR FLOOD PLAIN DETERMINATION.
3. THE HORIZONTAL DATUM IS STATE PLANE VIRGINIA SOUTH ZONE NAD−83 (2011)
4. THE VERTICAL DATUM IS BASED UPON NAVD−88.

100 50 0 100 200
SCALE: 1"=100'

NO.	REVISION	DATE

SHEET TITLE: APRIL VOLUME CHANGE JANUARY 2023 TO APRIL 2023

PROJECT TITLE: MONTHLY TOPOGRAPHY ANALYSIS SOLID WASTE PERMIT #588

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

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PROJ. NO. 02222208.05
DSN. BY: SRB
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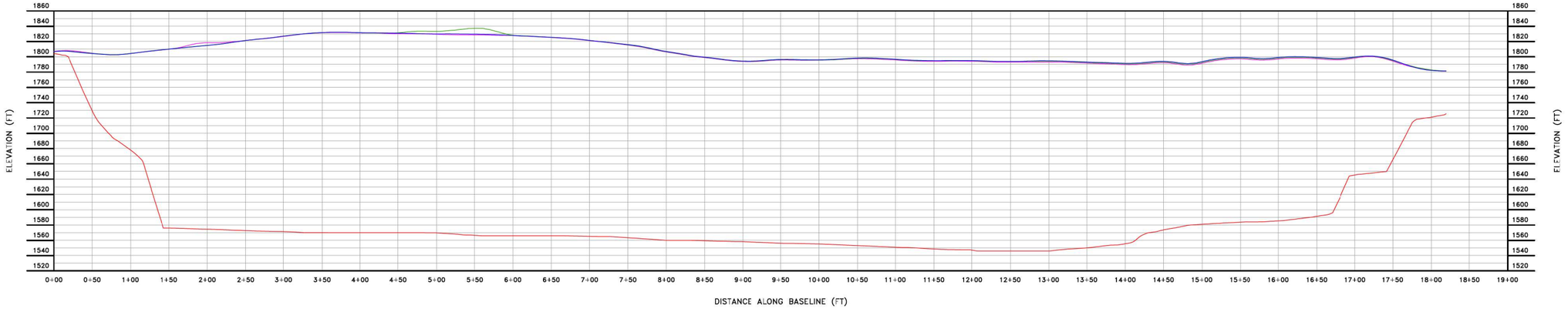
CHK. BY: CJW
Q/A RVW. BY: CJW
APP. BY: CJW

CADD FILE: SURF COMP
DATE: 5/8/2023
SCALE: 1" = 100'
DRAWING NO. 4 of 5

LONGITUDINAL PROFILE A ALIGN



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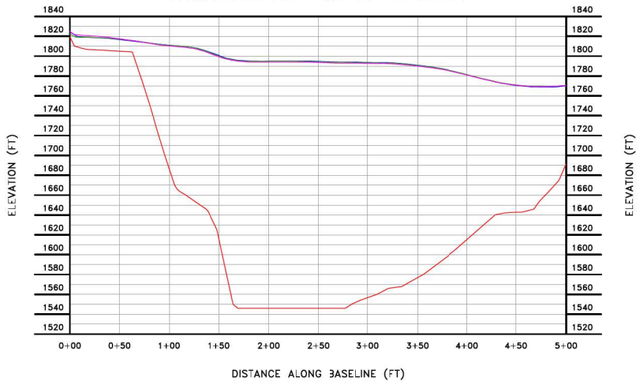

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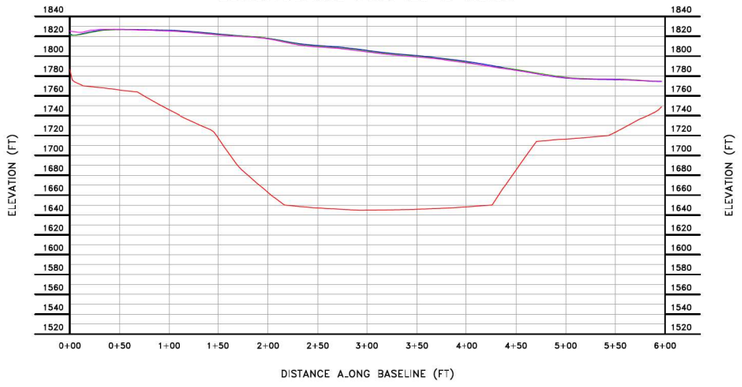

LEGEND

- BOTTOM LINER ELEVATION
- JANUARY 2023 TOPO
- MARCH 2023 TOPO
- APRIL 2023 TOPO

NO.	REVISION	DATE

SHEET TITLE: **PROFILES**

PROJECT TITLE: **MONTHLY TOPOGRAPHY ANALYSIS SOLID WASTE PERMIT #588**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
53 SOUTH MAIN STREET, MEDFORD, NJ 08055
PH. (609) 654-4000 SCSENGINEERS.COM

PROJ. NO. 02278208.05
DSN. BY: SRB
DWN. BY: CMW
CHK. BY: CJW
QA/A RVW. BY: CJW
APP. BY: CJW

CADD FILE: SURF COMP
DATE: 5/8/2023
SCALE: AS NOTED
DRAWING NO. **5** of **5**

Appendix F

Sample Collection Log and Lab Report

City of Bristol SWP 588 Landfill
Dual Phase LFG-EW Liquid Level Measurement Log

Date	4/12/2023							
Personnel	A. Minnick, T. Smith							
Location ID	Date	Well Casing Depth (ft)	Pump Depth (ft)	Cycle Count	Depth to Liquid (ft)	Casing Sickup (ft)	Liquid Column Thickness (ft)	Comments
EW-49	4/12/2023	96.15	90	439689	38.79	5.49	57.36	
EW-50	4/12/2023	77.70	83	845966	29.37	2.71	48.33	
EW-51	4/12/2023	92.80	95	---	28.12	3.32	64.68	
EW-52	4/12/2023	98.70	93	227417	36.10	2.41	62.60	
EW-53	4/12/2023	100.70	---	1852623	44.20	3.61	56.50	
EW-54	4/12/2023	82.70	75	241196	10.54	4.32	72.16	
EW-55	4/12/2023	90.40	90	000019	---	5.28	---	Cap stuck, unable to open
EW-56	4/12/2023	58.50	58	---	44.52	---	13.98	
EW-57	4/12/2023	107.40	71	263674	37.75	3.69	69.65	
EW-58	4/12/2023	84.50	82	1807642	27.42	4.98	57.08	Running
EW-59	4/12/2023	73.40	64	1561458	33.14	3.41	40.26	
EW-60	4/12/2023	81.80	70	166115	30.80	2.52	51.00	Running
EW-61	4/12/2023	87.80	66	212107	32.34	3.53	55.46	
EW-62	4/12/2023	110.60	80	114038	55.95	3.62	54.65	
EW-63	4/12/2023	62.10	64	48.74	42.41	4.09	19.69	
EW-64	4/12/2023	109.00	113	98055	62.85	6.41	46.15	
EW-65	4/12/2023	88.40	50	3967	41.62	5.23	46.78	
EW-67	4/12/2023	107.75	62.5	386149	38.42	4.21	69.33	
EW-68	4/12/2023	73.57	68	1844629	30.43	3.29	43.14	

--- = not applicable/available

Well casing depths measured on 12/20-21/2022 from top of PVC.

Well casing stickup - measured on 01/17/2023.

Log Checked By: J. Robb

City of Bristol SWP 588 Landfill
Dual Phase LFG-EW Sample Collection Log

Location ID	Sample Date	Sample Time	Temperature (°C)	pH (s.u.)	Specific Conductance (mS/cm)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Observations
EW-49	---	---	---	---	---	---	---	---	
EW-50	---	---	---	---	---	---	---	---	
EW-51	---	---	---	---	---	---	---	---	
EW-52	---	---	---	---	---	---	---	---	
EW-53	---	---	---	---	---	---	---	---	
EW-54	---	---	---	---	---	---	---	---	
EW-55	---	---	---	---	---	---	---	---	
EW-56	---	---	---	---	---	---	---	---	
EW-57	---	---	---	---	---	---	---	---	
EW-58	4/13/2023	8:20	49.1	7.12	13.85	0.66	-121.6	>1100	
EW-59	---	---	---	---	---	---	---	---	
EW-60	4/13/2023	8:35	2/21/1900	7.50	19.90	0.16	-184.3	>1100	
EW-61	---	---	---	---	---	---	---	---	
EW-62	---	---	---	---	---	---	---	---	
EW-63	---	---	---	---	---	---	---	---	
EW-64	---	---	---	---	---	---	---	---	
EW-65	---	---	---	---	---	---	---	---	
EW-67	---	---	---	---	---	---	---	---	
EW-68	---	---	---	---	---	---	---	---	

Sampler: A. Minnick, T. Smith

Samples Shipped By: Courier

Log Checked By: J. Robb (SCS)

Laboratory: Enthalpy Analytical

TNI Accredited
VELAP ID 460021

ENTHALPY ANALYTICAL

1941 Reymet Road ● Richmond, Virginia 23237 ● Tel: (804)-358-8295 Fax: (804)-358-8297

Certificate of Analysis

DRAFT REPORT

Laboratory Order ID 23D0768

Client Name:	SCS Engineers-Winchester 296 Victory Road Winchester, VA 22602	Date Received:	April 14, 2023 8:00
		Date Issued:	May 2, 2023 10:00
		Project Number:	2023 City of Bristol Landfill Le
Submitted To:	Jennifer Robb	Purchase Order:	
Client Site I.D.:	2023 City of Bristol Landfill Leachate		

Enclosed are the results of analyses for samples received by the laboratory on 04/14/2023 08:00. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

End Notes:
The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

Enthalpy Analytical
1941 Reymet Road
Richmond, VA 23237
(804)-358-8295 - Telephone
(804)-358-8297 - Fax

Analysis Detects Report

Date Issued: 5/2/2023 10:00:46AM

Client Name: SCS Engineers-Winchester
Client Site ID: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Laboratory Sample ID: **23D0768-01** **Client Sample ID:** **EW-58**

Parameter	Samp ID	Reference Method	Sample Results	Qual	LOD	LOQ	Dil. Factor	Units
Arsenic	01RE1	SW6020B	360		5.0	10	10	ug/L
Barium	01RE1	SW6020B	1210		10.0	50.0	10	ug/L
Cadmium	01	SW6020B	0.158	J	0.100	1.00	1	ug/L
Chromium	01RE1	SW6020B	306		4.00	10.0	10	ug/L
Copper	01	SW6020B	6.64		0.300	1.00	1	ug/L
Lead	01	SW6020B	2.2		1.0	1.0	1	ug/L
Nickel	01	SW6020B	114.3		1.000	1.000	1	ug/L
Selenium	01	SW6020B	1.89		0.850	1.00	1	ug/L
Zinc	01	SW6020B	53.9		2.50	5.00	1	ug/L
2-Butanone (MEK)	01RE1	SW8260D	3420		750	2500	250	ug/L
Acetone	01RE1	SW8260D	8290		1750	2500	250	ug/L
Benzene	01	SW8260D	3740		4.00	10.0	10	ug/L
Ethylbenzene	01	SW8260D	186		4.00	10.0	10	ug/L
Tetrahydrofuran	01	SW8260D	2410		100	100	10	ug/L
Toluene	01	SW8260D	303		5.00	10.0	10	ug/L
Xylenes, Total	01	SW8260D	329		10.0	30.0	10	ug/L
Ammonia as N	01	EPA350.1 R2.0	1410		73.1	100	1000	mg/L
BOD	01	SM22 5210B-2011	8430		0.2	2.0	1	mg/L
COD	01	SM22 5220D-2011	16800		2000	2000	200	mg/L
Nitrate+Nitrite as N	01RE1	SM22 4500-NO3F-2011	2.47		0.10	0.10	1	mg/L
TKN as N	01	EPA351.2 R2.0	1820		16.8	50.0	100	mg/L
Total Recoverable Phenolics	01	SW9065	18.7		0.300	0.500	1	mg/L

Enthalpy Analytical
1941 Reymet Road
Richmond, VA 23237
(804)-358-8295 - Telephone
(804)-358-8297 - Fax

Analysis Detects Report

Client Name: SCS Engineers-Winchester
Client Site ID: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Date Issued: 5/2/2023 10:00:46AM

Laboratory Sample ID: **23D0768-02** **Client Sample ID:** **EW-60**

Parameter	Samp ID	Reference Method	Sample Results	Qual	LOD	LOQ	Dil. Factor	Units
Arsenic	02	SW6020B	110		0.50	1.0	1	ug/L
Barium	02RE1	SW6020B	326		10.0	50.0	10	ug/L
Cadmium	02	SW6020B	0.333	J	0.100	1.00	1	ug/L
Chromium	02	SW6020B	142		0.400	1.00	1	ug/L
Copper	02	SW6020B	7.67		0.300	1.00	1	ug/L
Lead	02	SW6020B	6.7		1.0	1.0	1	ug/L
Mercury	02	SW7470A	0.00128		0.00020	0.00020	1	mg/L
Nickel	02	SW6020B	173.2		1.000	1.000	1	ug/L
Selenium	02	SW6020B	1.85		0.850	1.00	1	ug/L
Silver	02	SW6020B	0.110	J	0.0600	1.00	1	ug/L
Zinc	02RE1	SW6020B	414		25.0	50.0	10	ug/L
2-Butanone (MEK)	02RE1	SW8260D	5530		750	2500	250	ug/L
Acetone	02RE1	SW8260D	7560		1750	2500	250	ug/L
Benzene	02	SW8260D	320		4.00	10.0	10	ug/L
Ethylbenzene	02	SW8260D	43.4		4.00	10.0	10	ug/L
Tetrahydrofuran	02	SW8260D	4790		100	100	10	ug/L
Toluene	02	SW8260D	94.4		5.00	10.0	10	ug/L
Xylenes, Total	02	SW8260D	97.4		10.0	30.0	10	ug/L
Ammonia as N	02	EPA350.1 R2.0	1220		73.1	100	1000	mg/L
BOD	02	SM22 5210B-2011	2860		0.2	2.0	1	mg/L
COD	02	SM22 5220D-2011	7370		1000	1000	100	mg/L
TKN as N	02	EPA351.2 R2.0	1510		16.8	50.0	100	mg/L
Total Recoverable Phenolics	02	SW9065	5.10		0.300	0.500	1	mg/L

Note that this report is not the "Certificate of Analysis". This report only lists the target analytes that displayed concentrations that exceeded the detection limit specified for that analyte. For a complete listing of all analytes requested and the results of the analysis see the " Certificate of Analysis".

Enthalpy Analytical
1941 Reymet Road
Richmond, Virginia 23237
(804)-358-8295 - Telephone
(804)-358-8297 - Fax

Certificate of Analysis

Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM
Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EW-58	23D0768-01	Ground Water	04/13/2023 08:20	04/14/2023 08:00
EW-60	23D0768-02	Ground Water	04/13/2023 08:35	04/14/2023 08:00
Trip Blank	23D0768-03	Ground Water	03/30/2023 11:45	04/14/2023 08:00

ENTHALPY ANALYTICAL

Enthalpy Analytical
1941 Reymet Road
Richmond, Virginia 23237
(804)-358-8295 - Telephone
(804)-358-8297 - Fax

Certificate of Analysis

Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM
Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Client Sample ID: **EW-58** **Laboratory Sample ID:** **23D0768-01**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Metals (Total) by EPA 6000/7000 Series Methods												
Silver	01	7440-22-4	SW6020B	04/27/2023 10:45	04/28/2023 10:21	BLOD		0.0600	1.00	1	ug/L	AB
Arsenic	01RE1	7440-38-2	SW6020B	04/27/2023 10:45	04/28/2023 10:28	360		5.0	10	10	ug/L	AB
Barium	01RE1	7440-39-3	SW6020B	04/27/2023 10:45	04/28/2023 10:28	1210		10.0	50.0	10	ug/L	AB
Cadmium	01	7440-43-9	SW6020B	04/27/2023 10:45	04/28/2023 10:21	0.158	J	0.100	1.00	1	ug/L	AB
Chromium	01RE1	7440-47-3	SW6020B	04/27/2023 10:45	04/28/2023 10:28	306		4.00	10.0	10	ug/L	AB
Copper	01	7440-50-8	SW6020B	04/27/2023 10:45	04/28/2023 10:21	6.64		0.300	1.00	1	ug/L	AB
Mercury	01	7439-97-6	SW7470A	04/19/2023 09:40	04/19/2023 14:23	BLOD		0.00040	0.00040	1	mg/L	SGT
Nickel	01	7440-02-0	SW6020B	04/27/2023 10:45	04/28/2023 10:21	114.3		1.000	1.000	1	ug/L	AB
Lead	01	7439-92-1	SW6020B	04/27/2023 10:45	04/28/2023 10:21	2.2		1.0	1.0	1	ug/L	AB
Selenium	01	7782-49-2	SW6020B	04/27/2023 10:45	04/28/2023 10:21	1.89		0.850	1.00	1	ug/L	AB
Zinc	01	7440-66-6	SW6020B	04/27/2023 10:45	04/28/2023 10:21	53.9		2.50	5.00	1	ug/L	AB
Volatile Organic Compounds by GCMS												
2-Butanone (MEK)	01RE1	78-93-3	SW8260D	04/19/2023 20:34	04/19/2023 20:34	3420		750	2500	250	ug/L	TLH
Acetone	01RE1	67-64-1	SW8260D	04/19/2023 20:34	04/19/2023 20:34	8290		1750	2500	250	ug/L	TLH
Benzene	01	71-43-2	SW8260D	04/18/2023 16:45	04/18/2023 16:45	3740		4.00	10.0	10	ug/L	RJB
Ethylbenzene	01	100-41-4	SW8260D	04/18/2023 16:45	04/18/2023 16:45	186		4.00	10.0	10	ug/L	RJB
Toluene	01	108-88-3	SW8260D	04/18/2023 16:45	04/18/2023 16:45	303		5.00	10.0	10	ug/L	RJB
Xylenes, Total	01	1330-20-7	SW8260D	04/18/2023 16:45	04/18/2023 16:45	329		10.0	30.0	10	ug/L	RJB
Tetrahydrofuran	01	109-99-9	SW8260D	04/18/2023 16:45	04/18/2023 16:45	2410		100	100	10	ug/L	RJB
Surr: 1,2-Dichloroethane-d4 (Surr)	*01*	*114 %*	*70-120*	*04/18/2023 16:45*	*04/18/2023 16:45*							
Surr: 4-Bromofluorobenzene (Surr)	*01*	*109 %*	*75-120*	*04/18/2023 16:45*	*04/18/2023 16:45*							
Surr: Dibromofluoromethane (Surr)	*01*	*103 %*	*70-130*	*04/18/2023 16:45*	*04/18/2023 16:45*							
Surr: Toluene-d8 (Surr)	*01*	*102 %*	*70-130*	*04/18/2023 16:45*	*04/18/2023 16:45*							
Surr: 1,2-Dichloroethane-d4 (Surr)	*01RE1*	*91.2 %*	*70-120*	*04/19/2023 20:34*	*04/19/2023 20:34*							
Surr: 4-Bromofluorobenzene (Surr)	*01RE1*	*95.1 %*	*75-120*	*04/19/2023 20:34*	*04/19/2023 20:34*							

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Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM
Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Client Sample ID: **EW-58** **Laboratory Sample ID:** **23D0768-01**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Volatile Organic Compounds by GCMS												
Surr: Dibromofluoromethane (Surr)	*01RE1*	*103 %*	*70-130*	*04/19/2023 20:34*	*04/19/2023 20:34*							
Surr: Toluene-d8 (Surr)	*01RE1*	*96.9 %*	*70-130*	*04/19/2023 20:34*	*04/19/2023 20:34*							
Semivolatile Organic Compounds by GCMS												
Anthracene	01	120-12-7	SW8270E	04/17/2023 09:10	04/17/2023 18:47	BLOD		37.4	74.8	4	ug/L	BMS
Surr: 2,4,6-Tribromophenol (Surr)	*01*	*%*	*5-136*	*04/17/2023 09:10*	*04/17/2023 18:47*							*DS*
Surr: 2-Fluorobiphenyl (Surr)	*01*	*%*	*9-117*	*04/17/2023 09:10*	*04/17/2023 18:47*							*DS*
Surr: 2-Fluorophenol (Surr)	*01*	*%*	*5-60*	*04/17/2023 09:10*	*04/17/2023 18:47*							*DS*
Surr: Nitrobenzene-d5 (Surr)	*01*	*%*	*5-151*	*04/17/2023 09:10*	*04/17/2023 18:47*							*DS*
Surr: Phenol-d5 (Surr)	*01*	*0.560 %*	*5-60*	*04/17/2023 09:10*	*04/17/2023 18:47*							*DS*
Surr: p-Terphenyl-d14 (Surr)	*01*	*15.2 %*	*5-141*	*04/17/2023 09:10*	*04/17/2023 18:47*							

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Client Sample ID: **EW-58** **Laboratory Sample ID:** **23D0768-01**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Wet Chemistry Analysis												
Ammonia as N	01	7664-41-7	EPA350.1 R2.0	04/25/2023 12:41	04/25/2023 12:41	1410		73.1	100	1000	mg/L	SPH
BOD	01	E1640606	SM22 5210B-2011	04/14/2023 15:14	04/14/2023 15:14	8430		0.2	2.0	1	mg/L	LAM
COD	01	NA	SM22 5220D-2011	04/19/2023 09:30	04/19/2023 09:30	16800		2000	2000	200	mg/L	MGC
Nitrate as N	01	14797-55-8	Calc.	04/20/2023 14:53	04/20/2023 14:53	BLOD		0.600	2.60	50	mg/L	NBT
Nitrate+Nitrite as N	01RE1	E701177	SM22 4500-NO3F-2011	04/20/2023 14:53	04/20/2023 14:53	2.47		0.10	0.10	1	mg/L	NBT
Nitrite as N	01	14797-65-0	SM22 4500-NO2B-2011	04/14/2023 16:15	04/14/2023 16:15	BLOD		0.50	2.50	50	mg/L	LTN
Total Recoverable Phenolics	01	NA	SW9065	04/17/2023 16:26	04/17/2023 16:26	18.7		0.300	0.500	1	mg/L	MAH
TKN as N	01	E17148461	EPA351.2 R2.0	04/17/2023 15:40	04/17/2023 15:40	1820		16.8	50.0	100	mg/L	AAL

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Client Sample ID: **EW-60** **Laboratory Sample ID:** **23D0768-02**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Metals (Total) by EPA 6000/7000 Series Methods												
Silver	02	7440-22-4	SW6020B	04/27/2023 10:45	04/28/2023 10:24	0.110	J	0.0600	1.00	1	ug/L	AB
Arsenic	02	7440-38-2	SW6020B	04/27/2023 10:45	04/28/2023 10:24	110		0.50	1.0	1	ug/L	AB
Barium	02RE1	7440-39-3	SW6020B	04/27/2023 10:45	04/28/2023 10:31	326		10.0	50.0	10	ug/L	AB
Cadmium	02	7440-43-9	SW6020B	04/27/2023 10:45	04/28/2023 10:24	0.333	J	0.100	1.00	1	ug/L	AB
Chromium	02	7440-47-3	SW6020B	04/27/2023 10:45	04/28/2023 10:24	142		0.400	1.00	1	ug/L	AB
Copper	02	7440-50-8	SW6020B	04/27/2023 10:45	04/28/2023 10:24	7.67		0.300	1.00	1	ug/L	AB
Mercury	02	7439-97-6	SW7470A	04/19/2023 09:40	04/19/2023 14:30	0.00128		0.00020	0.00020	1	mg/L	SGT
Nickel	02	7440-02-0	SW6020B	04/27/2023 10:45	04/28/2023 10:24	173.2		1.000	1.000	1	ug/L	AB
Lead	02	7439-92-1	SW6020B	04/27/2023 10:45	04/28/2023 10:24	6.7		1.0	1.0	1	ug/L	AB
Selenium	02	7782-49-2	SW6020B	04/27/2023 10:45	04/28/2023 10:24	1.85		0.850	1.00	1	ug/L	AB
Zinc	02RE1	7440-66-6	SW6020B	04/27/2023 10:45	04/28/2023 10:31	414		25.0	50.0	10	ug/L	AB

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Client Sample ID: **EW-60** **Laboratory Sample ID:** **23D0768-02**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Volatile Organic Compounds by GCMS												
2-Butanone (MEK)	02RE1	78-93-3	SW8260D	04/19/2023 21:00	04/19/2023 21:00	5530		750	2500	250	ug/L	TLH
Acetone	02RE1	67-64-1	SW8260D	04/19/2023 21:00	04/19/2023 21:00	7560		1750	2500	250	ug/L	TLH
Benzene	02	71-43-2	SW8260D	04/18/2023 17:08	04/18/2023 17:08	320		4.00	10.0	10	ug/L	RJB
Ethylbenzene	02	100-41-4	SW8260D	04/18/2023 17:08	04/18/2023 17:08	43.4		4.00	10.0	10	ug/L	RJB
Toluene	02	108-88-3	SW8260D	04/18/2023 17:08	04/18/2023 17:08	94.4		5.00	10.0	10	ug/L	RJB
Xylenes, Total	02	1330-20-7	SW8260D	04/18/2023 17:08	04/18/2023 17:08	97.4		10.0	30.0	10	ug/L	RJB
Tetrahydrofuran	02	109-99-9	SW8260D	04/18/2023 17:08	04/18/2023 17:08	4790		100	100	10	ug/L	RJB
Surr: 1,2-Dichloroethane-d4 (Surr)	*02*		*114 %*	*70-120*	*04/18/2023 17:08*	*04/18/2023 17:08*						
Surr: 4-Bromofluorobenzene (Surr)	*02*		*110 %*	*75-120*	*04/18/2023 17:08*	*04/18/2023 17:08*						
Surr: Dibromofluoromethane (Surr)	*02*		*103 %*	*70-130*	*04/18/2023 17:08*	*04/18/2023 17:08*						
Surr: Toluene-d8 (Surr)	*02*		*102 %*	*70-130*	*04/18/2023 17:08*	*04/18/2023 17:08*						
Surr: 1,2-Dichloroethane-d4 (Surr)	*02RE1*		*90.9 %*	*70-120*	*04/19/2023 21:00*	*04/19/2023 21:00*						
Surr: 4-Bromofluorobenzene (Surr)	*02RE1*		*95.8 %*	*75-120*	*04/19/2023 21:00*	*04/19/2023 21:00*						
Surr: Dibromofluoromethane (Surr)	*02RE1*		*102 %*	*70-130*	*04/19/2023 21:00*	*04/19/2023 21:00*						
Surr: Toluene-d8 (Surr)	*02RE1*		*96.4 %*	*70-130*	*04/19/2023 21:00*	*04/19/2023 21:00*						
Semivolatile Organic Compounds by GCMS												
Anthracene	02	120-12-7	SW8270E	04/17/2023 09:10	04/17/2023 19:22	BLOD		38.8	77.7	4	ug/L	BMS
Surr: 2,4,6-Tribromophenol (Surr)	*02*		*154 %*	*5-136*	*04/17/2023 09:10*	*04/17/2023 19:22*						*DS*
Surr: 2-Fluorobiphenyl (Surr)	*02*		*%*	*9-117*	*04/17/2023 09:10*	*04/17/2023 19:22*						*DS*
Surr: 2-Fluorophenol (Surr)	*02*		*0.0800 %*	*5-60*	*04/17/2023 09:10*	*04/17/2023 19:22*						*DS*
Surr: Nitrobenzene-d5 (Surr)	*02*		*%*	*5-151*	*04/17/2023 09:10*	*04/17/2023 19:22*						*DS*
Surr: Phenol-d5 (Surr)	*02*		*0.400 %*	*5-60*	*04/17/2023 09:10*	*04/17/2023 19:22*						*DS*
Surr: p-Terphenyl-d14 (Surr)	*02*		*40.6 %*	*5-141*	*04/17/2023 09:10*	*04/17/2023 19:22*						

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Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Client Sample ID: **EW-60** **Laboratory Sample ID:** **23D0768-02**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Wet Chemistry Analysis												
Ammonia as N	02	7664-41-7	EPA350.1 R2.0	04/25/2023 12:41	04/25/2023 12:41	1220		73.1	100	1000	mg/L	SPH
BOD	02	E1640606	SM22 5210B-2011	04/14/2023 15:15	04/14/2023 15:15	2860		0.2	2.0	1	mg/L	LAM
COD	02	NA	SM22 5220D-2011	04/19/2023 09:30	04/19/2023 09:30	7370		1000	1000	100	mg/L	MGC
Nitrate as N	02	14797-55-8	Calc.	04/20/2023 13:23	04/20/2023 13:23	BLOD		0.600	2.60	50	mg/L	LTN
Nitrate+Nitrite as N	02	E701177	SM22 4500-NO3F-2011	04/20/2023 13:23	04/20/2023 13:23	BLOD		0.10	0.10	1	mg/L	NBT
Nitrite as N	02	14797-65-0	SM22 4500-NO2B-2011	04/14/2023 16:15	04/14/2023 16:15	BLOD		0.50	2.50	50	mg/L	LTN
Total Recoverable Phenolics	02	NA	SW9065	04/17/2023 16:26	04/17/2023 16:26	5.10		0.300	0.500	1	mg/L	MAH
TKN as N	02	E17148461	EPA351.2 R2.0	04/17/2023 15:40	04/17/2023 15:40	1510		16.8	50.0	100	mg/L	AAL

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Client Sample ID: **Trip Blank** **Laboratory Sample ID:** **23D0768-03**

Parameter	Samp ID	CAS	Reference Method	Sample Prep Date/Time	Analyzed Date/Time	Sample Results	Qual	LOD	LOQ	DF	Units	Analyst
Volatile Organic Compounds by GCMS												
2-Butanone (MEK)	03	78-93-3	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		3.00	10.0	1	ug/L	RJB
Acetone	03	67-64-1	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		7.00	10.0	1	ug/L	RJB
Benzene	03	71-43-2	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		0.40	1.00	1	ug/L	RJB
Ethylbenzene	03	100-41-4	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		0.40	1.00	1	ug/L	RJB
Toluene	03	108-88-3	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		0.50	1.00	1	ug/L	RJB
Xylenes, Total	03	1330-20-7	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		1.00	3.00	1	ug/L	RJB
Tetrahydrofuran	03	109-99-9	SW8260D	04/18/2023 13:15	04/18/2023 13:15	BLOD		10.0	10.0	1	ug/L	RJB
Surr: 1,2-Dichloroethane-d4 (Surr)	*03*		*109 %*	*70-120*	*04/18/2023 13:15*	*04/18/2023 13:15*						
Surr: 4-Bromofluorobenzene (Surr)	*03*		*109 %*	*75-120*	*04/18/2023 13:15*	*04/18/2023 13:15*						
Surr: Dibromofluoromethane (Surr)	*03*		*102 %*	*70-130*	*04/18/2023 13:15*	*04/18/2023 13:15*						
Surr: Toluene-d8 (Surr)	*03*		*102 %*	*70-130*	*04/18/2023 13:15*	*04/18/2023 13:15*						

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Metals (Total) by EPA 6000/7000 Series Methods - Quality Control

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Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0656 - SW7470A										
Blank (BGD0656-BLK1)				Prepared & Analyzed: 04/19/2023						
Mercury	ND	0.00020	mg/L							
LCS (BGD0656-BS1)				Prepared & Analyzed: 04/19/2023						
Mercury	0.00248	0.00020	mg/L	0.00250		99.1	80-120			
Matrix Spike (BGD0656-MS1)	**Source: 23D0719-01**			Prepared & Analyzed: 04/19/2023						
Mercury	0.00228	0.00020	mg/L	0.00250	BLOD	91.0	80-120			
Matrix Spike Dup (BGD0656-MSD1)	**Source: 23D0719-01**			Prepared & Analyzed: 04/19/2023						
Mercury	0.00223	0.00020	mg/L	0.00250	BLOD	89.2	80-120	2.00	20	
Batch BGD1007 - EPA200.8 R5.4										
Blank (BGD1007-BLK1)				Prepared: 04/27/2023 Analyzed: 04/28/2023						
Arsenic	ND	1.0	ug/L							
Barium	ND	5.00	ug/L							
Cadmium	ND	1.00	ug/L							
Chromium	ND	1.00	ug/L							
Copper	ND	1.00	ug/L							
Lead	ND	1.0	ug/L							
Nickel	ND	1.000	ug/L							
Selenium	ND	1.00	ug/L							
Silver	ND	1.00	ug/L							
Zinc	ND	5.00	ug/L							
LCS (BGD1007-BS1)				Prepared: 04/27/2023 Analyzed: 04/28/2023						
Arsenic	53	1.0	ug/L	50.0		106	80-120			
Barium	51.4	5.00	ug/L	50.0		103	80-120			

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Metals (Total) by EPA 6000/7000 Series Methods - Quality Control

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Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD1007 - EPA200.8 R5.4										
LCS (BGD1007-BS1)				Prepared: 04/27/2023 Analyzed: 04/28/2023						
Cadmium	51.7	1.00	ug/L	50.0		103	80-120			
Chromium	52.5	1.00	ug/L	50.0		105	80-120			
Copper	52.3	1.00	ug/L	50.0		105	80-120			
Lead	49	1.0	ug/L	50.0		98.0	80-120			
Nickel	51.47	1.000	ug/L	50.0		103	80-120			
Selenium	52.3	1.00	ug/L	50.0		105	80-120			
Silver	10.2	1.00	ug/L	10.0		102	80-120			E
Zinc	52.9	5.00	ug/L	50.0		106	80-120			
Matrix Spike (BGD1007-MS1)	**Source: 23D0744-04**			Prepared: 04/27/2023 Analyzed: 04/28/2023						
Arsenic	52	1.0	ug/L	50.0	BLOD	105	75-125			
Barium	78.7	5.00	ug/L	50.0	26.8	104	75-125			
Cadmium	51.8	1.00	ug/L	50.0	BLOD	104	75-125			
Chromium	53.9	1.00	ug/L	50.0	1.61	105	75-125			
Copper	50.7	1.00	ug/L	50.0	1.35	98.7	75-125			
Lead	47	1.0	ug/L	50.0	BLOD	93.6	75-125			
Nickel	50.02	1.000	ug/L	50.0	BLOD	100	75-125			
Selenium	52.3	1.00	ug/L	50.0	1.64	101	75-125			
Silver	10.2	1.00	ug/L	10.0	BLOD	102	75-125			E
Zinc	55.3	5.00	ug/L	50.0	5.62	99.4	75-125			
Matrix Spike Dup (BGD1007-MSD1)	**Source: 23D0744-04**			Prepared: 04/27/2023 Analyzed: 04/28/2023						
Arsenic	54	1.0	ug/L	50.0	BLOD	107	75-125	2.05	20	
Barium	79.1	5.00	ug/L	50.0	26.8	105	75-125	0.531	20	
Cadmium	52.4	1.00	ug/L	50.0	BLOD	105	75-125	1.12	20	
Chromium	54.3	1.00	ug/L	50.0	1.61	105	75-125	0.710	20	

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Metals (Total) by EPA 6000/7000 Series Methods - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD1007 - EPA200.8 R5.4										
Matrix Spike Dup (BGD1007-MSD1)	**Source: 23D0744-04**			Prepared: 04/27/2023 Analyzed: 04/28/2023						
Copper	51.2	1.00	ug/L	50.0	1.35	99.7	75-125	0.971	20	
Lead	48	1.0	ug/L	50.0	BLOD	95.5	75-125	2.01	20	
Nickel	50.23	1.000	ug/L	50.0	BLOD	100	75-125	0.409	20	
Selenium	53.2	1.00	ug/L	50.0	1.64	103	75-125	1.72	20	
Silver	10.3	1.00	ug/L	10.0	BLOD	103	75-125	0.402	20	E
Zinc	55.9	5.00	ug/L	50.0	5.62	101	75-125	1.04	20	

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Blank (BGD0619-BLK1)				Prepared & Analyzed: 04/18/2023						
2-Butanone (MEK)	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.00	ug/L							
Ethylbenzene	ND	1.00	ug/L							
Toluene	ND	1.00	ug/L							
Xylenes, Total	ND	3.00	ug/L							
Tetrahydrofuran	ND	10.0	ug/L							
Surr: 1,2-Dichloroethane-d4 (Surr)	*54.2*		ug/L	*50.0*		*108*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*55.0*		ug/L	*50.0*		*110*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*51.4*		ug/L	*50.0*		*103*	*70-130*			
Surr: Toluene-d8 (Surr)	*51.2*		ug/L	*50.0*		*102*	*70-130*			
LCS (BGD0619-BS1)				Prepared & Analyzed: 04/18/2023						
1,1,1,2-Tetrachloroethane	52.0	0.4	ug/L	50.0		104	80-130			
1,1,1-Trichloroethane	61.9	1	ug/L	50.0		124	65-130			
1,1,2,2-Tetrachloroethane	66.2	0.4	ug/L	50.0		132	65-130			L
1,1,2-Trichloroethane	61.5	1	ug/L	50.0		123	75-125			
1,1-Dichloroethane	62.2	1	ug/L	50.0		124	70-135			
1,1-Dichloroethylene	52.9	1	ug/L	50.0		106	70-130			
1,1-Dichloropropene	61.3	1	ug/L	50.0		123	75-135			
1,2,3-Trichlorobenzene	46.7	1	ug/L	50.0		93.5	55-140			
1,2,3-Trichloropropane	65.1	1	ug/L	50.0		130	75-125			L
1,2,4-Trichlorobenzene	59.8	1	ug/L	50.0		120	65-135			
1,2,4-Trimethylbenzene	62.8	1	ug/L	50.0		126	75-130			
1,2-Dibromo-3-chloropropane (DBCP)	53.4	1	ug/L	50.0		107	50-130			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
LCS (BGD0619-BS1)				Prepared & Analyzed: 04/18/2023						
1,2-Dibromoethane (EDB)	60.9	1	ug/L	50.0		122	80-120			
1,2-Dichlorobenzene	61.2	0.5	ug/L	50.0		122	70-120			L
1,2-Dichloroethane	59.3	1	ug/L	50.0		119	70-130			
1,2-Dichloropropane	58.9	0.5	ug/L	50.0		118	75-125			
1,3,5-Trimethylbenzene	63.2	1	ug/L	50.0		126	75-125			L
1,3-Dichlorobenzene	63.2	1	ug/L	50.0		126	75-125			L
1,3-Dichloropropane	60.7	1	ug/L	50.0		121	75-125			
1,4-Dichlorobenzene	61.4	1	ug/L	50.0		123	75-125			
2,2-Dichloropropane	62.0	1	ug/L	50.0		124	70-135			
2-Butanone (MEK)	60.9	10	ug/L	50.0		122	30-150			
2-Chlorotoluene	62.3	1	ug/L	50.0		125	75-125			
2-Hexanone (MBK)	64.4	5	ug/L	50.0		129	55-130			
4-Chlorotoluene	62.1	1	ug/L	50.0		124	75-130			
4-Isopropyltoluene	61.1	1	ug/L	50.0		122	75-130			
4-Methyl-2-pentanone (MIBK)	64.4	5	ug/L	50.0		129	60-135			
Acetone	55.5	10	ug/L	50.0		111	40-140			
Benzene	58.2	1	ug/L	50.0		116	80-120			
Bromobenzene	63.0	1	ug/L	50.0		126	75-125			L
Bromochloromethane	61.2	1	ug/L	50.0		122	65-130			
Bromodichloromethane	63.0	0.5	ug/L	50.0		126	75-120			L
Bromoform	51.8	1	ug/L	50.0		104	70-130			
Bromomethane	47.5	1	ug/L	50.0		95.0	30-145			
Carbon disulfide	55.0	10	ug/L	50.0		110	35-160			
Carbon tetrachloride	55.8	1	ug/L	50.0		112	65-140			
Chlorobenzene	59.7	1	ug/L	50.0		119	80-120			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
LCS (BGD0619-BS1)				Prepared & Analyzed: 04/18/2023						
Chloroethane	58.2	1	ug/L	50.0		116	60-135			
Chloroform	57.0	0.5	ug/L	50.0		114	65-135			
Chloromethane	68.6	1	ug/L	50.0		137	40-125			L
cis-1,2-Dichloroethylene	60.1	1	ug/L	50.0		120	70-125			
cis-1,3-Dichloropropene	42.0	1	ug/L	50.0		84.1	70-130			
Dibromochloromethane	48.9	0.5	ug/L	50.0		97.8	60-135			
Dibromomethane	57.4	1	ug/L	50.0		115	75-125			
Dichlorodifluoromethane	65.1	1	ug/L	50.0		130	30-155			
Ethylbenzene	62.8	1	ug/L	50.0		126	75-125			L
Hexachlorobutadiene	60.6	0.8	ug/L	50.0		121	50-140			
Isopropylbenzene	60.9	1	ug/L	50.0		122	75-125			
m+p-Xylenes	119	2	ug/L	100		119	75-130			
Methylene chloride	57.4	4	ug/L	50.0		115	55-140			
Methyl-t-butyl ether (MTBE)	64.7	1	ug/L	50.0		129	65-125			L
Naphthalene	45.1	1	ug/L	50.0		90.2	55-140			
n-Butylbenzene	61.4	1	ug/L	50.0		123	70-135			
n-Propylbenzene	61.6	1	ug/L	50.0		123	70-130			
o-Xylene	62.6	1	ug/L	50.0		125	80-120			L
sec-Butylbenzene	64.4	1	ug/L	50.0		129	70-125			L
Styrene	48.9	1	ug/L	50.0		97.8	65-135			
tert-Butylbenzene	62.1	1	ug/L	50.0		124	70-130			
Tetrachloroethylene (PCE)	58.0	1	ug/L	50.0		116	45-150			
Toluene	58.9	1	ug/L	50.0		118	75-120			
trans-1,2-Dichloroethylene	59.9	1	ug/L	50.0		120	60-140			
trans-1,3-Dichloropropene	45.2	1	ug/L	50.0		90.4	55-140			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
LCS (BGD0619-BS1)				Prepared & Analyzed: 04/18/2023						
Trichloroethylene	57.0	1	ug/L	50.0		114	70-125			
Trichlorofluoromethane	61.3	1	ug/L	50.0		123	60-145			
Vinyl chloride	56.8	0.5	ug/L	50.0		114	50-145			
Surr: 1,2-Dichloroethane-d4 (Surr)	*55.2*		ug/L	*50.0*		*110*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*53.0*		ug/L	*50.0*		*106*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*54.5*		ug/L	*50.0*		*109*	*70-130*			
Surr: Toluene-d8 (Surr)	*50.5*		ug/L	*50.0*		*101*	*70-130*			
Matrix Spike (BGD0619-MS1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
1,1,1,2-Tetrachloroethane	55.8	0.4	ug/L	50.0	BLOD	112	80-130			
1,1,1-Trichloroethane	64.2	1	ug/L	50.0	BLOD	128	65-130			
1,1,2,2-Tetrachloroethane	75.3	0.4	ug/L	50.0	BLOD	151	65-130			M
1,1,2-Trichloroethane	69.8	1	ug/L	50.0	BLOD	140	75-125			M
1,1-Dichloroethane	66.1	1	ug/L	50.0	BLOD	132	70-135			
1,1-Dichloroethylene	55.0	1	ug/L	50.0	BLOD	110	50-145			
1,1-Dichloropropene	63.7	1	ug/L	50.0	BLOD	127	75-135			
1,2,3-Trichlorobenzene	51.1	1	ug/L	50.0	BLOD	102	55-140			
1,2,3-Trichloropropane	72.7	1	ug/L	50.0	BLOD	145	75-125			M
1,2,4-Trichlorobenzene	63.8	1	ug/L	50.0	BLOD	128	65-135			
1,2,4-Trimethylbenzene	65.7	1	ug/L	50.0	BLOD	131	75-130			M
1,2-Dibromo-3-chloropropane (DBCP)	60.8	1	ug/L	50.0	BLOD	122	50-130			
1,2-Dibromoethane (EDB)	68.8	1	ug/L	50.0	BLOD	138	80-120			M
1,2-Dichlorobenzene	65.5	0.5	ug/L	50.0	BLOD	131	70-120			M
1,2-Dichloroethane	65.9	1	ug/L	50.0	BLOD	132	70-130			M
1,2-Dichloropropane	64.3	0.5	ug/L	50.0	BLOD	129	75-125			M

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Matrix Spike (BGD0619-MS1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
1,3,5-Trimethylbenzene	65.4	1	ug/L	50.0	BLOD	131	75-124			M
1,3-Dichlorobenzene	66.3	1	ug/L	50.0	BLOD	133	75-125			M
1,3-Dichloropropane	68.6	1	ug/L	50.0	BLOD	137	75-125			M
1,4-Dichlorobenzene	64.8	1	ug/L	50.0	BLOD	130	75-125			M
2,2-Dichloropropane	64.8	1	ug/L	50.0	BLOD	130	70-135			
2-Butanone (MEK)	78.1	10	ug/L	50.0	BLOD	151	30-150			M
2-Chlorotoluene	64.4	1	ug/L	50.0	BLOD	129	75-125			M
2-Hexanone (MBK)	68.3	5	ug/L	50.0	BLOD	137	55-130			M
4-Chlorotoluene	64.2	1	ug/L	50.0	BLOD	128	75-130			
4-Isopropyltoluene	63.5	1	ug/L	50.0	BLOD	127	75-130			
4-Methyl-2-pentanone (MIBK)	70.9	5	ug/L	50.0	BLOD	142	60-135			M
Acetone	82.8	10	ug/L	50.0	25.0	116	40-140			
Benzene	61.9	1	ug/L	50.0	BLOD	124	80-120			M
Bromobenzene	67.6	1	ug/L	50.0	BLOD	135	75-125			M
Bromochloromethane	68.0	1	ug/L	50.0	BLOD	136	65-130			M
Bromodichloromethane	68.4	0.5	ug/L	50.0	BLOD	137	75-136			M
Bromoform	59.3	1	ug/L	50.0	BLOD	119	70-130			
Bromomethane	49.2	1	ug/L	50.0	BLOD	98.4	30-145			
Carbon disulfide	55.4	10	ug/L	50.0	BLOD	111	35-160			
Carbon tetrachloride	57.6	1	ug/L	50.0	BLOD	115	65-140			
Chlorobenzene	62.8	1	ug/L	50.0	BLOD	126	80-120			M
Chloroethane	61.8	1	ug/L	50.0	BLOD	124	60-135			
Chloroform	61.2	0.5	ug/L	50.0	BLOD	122	65-135			
Chloromethane	75.0	1	ug/L	50.0	BLOD	150	40-125			M
cis-1,2-Dichloroethylene	64.7	1	ug/L	50.0	BLOD	129	70-125			M

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Matrix Spike (BGD0619-MS1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
cis-1,3-Dichloropropene	46.2	1	ug/L	50.0	BLOD	92.5	47-136			
Dibromochloromethane	55.7	0.5	ug/L	50.0	BLOD	111	60-135			
Dibromomethane	64.4	1	ug/L	50.0	BLOD	129	75-125			M
Dichlorodifluoromethane	67.5	1	ug/L	50.0	BLOD	135	30-155			
Ethylbenzene	64.8	1	ug/L	50.0	BLOD	130	75-125			M
Hexachlorobutadiene	60.5	0.8	ug/L	50.0	BLOD	121	50-140			
Isopropylbenzene	62.6	1	ug/L	50.0	BLOD	125	75-125			M
m+p-Xylenes	122	2	ug/L	100	BLOD	122	75-130			
Methylene chloride	62.2	4	ug/L	50.0	BLOD	123	55-140			
Methyl-t-butyl ether (MTBE)	74.2	1	ug/L	50.0	BLOD	148	65-125			M
Naphthalene	50.8	1	ug/L	50.0	BLOD	102	55-140			
n-Butylbenzene	63.9	1	ug/L	50.0	BLOD	128	70-135			
n-Propylbenzene	63.4	1	ug/L	50.0	BLOD	127	70-130			
o-Xylene	65.4	1	ug/L	50.0	BLOD	131	80-120			M
sec-Butylbenzene	65.7	1	ug/L	50.0	BLOD	131	70-125			M
Styrene	51.6	1	ug/L	50.0	BLOD	103	65-135			
tert-Butylbenzene	64.0	1	ug/L	50.0	BLOD	128	70-130			
Tetrachloroethylene (PCE)	55.1	1	ug/L	50.0	BLOD	110	51-231			
Toluene	61.8	1	ug/L	50.0	BLOD	124	75-120			M
trans-1,2-Dichloroethylene	62.8	1	ug/L	50.0	BLOD	126	60-140			
trans-1,3-Dichloropropene	50.8	1	ug/L	50.0	BLOD	102	55-140			
Trichloroethylene	59.4	1	ug/L	50.0	BLOD	119	70-125			
Trichlorofluoromethane	63.6	1	ug/L	50.0	BLOD	127	60-145			
Vinyl chloride	58.4	0.5	ug/L	50.0	BLOD	117	50-145			
Surr: 1,2-Dichloroethane-d4 (Surr)	*59.3*		ug/L	*50.0*		*119*	*70-120*			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Matrix Spike (BGD0619-MS1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
Surr: 4-Bromofluorobenzene (Surr)	*53.5*		ug/L	*50.0*		*107*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*56.2*		ug/L	*50.0*		*112*	*70-130*			
Surr: Toluene-d8 (Surr)	*50.7*		ug/L	*50.0*		*101*	*70-130*			
Matrix Spike Dup (BGD0619-MSD1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
1,1,1,2-Tetrachloroethane	53.5	0.4	ug/L	50.0	BLOD	107	80-130	4.13	30	
1,1,1-Trichloroethane	60.9	1	ug/L	50.0	BLOD	122	65-130	5.31	30	
1,1,2,2-Tetrachloroethane	74.0	0.4	ug/L	50.0	BLOD	148	65-130	1.71	30	M
1,1,2-Trichloroethane	68.6	1	ug/L	50.0	BLOD	137	75-125	1.74	30	M
1,1-Dichloroethane	62.5	1	ug/L	50.0	BLOD	125	70-135	5.57	30	
1,1-Dichloroethylene	52.0	1	ug/L	50.0	BLOD	104	50-145	5.57	30	
1,1-Dichloropropene	60.4	1	ug/L	50.0	BLOD	121	75-135	5.33	30	
1,2,3-Trichlorobenzene	49.3	1	ug/L	50.0	BLOD	98.5	55-140	3.63	30	
1,2,3-Trichloropropane	72.0	1	ug/L	50.0	BLOD	144	75-125	0.995	30	M
1,2,4-Trichlorobenzene	61.4	1	ug/L	50.0	BLOD	123	65-135	3.93	30	
1,2,4-Trimethylbenzene	61.8	1	ug/L	50.0	BLOD	124	75-130	6.07	30	
1,2-Dibromo-3-chloropropane (DBCP)	61.2	1	ug/L	50.0	BLOD	122	50-130	0.738	30	
1,2-Dibromoethane (EDB)	66.4	1	ug/L	50.0	BLOD	133	80-120	3.52	30	M
1,2-Dichlorobenzene	63.6	0.5	ug/L	50.0	BLOD	127	70-120	2.99	30	M
1,2-Dichloroethane	63.3	1	ug/L	50.0	BLOD	127	70-130	4.06	30	
1,2-Dichloropropane	61.8	0.5	ug/L	50.0	BLOD	124	75-125	3.89	30	
1,3,5-Trimethylbenzene	61.7	1	ug/L	50.0	BLOD	123	75-124	5.80	30	
1,3-Dichlorobenzene	62.6	1	ug/L	50.0	BLOD	125	75-125	5.74	30	M
1,3-Dichloropropane	66.8	1	ug/L	50.0	BLOD	134	75-125	2.57	30	M
1,4-Dichlorobenzene	62.4	1	ug/L	50.0	BLOD	125	75-125	3.79	30	

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Client Name: SCS Engineers-Winchester
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Client Site I.D.: 2023 City of Bristol Landfill Leachate
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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Matrix Spike Dup (BGD0619-MSD1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
2,2-Dichloropropane	61.1	1	ug/L	50.0	BLOD	122	70-135	6.02	30	
2-Butanone (MEK)	76.1	10	ug/L	50.0	BLOD	147	30-150	2.56	30	
2-Chlorotoluene	60.9	1	ug/L	50.0	BLOD	122	75-125	5.54	30	
2-Hexanone (MBK)	75.5	5	ug/L	50.0	BLOD	151	55-130	10.1	30	M
4-Chlorotoluene	61.4	1	ug/L	50.0	BLOD	123	75-130	4.49	30	
4-Isopropyltoluene	60.6	1	ug/L	50.0	BLOD	121	75-130	4.72	30	
4-Methyl-2-pentanone (MIBK)	79.0	5	ug/L	50.0	BLOD	158	60-135	10.7	30	M
Acetone	84.1	10	ug/L	50.0	25.0	118	40-140	1.52	30	
Benzene	59.1	1	ug/L	50.0	BLOD	118	80-120	4.63	30	
Bromobenzene	63.6	1	ug/L	50.0	BLOD	127	75-125	6.02	30	M
Bromochloromethane	64.8	1	ug/L	50.0	BLOD	130	65-130	4.70	30	
Bromodichloromethane	66.2	0.5	ug/L	50.0	BLOD	132	75-136	3.24	30	
Bromoform	58.2	1	ug/L	50.0	BLOD	116	70-130	1.96	30	
Bromomethane	45.0	1	ug/L	50.0	BLOD	90.0	30-145	8.87	30	
Carbon disulfide	56.3	10	ug/L	50.0	BLOD	113	35-160	1.66	30	
Carbon tetrachloride	55.1	1	ug/L	50.0	BLOD	110	65-140	4.60	30	
Chlorobenzene	59.6	1	ug/L	50.0	BLOD	119	80-120	5.21	30	
Chloroethane	56.3	1	ug/L	50.0	BLOD	113	60-135	9.23	30	
Chloroform	57.9	0.5	ug/L	50.0	BLOD	116	65-135	5.41	30	
Chloromethane	66.4	1	ug/L	50.0	BLOD	133	40-125	12.2	30	M
cis-1,2-Dichloroethylene	60.9	1	ug/L	50.0	BLOD	122	70-125	6.08	30	
cis-1,3-Dichloropropene	45.0	1	ug/L	50.0	BLOD	90.1	47-136	2.65	30	
Dibromochloromethane	54.4	0.5	ug/L	50.0	BLOD	109	60-135	2.40	30	
Dibromomethane	62.9	1	ug/L	50.0	BLOD	126	75-125	2.40	30	M
Dichlorodifluoromethane	62.0	1	ug/L	50.0	BLOD	124	30-155	8.55	30	

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0619 - SW5030B-MS										
Matrix Spike Dup (BGD0619-MSD1)	**Source: 23D0804-02**			Prepared & Analyzed: 04/18/2023						
Ethylbenzene	61.2	1	ug/L	50.0	BLOD	122	75-125	5.59	30	
Hexachlorobutadiene	58.9	0.8	ug/L	50.0	BLOD	118	50-140	2.70	30	
Isopropylbenzene	58.9	1	ug/L	50.0	BLOD	118	75-125	6.09	30	
m+p-Xylenes	115	2	ug/L	100	BLOD	115	75-130	5.71	30	
Methylene chloride	59.1	4	ug/L	50.0	BLOD	117	55-140	5.03	30	
Methyl-t-butyl ether (MTBE)	72.1	1	ug/L	50.0	BLOD	144	65-125	2.82	30	
Naphthalene	49.8	1	ug/L	50.0	BLOD	99.6	55-140	2.01	30	
n-Butylbenzene	60.1	1	ug/L	50.0	BLOD	120	70-135	6.02	30	
n-Propylbenzene	60.4	1	ug/L	50.0	BLOD	121	70-130	4.85	30	
o-Xylene	61.6	1	ug/L	50.0	BLOD	123	80-120	5.86	30	M
sec-Butylbenzene	62.6	1	ug/L	50.0	BLOD	125	70-125	4.77	30	M
Styrene	49.4	1	ug/L	50.0	BLOD	98.8	65-135	4.44	30	
tert-Butylbenzene	60.6	1	ug/L	50.0	BLOD	121	70-130	5.49	30	
Tetrachloroethylene (PCE)	52.6	1	ug/L	50.0	BLOD	105	51-231	4.53	30	
Toluene	59.6	1	ug/L	50.0	BLOD	119	75-120	3.54	30	
trans-1,2-Dichloroethylene	59.4	1	ug/L	50.0	BLOD	119	60-140	5.61	30	
trans-1,3-Dichloropropene	49.6	1	ug/L	50.0	BLOD	99.2	55-140	2.45	30	
Trichloroethylene	57.3	1	ug/L	50.0	BLOD	115	70-125	3.55	30	
Trichlorofluoromethane	59.7	1	ug/L	50.0	BLOD	119	60-145	6.39	30	
Vinyl chloride	53.3	0.5	ug/L	50.0	BLOD	107	50-145	9.09	30	
Surr: 1,2-Dichloroethane-d4 (Surr)	*59.4*		ug/L	*50.0*		*119*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*52.7*		ug/L	*50.0*		*105*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*55.5*		ug/L	*50.0*		*111*	*70-130*			
Surr: Toluene-d8 (Surr)	*50.7*		ug/L	*50.0*		*101*	*70-130*			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Blank (BGD0678-BLK1)				Prepared & Analyzed: 04/19/2023						
2-Butanone (MEK)	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.00	ug/L							
Ethylbenzene	ND	1.00	ug/L							
Toluene	ND	1.00	ug/L							
Xylenes, Total	ND	3.00	ug/L							
Surr: 1,2-Dichloroethane-d4 (Surr)	*43.1*		ug/L	*50.0*		*86.2*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*47.8*		ug/L	*50.0*		*95.7*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*51.7*		ug/L	*50.0*		*103*	*70-130*			
Surr: Toluene-d8 (Surr)	*48.3*		ug/L	*50.0*		*96.6*	*70-130*			
LCS (BGD0678-BS1)				Prepared & Analyzed: 04/19/2023						
1,1,1,2-Tetrachloroethane	49.4	0.4	ug/L	50.0		98.8	80-130			
1,1,1-Trichloroethane	45.5	1	ug/L	50.0		91.1	65-130			
1,1,2,2-Tetrachloroethane	43.7	0.4	ug/L	50.0		87.4	65-130			
1,1,2-Trichloroethane	46.3	1	ug/L	50.0		92.7	75-125			
1,1-Dichloroethane	43.6	1	ug/L	50.0		87.2	70-135			
1,1-Dichloroethylene	38.9	1	ug/L	50.0		77.8	70-130			
1,1-Dichloropropene	41.6	1	ug/L	50.0		83.2	75-135			
1,2,3-Trichlorobenzene	52.2	1	ug/L	50.0		104	55-140			
1,2,3-Trichloropropane	42.4	1	ug/L	50.0		84.8	75-125			
1,2,4-Trichlorobenzene	54.7	1	ug/L	50.0		109	65-135			
1,2,4-Trimethylbenzene	48.4	1	ug/L	50.0		96.8	75-130			
1,2-Dibromo-3-chloropropane (DBCP)	47.0	1	ug/L	50.0		93.9	50-130			
1,2-Dibromoethane (EDB)	44.2	1	ug/L	50.0		88.4	80-120			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
LCS (BGD0678-BS1)				Prepared & Analyzed: 04/19/2023						
1,2-Dichlorobenzene	46.8	0.5	ug/L	50.0		93.6	70-120			
1,2-Dichloroethane	36.6	1	ug/L	50.0		73.3	70-130			
1,2-Dichloropropane	40.4	0.5	ug/L	50.0		80.8	75-125			
1,3,5-Trimethylbenzene	46.0	1	ug/L	50.0		92.0	75-125			
1,3-Dichlorobenzene	47.3	1	ug/L	50.0		94.6	75-125			
1,3-Dichloropropane	43.8	1	ug/L	50.0		87.5	75-125			
1,4-Dichlorobenzene	46.3	1	ug/L	50.0		92.7	75-125			
2,2-Dichloropropane	45.6	1	ug/L	50.0		91.2	70-135			
2-Butanone (MEK)	36.1	10	ug/L	50.0		72.2	30-150			
2-Chlorotoluene	47.1	1	ug/L	50.0		94.2	75-125			
2-Hexanone (MBK)	38.4	5	ug/L	50.0		76.8	55-130			
4-Chlorotoluene	46.8	1	ug/L	50.0		93.6	75-130			
4-Isopropyltoluene	47.1	1	ug/L	50.0		94.3	75-130			
4-Methyl-2-pentanone (MIBK)	42.7	5	ug/L	50.0		85.4	60-135			
Acetone	33.3	10	ug/L	50.0		66.7	40-140			
Benzene	41.0	1	ug/L	50.0		82.0	80-120			
Bromobenzene	51.0	1	ug/L	50.0		102	75-125			
Bromochloromethane	41.5	1	ug/L	50.0		83.0	65-130			
Bromodichloromethane	48.5	0.5	ug/L	50.0		97.1	75-120			
Bromoform	49.3	1	ug/L	50.0		98.6	70-130			
Bromomethane	41.0	1	ug/L	50.0		82.0	30-145			
Carbon disulfide	40.9	10	ug/L	50.0		81.8	35-160			
Carbon tetrachloride	45.5	1	ug/L	50.0		91.0	65-140			
Chlorobenzene	47.5	1	ug/L	50.0		95.0	80-120			
Chloroethane	39.8	1	ug/L	50.0		79.7	60-135			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
LCS (BGD0678-BS1)				Prepared & Analyzed: 04/19/2023						
Chloroform	37.5	0.5	ug/L	50.0		75.0	65-135			
Chloromethane	44.1	1	ug/L	50.0		88.2	40-125			
cis-1,2-Dichloroethylene	41.4	1	ug/L	50.0		82.7	70-125			
cis-1,3-Dichloropropene	34.6	1	ug/L	50.0		69.3	70-130			L
Dibromochloromethane	49.4	0.5	ug/L	50.0		98.8	60-135			
Dibromomethane	42.2	1	ug/L	50.0		84.3	75-125			
Dichlorodifluoromethane	48.9	1	ug/L	50.0		97.8	30-155			
Ethylbenzene	48.1	1	ug/L	50.0		96.2	75-125			
Hexachlorobutadiene	53.3	0.8	ug/L	50.0		107	50-140			
Isopropylbenzene	45.8	1	ug/L	50.0		91.7	75-125			
m+p-Xylenes	95.8	2	ug/L	100		95.8	75-130			
Methylene chloride	39.3	4	ug/L	50.0		78.6	55-140			
Methyl-t-butyl ether (MTBE)	43.8	1	ug/L	50.0		87.6	65-125			
Naphthalene	55.8	1	ug/L	50.0		112	55-140			
n-Butylbenzene	48.6	1	ug/L	50.0		97.1	70-135			
n-Propylbenzene	47.0	1	ug/L	50.0		94.0	70-130			
o-Xylene	47.9	1	ug/L	50.0		95.8	80-120			
sec-Butylbenzene	49.4	1	ug/L	50.0		98.7	70-125			
Styrene	36.8	1	ug/L	50.0		73.6	65-135			
tert-Butylbenzene	47.4	1	ug/L	50.0		94.8	70-130			
Tetrachloroethylene (PCE)	52.3	1	ug/L	50.0		105	45-150			
Toluene	43.2	1	ug/L	50.0		86.4	75-120			
trans-1,2-Dichloroethylene	42.6	1	ug/L	50.0		85.3	60-140			
trans-1,3-Dichloropropene	37.5	1	ug/L	50.0		75.0	55-140			
Trichloroethylene	46.1	1	ug/L	50.0		92.3	70-125			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
LCS (BGD0678-BS1)				Prepared & Analyzed: 04/19/2023						
Trichlorofluoromethane	45.6	1	ug/L	50.0		91.1	60-145			
Vinyl chloride	47.7	0.5	ug/L	50.0		95.4	50-145			
Surr: 1,2-Dichloroethane-d4 (Surr)	*45.6*		ug/L	*50.0*		*91.2*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*50.8*		ug/L	*50.0*		*102*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*49.4*		ug/L	*50.0*		*98.7*	*70-130*			
Surr: Toluene-d8 (Surr)	*49.4*		ug/L	*50.0*		*98.7*	*70-130*			
Matrix Spike (BGD0678-MS1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
1,1,1,2-Tetrachloroethane	48.5	0.4	ug/L	50.0	BLOD	97.0	80-130			
1,1,1-Trichloroethane	43.9	1	ug/L	50.0	BLOD	87.7	65-130			
1,1,2,2-Tetrachloroethane	43.7	0.4	ug/L	50.0	BLOD	87.4	65-130			
1,1,2-Trichloroethane	43.8	1	ug/L	50.0	BLOD	87.7	75-125			
1,1-Dichloroethane	38.9	1	ug/L	50.0	BLOD	77.8	70-135			
1,1-Dichloroethylene	33.6	1	ug/L	50.0	BLOD	67.2	50-145			
1,1-Dichloropropene	40.8	1	ug/L	50.0	BLOD	81.6	75-135			
1,2,3-Trichlorobenzene	59.4	1	ug/L	50.0	BLOD	119	55-140			
1,2,3-Trichloropropane	44.3	1	ug/L	50.0	BLOD	88.6	75-125			
1,2,4-Trichlorobenzene	56.1	1	ug/L	50.0	BLOD	112	65-135			
1,2,4-Trimethylbenzene	47.5	1	ug/L	50.0	BLOD	95.0	75-130			
1,2-Dibromo-3-chloropropane (DBCP)	48.9	1	ug/L	50.0	BLOD	97.9	50-130			
1,2-Dibromoethane (EDB)	46.1	1	ug/L	50.0	BLOD	92.2	80-120			
1,2-Dichlorobenzene	46.3	0.5	ug/L	50.0	BLOD	92.5	70-120			
1,2-Dichloroethane	33.5	1	ug/L	50.0	BLOD	67.0	70-130			M
1,2-Dichloropropane	38.9	0.5	ug/L	50.0	BLOD	77.8	75-125			
1,3,5-Trimethylbenzene	44.3	1	ug/L	50.0	BLOD	88.6	75-124			

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Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Matrix Spike (BGD0678-MS1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
1,3-Dichlorobenzene	47.1	1	ug/L	50.0	BLOD	94.2	75-125			
1,3-Dichloropropane	42.0	1	ug/L	50.0	BLOD	83.9	75-125			
1,4-Dichlorobenzene	44.6	1	ug/L	50.0	BLOD	89.3	75-125			
2,2-Dichloropropane	44.1	1	ug/L	50.0	BLOD	88.2	70-135			
2-Butanone (MEK)	35.1	10	ug/L	50.0	BLOD	70.2	30-150			
2-Chlorotoluene	46.0	1	ug/L	50.0	BLOD	92.1	75-125			
2-Hexanone (MBK)	41.0	5	ug/L	50.0	BLOD	82.1	55-130			
4-Chlorotoluene	45.8	1	ug/L	50.0	BLOD	91.5	75-130			
4-Isopropyltoluene	47.1	1	ug/L	50.0	BLOD	94.2	75-130			
4-Methyl-2-pentanone (MIBK)	41.2	5	ug/L	50.0	BLOD	82.3	60-135			
Acetone	33.0	10	ug/L	50.0	BLOD	63.9	40-140			
Benzene	43.8	1	ug/L	50.0	BLOD	87.5	80-120			
Bromobenzene	49.4	1	ug/L	50.0	BLOD	98.8	75-125			
Bromochloromethane	40.7	1	ug/L	50.0	BLOD	81.4	65-130			
Bromodichloromethane	46.1	0.5	ug/L	50.0	BLOD	92.3	75-136			
Bromoform	49.4	1	ug/L	50.0	BLOD	98.9	70-130			
Bromomethane	35.6	1	ug/L	50.0	BLOD	71.2	30-145			
Carbon disulfide	37.8	10	ug/L	50.0	BLOD	75.6	35-160			
Carbon tetrachloride	47.8	1	ug/L	50.0	BLOD	95.6	65-140			
Chlorobenzene	46.4	1	ug/L	50.0	BLOD	92.8	80-120			
Chloroethane	36.2	1	ug/L	50.0	BLOD	72.4	60-135			
Chloroform	37.6	0.5	ug/L	50.0	BLOD	75.1	65-135			
Chloromethane	37.2	1	ug/L	50.0	BLOD	74.4	40-125			
cis-1,2-Dichloroethylene	42.2	1	ug/L	50.0	BLOD	84.3	70-125			
cis-1,3-Dichloropropene	33.2	1	ug/L	50.0	BLOD	66.4	47-136			

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Matrix Spike (BGD0678-MS1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
Dibromochloromethane	46.6	0.5	ug/L	50.0	BLOD	93.2	60-135			
Dibromomethane	44.5	1	ug/L	50.0	BLOD	89.0	75-125			
Dichlorodifluoromethane	48.4	1	ug/L	50.0	BLOD	96.9	30-155			
Ethylbenzene	46.8	1	ug/L	50.0	BLOD	93.7	75-125			
Hexachlorobutadiene	59.0	0.8	ug/L	50.0	BLOD	118	50-140			
Isopropylbenzene	44.0	1	ug/L	50.0	BLOD	88.0	75-125			
m+p-Xylenes	92.3	2	ug/L	100	BLOD	92.3	75-130			
Methylene chloride	37.8	4	ug/L	50.0	BLOD	75.6	55-140			
Methyl-t-butyl ether (MTBE)	39.2	1	ug/L	50.0	BLOD	78.4	65-125			
Naphthalene	64.2	1	ug/L	50.0	BLOD	128	55-140			
n-Butylbenzene	47.4	1	ug/L	50.0	BLOD	94.8	70-135			
n-Propylbenzene	45.8	1	ug/L	50.0	BLOD	91.5	70-130			
o-Xylene	47.3	1	ug/L	50.0	BLOD	94.6	80-120			
sec-Butylbenzene	47.7	1	ug/L	50.0	BLOD	95.3	70-125			
Styrene	35.2	1	ug/L	50.0	BLOD	70.3	65-135			
tert-Butylbenzene	46.5	1	ug/L	50.0	BLOD	93.1	70-130			
Tetrachloroethylene (PCE)	51.6	1	ug/L	50.0	BLOD	103	51-231			
Toluene	40.8	1	ug/L	50.0	BLOD	81.5	75-120			
trans-1,2-Dichloroethylene	42.4	1	ug/L	50.0	BLOD	84.9	60-140			
trans-1,3-Dichloropropene	36.1	1	ug/L	50.0	BLOD	72.2	55-140			
Trichloroethylene	46.0	1	ug/L	50.0	BLOD	92.0	70-125			
Trichlorofluoromethane	45.8	1	ug/L	50.0	BLOD	91.5	60-145			
Vinyl chloride	40.4	0.5	ug/L	50.0	BLOD	80.8	50-145			
Surr: 1,2-Dichloroethane-d4 (Surr)	*41.8*		ug/L	*50.0*		*83.7*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*50.6*		ug/L	*50.0*		*101*	*75-120*			

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Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Matrix Spike (BGD0678-MS1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
Surr: Dibromofluoromethane (Surr)	*48.3*		ug/L	*50.0*		*96.7*	*70-130*			
Surr: Toluene-d8 (Surr)	*48.0*		ug/L	*50.0*		*95.9*	*70-130*			
Matrix Spike Dup (BGD0678-MSD1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
1,1,1,2-Tetrachloroethane	46.4	0.4	ug/L	50.0	BLOD	92.8	80-130	4.51	30	
1,1,1-Trichloroethane	43.1	1	ug/L	50.0	BLOD	86.3	65-130	1.68	30	
1,1,2,2-Tetrachloroethane	41.0	0.4	ug/L	50.0	BLOD	82.0	65-130	6.38	30	
1,1,2-Trichloroethane	43.2	1	ug/L	50.0	BLOD	86.4	75-125	1.47	30	
1,1-Dichloroethane	37.6	1	ug/L	50.0	BLOD	75.1	70-135	3.56	30	
1,1-Dichloroethylene	33.9	1	ug/L	50.0	BLOD	67.9	50-145	0.948	30	
1,1-Dichloropropene	39.9	1	ug/L	50.0	BLOD	79.8	75-135	2.31	30	
1,2,3-Trichlorobenzene	57.0	1	ug/L	50.0	BLOD	114	55-140	4.14	30	
1,2,3-Trichloropropane	42.0	1	ug/L	50.0	BLOD	84.0	75-125	5.26	30	
1,2,4-Trichlorobenzene	54.8	1	ug/L	50.0	BLOD	110	65-135	2.36	30	
1,2,4-Trimethylbenzene	46.0	1	ug/L	50.0	BLOD	92.1	75-130	3.10	30	
1,2-Dibromo-3-chloropropane (DBCP)	46.4	1	ug/L	50.0	BLOD	92.9	50-130	5.22	30	
1,2-Dibromoethane (EDB)	42.9	1	ug/L	50.0	BLOD	85.9	80-120	7.14	30	
1,2-Dichlorobenzene	45.5	0.5	ug/L	50.0	BLOD	91.0	70-120	1.63	30	
1,2-Dichloroethane	32.5	1	ug/L	50.0	BLOD	65.0	70-130	3.03	30	M
1,2-Dichloropropane	38.0	0.5	ug/L	50.0	BLOD	76.1	75-125	2.31	30	
1,3,5-Trimethylbenzene	44.3	1	ug/L	50.0	BLOD	88.6	75-124	0.0226	30	
1,3-Dichlorobenzene	45.1	1	ug/L	50.0	BLOD	90.2	75-125	4.32	30	
1,3-Dichloropropane	41.7	1	ug/L	50.0	BLOD	83.4	75-125	0.669	30	
1,4-Dichlorobenzene	44.2	1	ug/L	50.0	BLOD	88.3	75-125	1.08	30	
2,2-Dichloropropane	41.6	1	ug/L	50.0	BLOD	83.2	70-135	5.81	30	

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Matrix Spike Dup (BGD0678-MSD1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
2-Butanone (MEK)	34.2	10	ug/L	50.0	BLOD	68.5	30-150	2.51	30	
2-Chlorotoluene	44.8	1	ug/L	50.0	BLOD	89.5	75-125	2.82	30	
2-Hexanone (MBK)	38.2	5	ug/L	50.0	BLOD	76.4	55-130	7.22	30	
4-Chlorotoluene	44.9	1	ug/L	50.0	BLOD	89.8	75-130	1.83	30	
4-Isopropyltoluene	45.8	1	ug/L	50.0	BLOD	91.7	75-130	2.71	30	
4-Methyl-2-pentanone (MIBK)	40.0	5	ug/L	50.0	BLOD	80.1	60-135	2.76	30	
Acetone	31.6	10	ug/L	50.0	BLOD	61.2	40-140	4.27	30	
Benzene	42.4	1	ug/L	50.0	BLOD	84.8	80-120	3.09	30	
Bromobenzene	47.3	1	ug/L	50.0	BLOD	94.6	75-125	4.30	30	
Bromochloromethane	38.3	1	ug/L	50.0	BLOD	76.6	65-130	6.02	30	
Bromodichloromethane	44.6	0.5	ug/L	50.0	BLOD	89.2	75-136	3.35	30	
Bromoform	46.6	1	ug/L	50.0	BLOD	93.3	70-130	5.83	30	
Bromomethane	33.8	1	ug/L	50.0	BLOD	67.5	30-145	5.31	30	
Carbon disulfide	36.7	10	ug/L	50.0	BLOD	73.3	35-160	3.06	30	
Carbon tetrachloride	46.1	1	ug/L	50.0	BLOD	92.2	65-140	3.60	30	
Chlorobenzene	44.3	1	ug/L	50.0	BLOD	88.6	80-120	4.72	30	
Chloroethane	34.7	1	ug/L	50.0	BLOD	69.3	60-135	4.32	30	
Chloroform	36.4	0.5	ug/L	50.0	BLOD	72.9	65-135	2.97	30	
Chloromethane	37.2	1	ug/L	50.0	BLOD	74.4	40-125	0.108	30	
cis-1,2-Dichloroethylene	41.5	1	ug/L	50.0	BLOD	83.0	70-125	1.53	30	
cis-1,3-Dichloropropene	31.7	1	ug/L	50.0	BLOD	63.4	47-136	4.56	30	
Dibromochloromethane	44.9	0.5	ug/L	50.0	BLOD	89.9	60-135	3.63	30	
Dibromomethane	41.6	1	ug/L	50.0	BLOD	83.2	75-125	6.76	30	
Dichlorodifluoromethane	46.3	1	ug/L	50.0	BLOD	92.6	30-155	4.56	30	
Ethylbenzene	45.5	1	ug/L	50.0	BLOD	91.0	75-125	2.92	30	

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Volatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0678 - SW5030B-MS										
Matrix Spike Dup (BGD0678-MSD1)	**Source: 23D0882-03**			Prepared & Analyzed: 04/19/2023						
Hexachlorobutadiene	59.9	0.8	ug/L	50.0	BLOD	120	50-140	1.45	30	
Isopropylbenzene	42.8	1	ug/L	50.0	BLOD	85.6	75-125	2.77	30	
m+p-Xylenes	89.8	2	ug/L	100	BLOD	89.8	75-130	2.82	30	
Methylene chloride	36.8	4	ug/L	50.0	BLOD	73.5	55-140	2.79	30	
Methyl-t-butyl ether (MTBE)	38.1	1	ug/L	50.0	BLOD	76.2	65-125	2.77	30	
Naphthalene	61.4	1	ug/L	50.0	BLOD	123	55-140	4.49	30	
n-Butylbenzene	46.9	1	ug/L	50.0	BLOD	93.8	70-135	1.10	30	
n-Propylbenzene	45.2	1	ug/L	50.0	BLOD	90.3	70-130	1.32	30	
o-Xylene	44.9	1	ug/L	50.0	BLOD	89.9	80-120	5.07	30	
sec-Butylbenzene	46.2	1	ug/L	50.0	BLOD	92.4	70-125	3.07	30	
Styrene	33.8	1	ug/L	50.0	BLOD	67.7	65-135	3.85	30	
tert-Butylbenzene	45.7	1	ug/L	50.0	BLOD	91.4	70-130	1.84	30	
Tetrachloroethylene (PCE)	50.2	1	ug/L	50.0	BLOD	100	51-231	2.81	30	
Toluene	40.0	1	ug/L	50.0	BLOD	80.1	75-120	1.76	30	
trans-1,2-Dichloroethylene	41.0	1	ug/L	50.0	BLOD	81.9	60-140	3.52	30	
trans-1,3-Dichloropropene	35.0	1	ug/L	50.0	BLOD	69.9	55-140	3.21	30	
Trichloroethylene	44.5	1	ug/L	50.0	BLOD	89.1	70-125	3.25	30	
Trichlorofluoromethane	44.4	1	ug/L	50.0	BLOD	88.7	60-145	3.11	30	
Vinyl chloride	40.2	0.5	ug/L	50.0	BLOD	80.3	50-145	0.621	30	
Surr: 1,2-Dichloroethane-d4 (Surr)	*41.9*		ug/L	*50.0*		*83.9*	*70-120*			
Surr: 4-Bromofluorobenzene (Surr)	*49.8*		ug/L	*50.0*		*99.7*	*75-120*			
Surr: Dibromofluoromethane (Surr)	*48.2*		ug/L	*50.0*		*96.3*	*70-130*			
Surr: Toluene-d8 (Surr)	*48.7*		ug/L	*50.0*		*97.3*	*70-130*			

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Blank (BGD0564-BLK1)				Prepared & Analyzed: 04/17/2023						
Anthracene	ND	10.0	ug/L							
Surr: 2,4,6-Tribromophenol (Surr)	*105*		ug/L	*100*		*105*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*33.2*		ug/L	*50.0*		*66.3*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*48.8*		ug/L	*100*		*48.8*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*48.1*		ug/L	*50.0*		*96.3*	*5-151*			
Surr: Phenol-d5 (Surr)	*34.7*		ug/L	*100*		*34.7*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*47.6*		ug/L	*50.0*		*95.3*	*5-141*			
LCS (BGD0564-BS1)				Prepared & Analyzed: 04/17/2023						
1,2,4-Trichlorobenzene	32.5	10.0	ug/L	50.0		65.1	57-130			
1,2-Dichlorobenzene	29.8	10.0	ug/L	50.0		59.6	22-115			
1,3-Dichlorobenzene	27.2	10.0	ug/L	50.0		54.5	22-112			
1,4-Dichlorobenzene	31.6	10.0	ug/L	50.0		63.2	13-112			
2,4,6-Trichlorophenol	31.9	10.0	ug/L	50.0		63.7	52-129			
2,4-Dichlorophenol	34.5	10.0	ug/L	50.0		69.0	53-122			
2,4-Dimethylphenol	36.7	5.00	ug/L	50.0		73.4	42-120			
2,4-Dinitrophenol	21.4	50.0	ug/L	50.0		42.7	48-127			L
2,4-Dinitrotoluene	38.1	10.0	ug/L	50.0		76.3	10-173			
2,6-Dinitrotoluene	39.3	10.0	ug/L	50.0		78.5	68-137			
2-Chloronaphthalene	31.0	10.0	ug/L	50.0		62.0	65-120			L
2-Chlorophenol	34.4	10.0	ug/L	50.0		68.9	36-120			
2-Nitrophenol	42.7	10.0	ug/L	50.0		85.5	45-167			
3,3'-Dichlorobenzidine	20.7	10.0	ug/L	50.0		41.4	10-213			
4,6-Dinitro-2-methylphenol	38.2	50.0	ug/L	50.0		76.4	53-130			
4-Bromophenyl phenyl ether	38.0	10.0	ug/L	50.0		76.1	65-120			

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Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
LCS (BGD0564-BS1)				Prepared & Analyzed: 04/17/2023						
4-Chlorophenyl phenyl ether	34.0	10.0	ug/L	50.0		68.1	38-145			
4-Nitrophenol	12.8	50.0	ug/L	50.0		25.6	13-129			
Acenaphthene	32.7	10.0	ug/L	50.0		65.3	60-132			
Acenaphthylene	32.6	10.0	ug/L	50.0		65.2	54-126			
Acetophenone	33.1	20.0	ug/L	50.0		66.2	0-200			
Anthracene	31.7	10.0	ug/L	50.0		63.4	43-120			
Benzo (a) anthracene	31.5	10.0	ug/L	50.0		62.9	42-133			
Benzo (a) pyrene	37.0	10.0	ug/L	50.0		74.1	32-148			
Benzo (b) fluoranthene	38.5	10.0	ug/L	50.0		77.1	42-140			
Benzo (g,h,i) perylene	28.3	10.0	ug/L	50.0		56.5	10-195			
Benzo (k) fluoranthene	34.6	10.0	ug/L	50.0		69.3	25-146			
bis (2-Chloroethoxy) methane	34.7	10.0	ug/L	50.0		69.3	49-165			
bis (2-Chloroethyl) ether	31.9	10.0	ug/L	50.0		63.7	43-126			
2,2'-Oxybis (1-chloropropane)	33.7	10.0	ug/L	50.0		67.4	63-139			
bis (2-Ethylhexyl) phthalate	39.5	10.0	ug/L	50.0		78.9	29-137			
Butyl benzyl phthalate	41.8	10.0	ug/L	50.0		83.6	10-140			
Chrysene	30.9	10.0	ug/L	50.0		61.8	44-140			
Dibenz (a,h) anthracene	36.8	10.0	ug/L	50.0		73.5	10-200			
Diethyl phthalate	38.4	10.0	ug/L	50.0		76.7	10-120			
Dimethyl phthalate	36.2	10.0	ug/L	50.0		72.4	10-120			
Di-n-butyl phthalate	40.8	10.0	ug/L	50.0		81.7	10-120			
Di-n-octyl phthalate	40.6	10.0	ug/L	50.0		81.2	19-132			
Fluoranthene	37.4	10.0	ug/L	50.0		74.8	43-121			
Fluorene	36.0	10.0	ug/L	50.0		72.0	70-120			
Hexachlorobenzene	47.0	1.00	ug/L	50.0		94.0	10-142			

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Batch BGD0564 - SW3510C/EPA600-MS										
LCS (BGD0564-BS1)				Prepared & Analyzed: 04/17/2023						
Hexachlorobutadiene	38.6	10.0	ug/L	50.0		77.1	38-120			
Hexachlorocyclopentadiene	16.9	10.0	ug/L	50.0		33.8	10-76			
Hexachloroethane	35.3	10.0	ug/L	50.0		70.5	55-120			
Indeno (1,2,3-cd) pyrene	36.3	10.0	ug/L	50.0		72.7	10-151			
Isophorone	21.9	10.0	ug/L	50.0		43.8	47-180			L
Naphthalene	33.1	5.00	ug/L	50.0		66.2	36-120			
Nitrobenzene	40.1	10.0	ug/L	50.0		80.2	54-158			
n-Nitrosodimethylamine	24.2	10.0	ug/L	50.0		48.5	10-85			
n-Nitrosodi-n-propylamine	31.6	10.0	ug/L	50.0		63.2	14-198			
n-Nitrosodiphenylamine	28.3	10.0	ug/L	50.0		56.6	12-97			
p-Chloro-m-cresol	39.8	10.0	ug/L	50.0		79.7	10-142			
Pentachlorophenol	19.6	20.0	ug/L	50.0		39.2	38-152			
Phenanthrene	36.7	10.0	ug/L	50.0		73.4	65-120			
Phenol	17.3	10.0	ug/L	50.5		34.2	17-120			
Pyrene	33.9	10.0	ug/L	50.0		67.8	70-120			L
Pyridine	24.3	10.0	ug/L	50.0		48.6	10-103			
Surr: 2,4,6-Tribromophenol (Surr)	*112*		ug/L	*100*		*112*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*31.5*		ug/L	*50.0*		*63.0*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*43.8*		ug/L	*100*		*43.8*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*43.7*		ug/L	*50.0*		*87.3*	*5-151*			
Surr: Phenol-d5 (Surr)	*33.1*		ug/L	*100*		*33.1*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*36.7*		ug/L	*50.0*		*73.3*	*5-141*			
Matrix Spike (BGD0564-MS1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
1,2,4-Trichlorobenzene	31.8	10.0	ug/L	50.0	BLOD	63.7	44-142			

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Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
1,2-Dichlorobenzene	32.1	10.0	ug/L	50.0	BLOD	64.2	22-115			
1,3-Dichlorobenzene	28.0	10.0	ug/L	50.0	BLOD	56.0	22-112			
1,4-Dichlorobenzene	32.8	10.0	ug/L	50.0	BLOD	65.5	13-112			
2,4,6-Trichlorophenol	30.3	10.0	ug/L	50.0	BLOD	60.6	37-144			
2,4-Dichlorophenol	32.4	10.0	ug/L	50.0	BLOD	64.7	39-135			
2,4-Dimethylphenol	33.3	5.00	ug/L	50.0	BLOD	66.6	32-120			
2,4-Dinitrophenol	27.6	50.0	ug/L	50.0	BLOD	55.1	39-139			
2,4-Dinitrotoluene	44.1	10.0	ug/L	50.0	BLOD	88.2	10-191			
2,6-Dinitrotoluene	41.2	10.0	ug/L	50.0	BLOD	82.4	50-158			
2-Chloronaphthalene	30.2	10.0	ug/L	50.0	BLOD	60.5	60-120			
2-Chlorophenol	36.2	10.0	ug/L	50.0	BLOD	72.5	23-134			
2-Nitrophenol	40.5	10.0	ug/L	50.0	BLOD	81.0	29-182			
3,3'-Dichlorobenzidine	27.4	10.0	ug/L	50.0	BLOD	54.9	10-262			
4,6-Dinitro-2-methylphenol	46.0	50.0	ug/L	50.0	BLOD	92.0	10-181			
4-Bromophenyl phenyl ether	40.2	10.0	ug/L	50.0	BLOD	80.4	53-127			
4-Chlorophenyl phenyl ether	34.5	10.0	ug/L	50.0	BLOD	69.0	25-158			
4-Nitrophenol	13.0	50.0	ug/L	50.0	BLOD	26.0	10-132			
Acenaphthene	33.7	10.0	ug/L	50.0	BLOD	67.4	47-145			
Acenaphthylene	34.5	10.0	ug/L	50.0	BLOD	69.1	33-145			
Acetophenone	33.3	20.0	ug/L	50.0	BLOD	66.6	0-200			
Anthracene	38.0	10.0	ug/L	50.0	BLOD	75.9	27-133			
Benzo (a) anthracene	39.1	10.0	ug/L	50.0	BLOD	78.2	33-143			
Benzo (a) pyrene	45.9	10.0	ug/L	50.0	BLOD	91.7	17-163			
Benzo (b) fluoranthene	43.4	10.0	ug/L	50.0	BLOD	86.8	24-159			
Benzo (g,h,i) perylene	34.0	10.0	ug/L	50.0	BLOD	68.1	10-219			

ENTHALPY ANALYTICAL

Enthalpy Analytical
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Certificate of Analysis

Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM

Client Site I.D.: 2023 City of Bristol Landfill Leachate

Submitted To: Jennifer Robb

Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
Benzo (k) fluoranthene	42.3	10.0	ug/L	50.0	BLOD	84.5	11-162			
bis (2-Chloroethoxy) methane	33.3	10.0	ug/L	50.0	BLOD	66.5	33-184			
bis (2-Chloroethyl) ether	30.9	10.0	ug/L	50.0	BLOD	61.8	12-158			
2,2'-Oxybis (1-chloropropane)	34.8	10.0	ug/L	50.0	BLOD	69.7	36-166			
bis (2-Ethylhexyl) phthalate	47.2	10.0	ug/L	50.0	BLOD	94.4	10-158			
Butyl benzyl phthalate	51.5	10.0	ug/L	50.0	BLOD	103	10-152			
Chrysene	38.4	10.0	ug/L	50.0	BLOD	76.8	17-169			
Dibenz (a,h) anthracene	45.7	10.0	ug/L	50.0	BLOD	91.4	10-227			
Diethyl phthalate	41.9	10.0	ug/L	50.0	BLOD	83.9	10-120			
Dimethyl phthalate	36.8	10.0	ug/L	50.0	BLOD	73.7	10-120			
Di-n-butyl phthalate	50.3	10.0	ug/L	50.0	BLOD	101	10-120			
Di-n-octyl phthalate	45.4	10.0	ug/L	50.0	BLOD	90.8	10-146			
Fluoranthene	43.8	10.0	ug/L	50.0	BLOD	87.6	26-137			
Fluorene	37.2	10.0	ug/L	50.0	BLOD	74.3	59-121			
Hexachlorobenzene	52.8	1.00	ug/L	50.0	BLOD	106	10-152			
Hexachlorobutadiene	37.2	10.0	ug/L	50.0	BLOD	74.3	24-120			
Hexachlorocyclopentadiene	15.9	10.0	ug/L	50.0	BLOD	31.8	10-90			
Hexachloroethane	34.4	10.0	ug/L	50.0	BLOD	68.7	40-120			
Indeno (1,2,3-cd) pyrene	44.2	10.0	ug/L	50.0	BLOD	88.4	10-171			
Isophorone	20.2	10.0	ug/L	50.0	BLOD	40.5	21-196			
Naphthalene	32.0	5.00	ug/L	50.0	BLOD	64.1	21-133			
Nitrobenzene	38.1	10.0	ug/L	50.0	BLOD	76.2	35-180			
n-Nitrosodimethylamine	19.6	10.0	ug/L	50.0	BLOD	39.1	10-85			
n-Nitrosodi-n-propylamine	31.6	10.0	ug/L	50.0	BLOD	63.1	10-230			
n-Nitrosodiphenylamine	31.3	10.0	ug/L	50.0	BLOD	62.6	12-111			

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Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
p-Chloro-m-cresol	38.4	10.0	ug/L	50.0	BLOD	76.8	10-127			
Pentachlorophenol	25.3	20.0	ug/L	50.0	BLOD	50.6	14-176			
Phenanthrene	39.2	10.0	ug/L	50.0	BLOD	78.5	54-120			
Phenol	14.0	10.0	ug/L	50.5	BLOD	27.7	10-120			
Pyrene	40.8	10.0	ug/L	50.0	BLOD	81.7	52-120			
Pyridine	22.4	10.0	ug/L	50.0	BLOD	44.9	10-110			
Surr: 2,4,6-Tribromophenol (Surr)	*126*		ug/L	*100*		*126*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*32.2*		ug/L	*50.0*		*64.3*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*37.6*		ug/L	*100*		*37.6*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*41.4*		ug/L	*50.0*		*82.9*	*5-151*			
Surr: Phenol-d5 (Surr)	*26.8*		ug/L	*100*		*26.8*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*43.1*		ug/L	*50.0*		*86.3*	*5-141*			
Matrix Spike (BGD0564-MS2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
1,2,4-Trichlorobenzene	15.4	10.0	ug/L	46.7	BLOD	33.0	44-142			M
1,2-Dichlorobenzene	16.1	10.0	ug/L	46.7	BLOD	34.5	22-115			
1,3-Dichlorobenzene	16.2	10.0	ug/L	46.7	BLOD	34.7	22-112			
1,4-Dichlorobenzene	18.3	10.0	ug/L	46.7	BLOD	39.2	13-112			
2,4,6-Trichlorophenol	18.8	10.0	ug/L	46.7	BLOD	40.2	37-144			
2,4-Dichlorophenol	16.5	10.0	ug/L	46.7	BLOD	35.4	39-135			M
2,4-Dimethylphenol	16.3	5.00	ug/L	46.7	BLOD	35.0	32-120			
2,4-Dinitrophenol	28.1	50.0	ug/L	46.7	BLOD	60.2	39-139			
2,4-Dinitrotoluene	25.0	10.0	ug/L	46.7	BLOD	53.6	10-191			
2,6-Dinitrotoluene	19.9	10.0	ug/L	46.7	BLOD	42.5	50-158			M
2-Chloronaphthalene	16.7	10.0	ug/L	46.7	BLOD	35.6	60-120			M

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
2-Chlorophenol	16.5	10.0	ug/L	46.7	BLOD	35.4	23-134			
2-Nitrophenol	17.2	10.0	ug/L	46.7	BLOD	36.9	29-182			
3,3'-Dichlorobenzidine	6.51	10.0	ug/L	46.7	BLOD	13.9	10-262			
4,6-Dinitro-2-methylphenol	32.7	50.0	ug/L	46.7	BLOD	69.9	10-181			
4-Bromophenyl phenyl ether	20.3	10.0	ug/L	46.7	BLOD	43.5	53-127			M
4-Chlorophenyl phenyl ether	17.6	10.0	ug/L	46.7	BLOD	37.6	25-158			
4-Nitrophenol	16.3	50.0	ug/L	46.7	BLOD	34.9	10-132			
Acenaphthene	17.4	10.0	ug/L	46.7	BLOD	37.3	47-145			M
Acenaphthylene	17.4	10.0	ug/L	46.7	BLOD	37.2	33-145			
Acetophenone	18.2	20.0	ug/L	46.7	BLOD	39.0	0-200			
Anthracene	20.8	10.0	ug/L	46.7	BLOD	44.5	27-133			
Benzo (a) anthracene	23.9	10.0	ug/L	46.7	BLOD	51.1	33-143			
Benzo (a) pyrene	26.6	10.0	ug/L	46.7	BLOD	57.0	17-163			
Benzo (b) fluoranthene	27.9	10.0	ug/L	46.7	BLOD	59.6	24-159			
Benzo (g,h,i) perylene	13.0	10.0	ug/L	46.7	BLOD	27.8	10-219			
Benzo (k) fluoranthene	32.5	10.0	ug/L	46.7	BLOD	69.5	11-162			
bis (2-Chloroethoxy) methane	15.6	10.0	ug/L	46.7	BLOD	33.3	33-184			
bis (2-Chloroethyl) ether	16.6	10.0	ug/L	46.7	BLOD	35.6	12-158			
2,2'-Oxybis (1-chloropropane)	15.6	10.0	ug/L	46.7	BLOD	33.3	36-166			M
bis (2-Ethylhexyl) phthalate	23.0	10.0	ug/L	46.7	BLOD	49.2	10-158			
Butyl benzyl phthalate	21.4	10.0	ug/L	46.7	BLOD	45.7	10-152			
Chrysene	25.4	10.0	ug/L	46.7	BLOD	54.3	17-169			
Dibenz (a,h) anthracene	16.9	10.0	ug/L	46.7	BLOD	36.3	10-227			
Diethyl phthalate	22.7	10.0	ug/L	46.7	BLOD	48.5	10-120			
Dimethyl phthalate	ND	10.0	ug/L	46.7	BLOD		10-120			M

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
Di-n-butyl phthalate	26.1	10.0	ug/L	46.7	BLOD	55.9	10-120			
Di-n-octyl phthalate	39.3	10.0	ug/L	46.7	BLOD	84.0	10-146			
Fluoranthene	28.8	10.0	ug/L	46.7	BLOD	61.5	26-137			
Fluorene	20.2	10.0	ug/L	46.7	BLOD	43.2	59-121			M
Hexachlorobenzene	19.9	1.00	ug/L	46.7	BLOD	42.6	10-152			
Hexachlorobutadiene	16.5	10.0	ug/L	46.7	BLOD	35.3	24-120			
Hexachlorocyclopentadiene	6.11	10.0	ug/L	46.7	BLOD	13.1	10-90			
Hexachloroethane	19.6	10.0	ug/L	46.7	BLOD	42.0	40-120			
Indeno (1,2,3-cd) pyrene	18.3	10.0	ug/L	46.7	BLOD	39.1	10-171			
Isophorone	8.84	10.0	ug/L	46.7	BLOD	18.9	21-196			M
Naphthalene	17.0	5.00	ug/L	46.7	BLOD	36.4	21-133			
Nitrobenzene	22.7	10.0	ug/L	46.7	BLOD	48.6	35-180			
n-Nitrosodimethylamine	9.75	10.0	ug/L	46.7	BLOD	20.9	10-85			
n-Nitrosodi-n-propylamine	19.0	10.0	ug/L	46.7	BLOD	40.6	10-230			
n-Nitrosodiphenylamine	19.5	10.0	ug/L	46.7	BLOD	41.7	12-111			
p-Chloro-m-cresol	16.2	10.0	ug/L	46.7	BLOD	34.6	10-127			
Pentachlorophenol	23.4	20.0	ug/L	46.7	BLOD	50.1	14-176			
Phenanthrene	25.9	10.0	ug/L	46.7	BLOD	55.5	54-120			
Phenol	6.77	10.0	ug/L	47.2	BLOD	14.3	10-120			
Pyrene	25.6	10.0	ug/L	46.7	BLOD	54.8	52-120			
Pyridine	10.6	10.0	ug/L	46.7	BLOD	22.7	10-110			
Surr: 2,4,6-Tribromophenol (Surr)	*51.9*		ug/L	*93.5*		*55.5*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*18.1*		ug/L	*46.7*		*38.8*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*17.0*		ug/L	*93.5*		*18.2*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*24.3*		ug/L	*46.7*		*51.9*	*5-151*			

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Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike (BGD0564-MS2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
Surr: Phenol-d5 (Surr)	*14.5*		ug/L	*93.5*		*15.6*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*22.5*		ug/L	*46.7*		*48.2*	*5-141*			
Matrix Spike Dup (BGD0564-MSD1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
1,2,4-Trichlorobenzene	16.2	10.0	ug/L	50.0	BLOD	32.4	44-142	65.0	20	M, P
1,2-Dichlorobenzene	14.5	10.0	ug/L	50.0	BLOD	29.0	22-115	75.6	20	P
1,3-Dichlorobenzene	14.5	10.0	ug/L	50.0	BLOD	28.9	22-112	63.7	20	P
1,4-Dichlorobenzene	16.0	10.0	ug/L	50.0	BLOD	32.1	13-112	68.5	20	P
2,4,6-Trichlorophenol	14.8	10.0	ug/L	50.0	BLOD	29.6	37-144	68.9	20	M, P
2,4-Dichlorophenol	16.0	10.0	ug/L	50.0	BLOD	32.0	39-135	67.6	20	M, P
2,4-Dimethylphenol	17.8	5.00	ug/L	50.0	BLOD	35.6	32-120	60.7	20	P
2,4-Dinitrophenol	10.6	50.0	ug/L	50.0	BLOD	21.3	39-139	88.6	20	M, P
2,4-Dinitrotoluene	25.2	10.0	ug/L	50.0	BLOD	50.5	10-191	54.4	20	P
2,6-Dinitrotoluene	23.7	10.0	ug/L	50.0	BLOD	47.4	50-158	53.9	20	M, P
2-Chloronaphthalene	16.3	10.0	ug/L	50.0	BLOD	32.6	60-120	59.8	20	M, P
2-Chlorophenol	18.3	10.0	ug/L	50.0	BLOD	36.6	23-134	65.7	20	P
2-Nitrophenol	20.4	10.0	ug/L	50.0	BLOD	40.9	29-182	65.8	20	P
3,3'-Dichlorobenzidine	17.8	10.0	ug/L	50.0	BLOD	35.5	10-262	42.9	20	P
4,6-Dinitro-2-methylphenol	27.5	50.0	ug/L	50.0	BLOD	55.0	10-181	50.4	20	P
4-Bromophenyl phenyl ether	22.6	10.0	ug/L	50.0	BLOD	45.3	53-127	55.8	20	M, P
4-Chlorophenyl phenyl ether	17.2	10.0	ug/L	50.0	BLOD	34.4	25-158	66.8	20	P
4-Nitrophenol	5.28	50.0	ug/L	50.0	BLOD	10.6	10-132	84.6	20	P
Acenaphthene	18.1	10.0	ug/L	50.0	BLOD	36.1	47-145	60.4	20	M, P
Acenaphthylene	18.5	10.0	ug/L	50.0	BLOD	37.1	33-145	60.3	20	P
Acetophenone	16.2	20.0	ug/L	50.0	BLOD	32.5	0-200	68.9	20	P

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Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike Dup (BGD0564-MSD1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
Anthracene	23.9	10.0	ug/L	50.0	BLOD	47.7	27-133	45.6	20	P
Benzo (a) anthracene	29.1	10.0	ug/L	50.0	BLOD	58.3	33-143	29.2	20	P
Benzo (a) pyrene	32.9	10.0	ug/L	50.0	BLOD	65.8	17-163	32.9	20	P
Benzo (b) fluoranthene	36.4	10.0	ug/L	50.0	BLOD	72.9	24-159	17.4	20	P
Benzo (g,h,i) perylene	24.6	10.0	ug/L	50.0	BLOD	49.3	10-219	32.1	20	P
Benzo (k) fluoranthene	29.7	10.0	ug/L	50.0	BLOD	59.4	11-162	34.9	20	P
bis (2-Chloroethoxy) methane	16.4	10.0	ug/L	50.0	BLOD	32.7	33-184	68.1	20	M, P
bis (2-Chloroethyl) ether	14.5	10.0	ug/L	50.0	BLOD	29.0	12-158	72.4	20	P
2,2'-Oxybis (1-chloropropane)	15.3	10.0	ug/L	50.0	BLOD	30.6	36-166	77.8	20	M, P
bis (2-Ethylhexyl) phthalate	41.7	10.0	ug/L	50.0	BLOD	83.5	10-158	12.3	20	
Butyl benzyl phthalate	44.3	10.0	ug/L	50.0	BLOD	88.6	10-152	15.0	20	
Chrysene	29.9	10.0	ug/L	50.0	BLOD	59.9	17-169	24.8	20	P
Dibenz (a,h) anthracene	30.1	10.0	ug/L	50.0	BLOD	60.2	10-227	41.2	20	P
Diethyl phthalate	27.2	10.0	ug/L	50.0	BLOD	54.3	10-120	42.7	20	P
Dimethyl phthalate	20.6	10.0	ug/L	50.0	BLOD	41.2	10-120	56.7	20	P
Di-n-butyl phthalate	33.8	10.0	ug/L	50.0	BLOD	67.6	10-120	39.3	20	P
Di-n-octyl phthalate	40.6	10.0	ug/L	50.0	BLOD	81.2	10-146	11.2	20	P
Fluoranthene	30.5	10.0	ug/L	50.0	BLOD	61.0	26-137	35.8	20	P
Fluorene	19.8	10.0	ug/L	50.0	BLOD	39.6	59-121	61.0	20	M, P
Hexachlorobenzene	33.4	1.00	ug/L	50.0	BLOD	66.7	10-152	45.1	20	P
Hexachlorobutadiene	17.6	10.0	ug/L	50.0	BLOD	35.2	24-120	71.4	20	P
Hexachlorocyclopentadiene	5.29	10.0	ug/L	50.0	BLOD	10.6	10-90	100	20	P
Hexachloroethane	15.7	10.0	ug/L	50.0	BLOD	31.5	40-120	74.4	20	M, P
Indeno (1,2,3-cd) pyrene	30.5	10.0	ug/L	50.0	BLOD	60.9	10-171	36.8	20	P
Isophorone	9.47	10.0	ug/L	50.0	BLOD	18.9	21-196	72.5	20	M, P

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Certificate of Analysis

Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM
Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike Dup (BGD0564-MSD1)	**Source: 23D0755-05**			Prepared & Analyzed: 04/17/2023						
Naphthalene	17.2	5.00	ug/L	50.0	BLOD	34.4	21-133	60.3	20	P
Nitrobenzene	18.9	10.0	ug/L	50.0	BLOD	37.8	35-180	67.5	20	P
n-Nitrosodimethylamine	9.51	10.0	ug/L	50.0	BLOD	19.0	10-85	69.1	20	P
n-Nitrosodi-n-propylamine	14.8	10.0	ug/L	50.0	BLOD	29.6	10-230	72.3	20	P
n-Nitrosodiphenylamine	18.0	10.0	ug/L	50.0	BLOD	36.0	12-111	54.1	20	P
p-Chloro-m-cresol	18.9	10.0	ug/L	50.0	BLOD	37.7	10-127	68.2	20	P
Pentachlorophenol	12.0	20.0	ug/L	50.0	BLOD	24.1	14-176	71.0	20	P
Phenanthrene	25.8	10.0	ug/L	50.0	BLOD	51.6	54-120	41.2	20	M, P
Phenol	6.77	10.0	ug/L	50.5	BLOD	13.4	10-120	69.7	20	P
Pyrene	33.3	10.0	ug/L	50.0	BLOD	66.7	52-120	20.3	20	P
Pyridine	12.8	10.0	ug/L	50.0	BLOD	25.5	10-110	55.0	20	P
Surr: 2,4,6-Tribromophenol (Surr)	*70.5*		ug/L	*100*		*70.5*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*15.8*		ug/L	*50.0*		*31.7*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*20.0*		ug/L	*100*		*20.0*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*20.3*		ug/L	*50.0*		*40.6*	*5-151*			
Surr: Phenol-d5 (Surr)	*13.1*		ug/L	*100*		*13.1*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*36.5*		ug/L	*50.0*		*72.9*	*5-141*			
Matrix Spike Dup (BGD0564-MSD2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
1,2,4-Trichlorobenzene	13.3	10.0	ug/L	46.7	BLOD	28.5	44-142	14.6	20	M
1,2-Dichlorobenzene	13.2	10.0	ug/L	46.7	BLOD	28.2	22-115	20.2	20	P
1,3-Dichlorobenzene	11.7	10.0	ug/L	46.7	BLOD	25.0	22-112	32.4	20	P
1,4-Dichlorobenzene	13.7	10.0	ug/L	46.7	BLOD	29.4	13-112	28.7	20	P
2,4,6-Trichlorophenol	16.5	10.0	ug/L	46.7	BLOD	35.4	37-144	12.7	20	M
2,4-Dichlorophenol	14.0	10.0	ug/L	46.7	BLOD	29.9	39-135	16.7	20	M

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike Dup (BGD0564-MSD2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
2,4-Dimethylphenol	13.8	5.00	ug/L	46.7	BLOD	29.5	32-120	17.1	20	M
2,4-Dinitrophenol	22.5	50.0	ug/L	46.7	BLOD	48.1	39-139	22.2	20	P
2,4-Dinitrotoluene	23.8	10.0	ug/L	46.7	BLOD	50.9	10-191	5.13	20	
2,6-Dinitrotoluene	20.0	10.0	ug/L	46.7	BLOD	42.7	50-158	0.563	20	M
2-Chloronaphthalene	14.7	10.0	ug/L	46.7	BLOD	31.4	60-120	12.7	20	M
2-Chlorophenol	12.9	10.0	ug/L	46.7	BLOD	27.5	23-134	24.9	20	P
2-Nitrophenol	14.8	10.0	ug/L	46.7	BLOD	31.6	29-182	15.4	20	
3,3'-Dichlorobenzidine	7.13	10.0	ug/L	46.7	BLOD	15.3	10-262	9.04	20	
4,6-Dinitro-2-methylphenol	29.7	50.0	ug/L	46.7	BLOD	63.6	10-181	9.56	20	
4-Bromophenyl phenyl ether	17.7	10.0	ug/L	46.7	BLOD	37.8	53-127	13.9	20	M
4-Chlorophenyl phenyl ether	16.5	10.0	ug/L	46.7	BLOD	35.2	25-158	6.43	20	
4-Nitrophenol	14.2	50.0	ug/L	46.7	BLOD	30.4	10-132	13.7	20	
Acenaphthene	15.1	10.0	ug/L	46.7	BLOD	32.4	47-145	14.1	20	M
Acenaphthylene	16.0	10.0	ug/L	46.7	BLOD	34.3	33-145	8.00	20	
Acetophenone	14.7	20.0	ug/L	46.7	BLOD	31.4	0-200	21.5	20	P
Anthracene	19.3	10.0	ug/L	46.7	BLOD	41.3	27-133	7.60	20	
Benzidine	ND	50.0	ug/L	46.7	BLOD		12-309		20	M
Benzo (a) anthracene	21.7	10.0	ug/L	46.7	BLOD	46.4	33-143	9.60	20	
Benzo (a) pyrene	23.1	10.0	ug/L	46.7	BLOD	49.4	17-163	14.4	20	
Benzo (b) fluoranthene	23.9	10.0	ug/L	46.7	BLOD	51.1	24-159	15.3	20	
Benzo (g,h,i) perylene	11.9	10.0	ug/L	46.7	BLOD	25.5	10-219	8.56	20	
Benzo (k) fluoranthene	24.7	10.0	ug/L	46.7	BLOD	52.9	11-162	27.1	20	P
bis (2-Chloroethoxy) methane	12.9	10.0	ug/L	46.7	BLOD	27.6	33-184	18.9	20	M
bis (2-Chloroethyl) ether	13.2	10.0	ug/L	46.7	BLOD	28.3	12-158	23.0	20	P
2,2'-Oxybis (1-chloropropane)	11.6	10.0	ug/L	46.7	BLOD	24.7	36-166	29.5	20	M, P

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike Dup (BGD0564-MSD2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
bis (2-Ethylhexyl) phthalate	19.0	10.0	ug/L	46.7	BLOD	40.6	10-158	19.2	20	
Butyl benzyl phthalate	19.4	10.0	ug/L	46.7	BLOD	41.5	10-152	9.72	20	
Chrysene	23.3	10.0	ug/L	46.7	BLOD	49.8	17-169	8.72	20	
Dibenz (a,h) anthracene	15.9	10.0	ug/L	46.7	BLOD	33.9	10-227	6.61	20	
Diethyl phthalate	21.8	10.0	ug/L	46.7	BLOD	46.7	10-120	3.87	20	
Dimethyl phthalate	20.2	10.0	ug/L	46.7	BLOD	43.3	10-120		20	
Di-n-butyl phthalate	23.0	10.0	ug/L	46.7	BLOD	49.2	10-120	12.8	20	
Di-n-octyl phthalate	28.5	10.0	ug/L	46.7	BLOD	60.9	10-146	31.8	20	P
Fluoranthene	25.1	10.0	ug/L	46.7	BLOD	53.7	26-137	13.6	20	
Fluorene	18.6	10.0	ug/L	46.7	BLOD	39.8	59-121	8.29	20	M
Hexachlorobenzene	19.3	1.00	ug/L	46.7	BLOD	41.3	10-152	3.10	20	
Hexachlorobutadiene	13.2	10.0	ug/L	46.7	BLOD	28.2	24-120	22.6	20	P
Hexachlorocyclopentadiene	5.28	10.0	ug/L	46.7	BLOD	11.3	10-90	14.6	20	
Hexachloroethane	15.1	10.0	ug/L	46.7	BLOD	32.4	40-120	25.9	20	M, P
Indeno (1,2,3-cd) pyrene	15.9	10.0	ug/L	46.7	BLOD	34.1	10-171	13.8	20	
Isophorone	7.52	10.0	ug/L	46.7	BLOD	16.1	21-196	16.1	20	M
Naphthalene	14.6	5.00	ug/L	46.7	BLOD	31.3	21-133	15.3	20	
Nitrobenzene	18.9	10.0	ug/L	46.7	BLOD	40.4	35-180	18.5	20	
n-Nitrosodimethylamine	9.77	10.0	ug/L	46.7	BLOD	20.9	10-85	0.192	20	
n-Nitrosodi-n-propylamine	15.7	10.0	ug/L	46.7	BLOD	33.6	10-230	18.8	20	
n-Nitrosodiphenylamine	18.1	10.0	ug/L	46.7	BLOD	38.7	12-111	7.61	20	
p-Chloro-m-cresol	14.9	10.0	ug/L	46.7	BLOD	31.9	10-127	8.18	20	
Pentachlorophenol	22.1	20.0	ug/L	46.7	BLOD	47.2	14-176	5.88	20	
Phenanthrene	23.9	10.0	ug/L	46.7	BLOD	51.1	54-120	8.26	20	M
Phenol	5.16	10.0	ug/L	47.2	BLOD	10.9	10-120	27.0	20	P

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Semivolatile Organic Compounds by GCMS - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0564 - SW3510C/EPA600-MS										
Matrix Spike Dup (BGD0564-MSD2)	**Source: 23D0807-02**			Prepared & Analyzed: 04/18/2023						
Pyrene	25.0	10.0	ug/L	46.7	BLOD	53.4	52-120	2.59	20	
Pyridine	15.2	10.0	ug/L	46.7	BLOD	32.5	10-110	35.3	20	P
Surr: 2,4,6-Tribromophenol (Surr)	*45.8*		ug/L	*93.5*		*49.0*	*5-136*			
Surr: 2-Fluorobiphenyl (Surr)	*15.5*		ug/L	*46.7*		*33.2*	*9-117*			
Surr: 2-Fluorophenol (Surr)	*14.6*		ug/L	*93.5*		*15.7*	*5-60*			
Surr: Nitrobenzene-d5 (Surr)	*20.4*		ug/L	*46.7*		*43.7*	*5-151*			
Surr: Phenol-d5 (Surr)	*11.3*		ug/L	*93.5*		*12.1*	*5-60*			
Surr: p-Terphenyl-d14 (Surr)	*18.5*		ug/L	*46.7*		*39.5*	*5-141*			

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Wet Chemistry Analysis - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0495 - No Prep Wet Chem										
Blank (BGD0495-BLK1)				Prepared & Analyzed: 04/14/2023						
BOD	ND	2.0	mg/L							
LCS (BGD0495-BS1)				Prepared & Analyzed: 04/14/2023						
BOD	199	2	mg/L	198		101	84.6-115.4			
Duplicate (BGD0495-DUP1)	**Source: 23D0787-01**			Prepared & Analyzed: 04/14/2023						
BOD	3.9	2.0	mg/L		4.1			4.96	20	
Batch BGD0533 - No Prep Wet Chem										
Blank (BGD0533-BLK1)				Prepared & Analyzed: 04/14/2023						
Nitrite as N	ND	0.05	mg/L							
LCS (BGD0533-BS1)				Prepared & Analyzed: 04/14/2023						
Nitrite as N	0.10	0.05	mg/L	0.100		102	80-120			
Matrix Spike (BGD0533-MS1)	**Source: 23D0744-01**			Prepared & Analyzed: 04/14/2023						
Nitrite as N	0.10	0.05	mg/L	0.100	BLOD	97.0	80-120			
Matrix Spike Dup (BGD0533-MSD1)	**Source: 23D0744-01**			Prepared & Analyzed: 04/14/2023						
Nitrite as N	0.10	0.05	mg/L	0.100	BLOD	96.0	80-120	1.04	20	
Batch BGD0581 - No Prep Wet Chem										
Blank (BGD0581-BLK1)				Prepared & Analyzed: 04/17/2023						
Total Recoverable Phenolics	ND	0.050	mg/L							

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Wet Chemistry Analysis - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0581 - No Prep Wet Chem										
LCS (BGD0581-BS1)				Prepared & Analyzed: 04/17/2023						
Total Recoverable Phenolics	0.48	0.050	mg/L	0.500		96.8	80-120			
Matrix Spike (BGD0581-MS1)		**Source: 23D0664-05**		Prepared & Analyzed: 04/17/2023						
Total Recoverable Phenolics	0.51	0.050	mg/L	0.500	BLOD	101	70-130			
Matrix Spike Dup (BGD0581-MSD1)		**Source: 23D0664-05**		Prepared & Analyzed: 04/17/2023						
Total Recoverable Phenolics	0.50	0.050	mg/L	0.500	BLOD	99.6	70-130	1.59	20	
Batch BGD0590 - No Prep Wet Chem										
Blank (BGD0590-BLK1)				Prepared & Analyzed: 04/17/2023						
TKN as N	ND	0.50	mg/L							
LCS (BGD0590-BS1)				Prepared & Analyzed: 04/17/2023						
TKN as N	10.3	0.50	mg/L	10.0		103	90-110			
Matrix Spike (BGD0590-MS1)		**Source: 23D0643-01**		Prepared & Analyzed: 04/17/2023						
TKN as N	11.3	0.50	mg/L	10.0	1.19	101	90-110			
Matrix Spike Dup (BGD0590-MSD1)		**Source: 23D0643-01**		Prepared & Analyzed: 04/17/2023						
TKN as N	11.7	0.50	mg/L	10.0	1.19	105	90-110	3.48	20	
Batch BGD0667 - No Prep Wet Chem										
Blank (BGD0667-BLK1)				Prepared & Analyzed: 04/19/2023						
COD	ND	10.0	mg/L							

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Wet Chemistry Analysis - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0667 - No Prep Wet Chem										
LCS (BGD0667-BS1)				Prepared & Analyzed: 04/19/2023						
COD	48.6	10.0	mg/L	50.0		97.3	88-119			
Matrix Spike (BGD0667-MS1)	**Source: 23D0744-01**			Prepared & Analyzed: 04/19/2023						
COD	57.8	10.0	mg/L	50.0	BLOD	116	72.4-130			
Matrix Spike Dup (BGD0667-MSD1)	**Source: 23D0744-01**			Prepared & Analyzed: 04/19/2023						
COD	49.6	10.0	mg/L	50.0	BLOD	99.1	72.4-130	15.4	20	
Batch BGD0732 - No Prep Wet Chem										
LCS (BGD0732-BS1)				Prepared & Analyzed: 04/20/2023						
Nitrate+Nitrite as N	2.56	0.1	mg/L	2.50		103	90-110			
Matrix Spike (BGD0732-MS1)	**Source: 23D0819-01**			Prepared & Analyzed: 04/20/2023						
Nitrate+Nitrite as N	2.95	0.10	mg/L	2.50	BLOD	118	90-110			M
Matrix Spike Dup (BGD0732-MSD1)	**Source: 23D0819-01**			Prepared & Analyzed: 04/20/2023						
Nitrate+Nitrite as N	2.96	0.10	mg/L	2.50	BLOD	118	90-110	0.542	20	M
Batch BGD0898 - No Prep Wet Chem										
Blank (BGD0898-BLK1)				Prepared & Analyzed: 04/25/2023						
Ammonia as N	ND	0.10	mg/L							
LCS (BGD0898-BS1)				Prepared & Analyzed: 04/25/2023						
Ammonia as N	0.99	0.1	mg/L	1.00		99.1	90-110			

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Wet Chemistry Analysis - Quality Control

Enthalpy Analytical

Analyte	Result	LOQ	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch BGD0898 - No Prep Wet Chem										
Matrix Spike (BGD0898-MS1)		**Source: 23D1096-04**		Prepared & Analyzed: 04/25/2023						
Ammonia as N	1.12	0.10	mg/L	1.00	0.17	95.8	89.3-131			
Matrix Spike (BGD0898-MS2)		**Source: 23D1099-01**		Prepared & Analyzed: 04/25/2023						
Ammonia as N	1.00	0.10	mg/L	1.00	BLOD	100	89.3-131			
Matrix Spike Dup (BGD0898-MSD1)		**Source: 23D1096-04**		Prepared & Analyzed: 04/25/2023						
Ammonia as N	1.14	0.10	mg/L	1.00	0.17	97.7	89.3-131	1.68	20	
Matrix Spike Dup (BGD0898-MSD2)		**Source: 23D1099-01**		Prepared & Analyzed: 04/25/2023						
Ammonia as N	0.98	0.10	mg/L	1.00	BLOD	97.8	89.3-131	2.52	20	

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Analytical Summary

23D0768-01	Subcontract
23D0768-02	Subcontract

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Metals (Total) by EPA 6000/7000 Series Methods			**Preparation Method:**	**EPA200.8 R5.4**	
23D0768-01	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
23D0768-01RE1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
23D0768-02	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
23D0768-02RE1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Wet Chemistry Analysis			**Preparation Method:**	**No Prep Wet Chem**	
23D0768-01	300 mL / 300 mL	SM22 5210B-2011	BGD0495	SGD0690	
23D0768-02	300 mL / 300 mL	SM22 5210B-2011	BGD0495	SGD0690	
23D0768-01	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
23D0768-02	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
23D0768-01	0.500 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
23D0768-02	0.500 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
23D0768-01	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255
23D0768-02	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255
23D0768-01	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
23D0768-02	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
23D0768-01	1.00 mL / 5.00 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
23D0768-01RE1	5.00 mL / 5.00 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
23D0768-02	5.00 mL / 5.00 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
23D0768-01	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
23D0768-02	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310

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Certificate of Analysis

Client Name: SCS Engineers-Winchester
Date Issued: 5/2/2023 10:00:46AM
Client Site I.D.: 2023 City of Bristol Landfill Leachate
Submitted To: Jennifer Robb

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Semivolatile Organic Compounds by GCMS			**Preparation Method:**	**SW3510C/EPA600-MS**	
23D0768-01	1070 mL / 2.00 mL	SW8270E	BGD0564	SGD0664	AL20040
23D0768-02	1030 mL / 2.00 mL	SW8270E	BGD0564	SGD0664	AL20040

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**SW5030B-MS**	
23D0768-01	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
23D0768-02	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
23D0768-03	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
23D0768-01RE1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066
23D0768-02RE1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Metals (Total) by EPA 6000/7000 Series Methods			**Preparation Method:**	**SW7470A**	
23D0768-01	10.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263
23D0768-02	20.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263

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QC Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Metals (Total) by EPA 6000/7000 Series Methods			**Preparation Method:**	**EPA200.8 R5.4**	
BGD1007-BLK1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
BGD1007-BS1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
BGD1007-MS1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323
BGD1007-MSD1	50.0 mL / 50.0 mL	SW6020B	BGD1007	SGD1081	AD30323

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Wet Chemistry Analysis			**Preparation Method:**	**No Prep Wet Chem**	
BGD0495-BLK1	300 mL / 300 mL	SM22 5210B-2011	BGD0495	SGD0690	
BGD0495-BS1	300 mL / 300 mL	SM22 5210B-2011	BGD0495	SGD0690	
BGD0495-DUP1	300 mL / 300 mL	SM22 5210B-2011	BGD0495	SGD0690	
BGD0533-BLK1	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
BGD0533-BS1	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
BGD0533-MRL1	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
BGD0533-MS1	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
BGD0533-MSD1	25.0 mL / 25.0 mL	SM22 4500-NO2B-2011	BGD0533	SGD0559	AJ20138
BGD0581-BLK1	5.00 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
BGD0581-BS1	5.00 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
BGD0581-MRL1	5.00 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
BGD0581-MS1	5.00 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
BGD0581-MSD1	5.00 mL / 10.0 mL	SW9065	BGD0581	SGD0586	AL20103
BGD0590-BLK1	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255
BGD0590-BS1	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255
BGD0590-MS1	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255

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Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Wet Chemistry Analysis			**Preparation Method:**	**No Prep Wet Chem**	
BGD0590-MSD1	25.0 mL / 25.0 mL	EPA351.2 R2.0	BGD0590	SGD0622	AD30255
BGD0667-BLK1	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
BGD0667-BS1	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
BGD0667-MRL1	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
BGD0667-MS1	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
BGD0667-MSD1	2.00 mL / 2.00 mL	SM22 5220D-2011	BGD0667	SGD0706	AD30264
BGD0732-BLK1		SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
BGD0732-BS1	5.00 mL / 5.00 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
BGD0732-MRL1		SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
BGD0732-MS1	50.0 mL / 50.0 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
BGD0732-MSD1	50.0 mL / 50.0 mL	SM22 4500-NO3F-2011	BGD0732	SGD0756	AD30272
BGD0898-BLK1	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-BS1	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-MRL1	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-MS1	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-MS2	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-MSD1	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310
BGD0898-MSD2	6.00 mL / 6.00 mL	EPA350.1 R2.0	BGD0898	SGD0913	AD30310

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Semivolatile Organic Compounds by GCMS			**Preparation Method:**	**SW3510C/EPA600-MS**	
BGD0564-BLK1	1000 mL / 1.00 mL	SW8270E	BGD0564	SGD0664	AL20040
BGD0564-BLK2		SW8270E	BGD0564	SGD0703	AB30072
BGD0564-BS1	1000 mL / 1.00 mL	SW8270E	BGD0564	SGD0664	AL20040
BGD0564-BS2		SW8270E	BGD0564	SGD0703	AB30072
BGD0564-MS1	1000 mL / 1.00 mL	SW8270E	BGD0564	SGD0664	AL20040
BGD0564-MS2	1070 mL / 1.00 mL	SW8270E	BGD0564	SGD0683	AB30070
BGD0564-MSD1	1000 mL / 1.00 mL	SW8270E	BGD0564	SGD0664	AL20040

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Semivolatile Organic Compounds by GCMS			**Preparation Method:**	**SW3510C/EPA600-MS**	
BGD0564-MSD2	1070 mL / 1.00 mL	SW8270E	BGD0564	SGD0683	AB30070

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GCMS			**Preparation Method:**	**SW5030B-MS**	
BGD0619-BLK1	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
BGD0619-BS1	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
BGD0619-MS1	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
BGD0619-MSD1	5.00 mL / 5.00 mL	SW8260D	BGD0619	SGD0657	AD30180
BGD0678-BLK1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066
BGD0678-BS1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066
BGD0678-MS1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066
BGD0678-MSD1	5.00 mL / 5.00 mL	SW8260D	BGD0678	SGD0710	AB30066

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Metals (Total) by EPA 6000/7000 Series Methods			**Preparation Method:**	**SW7470A**	
BGD0656-BLK1	20.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263
BGD0656-BS1	20.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263
BGD0656-MS1	20.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263
BGD0656-MSD1	20.0 mL / 20.0 mL	SW7470A	BGD0656	SGD0701	AD30263

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Certified Analyses included in this Report

Analyte	Certifications
EPA350.1 R2.0 in Non-Potable Water	
Ammonia as N	VELAP,NCDEQ,PADEP,WVDEP
EPA351.2 R2.0 in Non-Potable Water	
TKN as N	VELAP,NCDEQ,WVDEP
SM22 4500-NO2B-2011 in Non-Potable Water	
Nitrite as N	VELAP,WVDEP,NCDEQ
SM22 4500-NO3F-2011 in Non-Potable Water	
Nitrate+Nitrite as N	VELAP,WVDEP
SM22 5210B-2011 in Non-Potable Water	
BOD	VELAP,NCDEQ,WVDEP
SM22 5220D-2011 in Non-Potable Water	
COD	VELAP,NCDEQ,PADEP,WVDEP
SW6020B in Non-Potable Water	
Arsenic	VELAP,WVDEP
Barium	VELAP,WVDEP
Cadmium	VELAP,WVDEP
Chromium	VELAP,WVDEP
Copper	VELAP,WVDEP
Lead	VELAP,WVDEP
Nickel	VELAP,WVDEP
Selenium	VELAP,WVDEP
Silver	VELAP,WVDEP
Zinc	VELAP,WVDEP
SW7470A in Non-Potable Water	
Mercury	VELAP,NCDEQ,WVDEP

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Certified Analyses included in this Report

Analyte	Certifications
SW8260D in Non-Potable Water	
2-Butanone (MEK)	VELAP,NCDEQ,PADEP,WVDEP
Acetone	VELAP,NCDEQ,PADEP,WVDEP
Benzene	VELAP,NCDEQ,PADEP,WVDEP
Ethylbenzene	VELAP,NCDEQ,PADEP,WVDEP
Toluene	VELAP,NCDEQ,PADEP,WVDEP
Xylenes, Total	VELAP,NCDEQ,PADEP,WVDEP
Tetrahydrofuran	VELAP,PADEP
SW8270E in Non-Potable Water	
Anthracene	VELAP,PADEP,NCDEQ,WVDEP
SW9065 in Non-Potable Water	
Total Recoverable Phenolics	VELAP,WVDEP

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Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2023
NC	North Carolina DENR	495	12/31/2023
NCDEQ	North Carolina DEQ	495	12/31/2023
NCDOH	North Carolina Department of Health	51714	07/31/2023
NYDOH	New York DOH Drinking Water	12069	04/01/2024
PADEP	NELAP-Pennsylvania Certificate #008	68-03503	10/31/2023
SCDHEC	South Carolina Dept of Health and Environmental Control Certificate 93016001	93016	06/14/2023
VELAP	NELAP-Virginia Certificate #12333	460021	06/14/2023
WVDEP	West Virginia DEP	350	11/30/2023

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Qualifiers and Definitions

DS	Surrogate concentration reflects a dilution factor.
E	Estimated concentration, outside calibration range
J	The reported result is an estimated value.
L	LCS recovery is outside of established acceptance limits
M	Matrix spike recovery is outside established acceptance limits
P	Duplicate analysis does not meet the acceptance criteria for precision
RPD	Relative Percent Difference
Qual	Qualifers
-RE	Denotes sample was re-analyzed
LOD	Limit of Detection
BLOD	Below Limit of Detection
LOQ	Limit of Quantitation
DF	Dilution Factor
TIC	Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.
PCBs, Total	Total PCBs are defined as the sum of detected Aroclors 1016, 1221, 1232, 1248, 1254, 1260, 1262, and 1268.

ENTHALPY ANALYTICAL

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CHAIN OF CUSTODY

COMPANY NAME: SCS Engineers	INVOICE TO: SAME	PROJECT NAME/Quote #:
CONTACT: Jennifer Robb	INVOICE CONTACT:	SITE NAME: 2023 City of Bristol Landfill Leachate
ADDRESS: 11260 Roger Bacon Drive,	INVOICE ADDRESS:	PROJECT NUMBER: 02218208.15 Task 1
Ste. 300, Reston VA 20190	INVOICE PHONE #:	P.O. #:
PHONE #: 703-471-6150 EMAIL: jrobb@scsengineers.com		Pretreatment Program:
Is sample for compliance reporting? YES NO	Regulatory State: V A	Is sample from a chlorinated supply? YES NO / PWS I.D. #:
SAMPLER NAME (PRINT): Anthony Memmott / Ty Smith	SAMPLER SIGNATURE:	Turn Around Time: 10 Day(s)

Matrix Codes: WW=Waste Water/Storm Water GW=Ground Water DW=Drinking Water S=Soil/Solids OR=Organic A=Air WP=Wipe OT=Other

CLIENT SAMPLE I.D.	Grab	Composite	Field Filtered (Dissolved Metals)	Composite Start Date	Composite Start Time	Grab Date or Composite Stop Date	Grab Time or Composite Stop Time	Time Preserved	Matrix (See Codes)	Number of Containers	Ammonia - EPA 350.1	BOD - SM22 5210B-2021	COD - SM22 5220D-2011	Nitrate SM22 450-NO3F-2011 (report seperatly from Nitrite)	Nitrite SM22 450-NO3F-2011	SVOC (Anthracene) 8270	Total Metals (As, Ba, Cd, Cr, Cu, Pb, Ni, Se, Ag, Zn) 6010	TKN - EPA 351.2 R2.0	Mercury - 7470	Total Recoverable Phenolics - 9065	W. Fatty Acids (See List) 8015	VOCs (See List) 8260
1) EW-58	X					041323	820		GW	6	X	X	X	X	X	X	X	X	X	X	X	X
2) EW-60	X					041323	835		GW	16	X	X	X	X	X	X	X	X	X	X	X	X
3) Trip Blank	X					041023	1185		GW	2												X
4)									GW													
5)									GW													
6)									GW													
7)									GW													
8)									GW													
9)									GW													
10)									DI													

COMMENTS

Preservative Codes: N=Nitric Acid C=Hydrochloric Acid S=Sulfuric Acid H=Sodium Hydroxide A=Ascorbic Acid Z=Zinc Acetate T=Sodium Thiosulfate M=Methanol

Note VOC 8260 no HCl

PLEASE NOTE PRESERVATIVE(S), INTERFERENCE CHECKS or PUMP RATE (L/min)

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME
	041323 1100	LCW	
RELINQUISHED: LCW	DATE / TIME	RECEIVED: M Steer	DATE / TIME 4/14/23 0800
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME

QC Data Package
Level III ☐
Level IV ☐

LAB USE ONLY Therm ID: 277
Custody Seals used and intact? (Y / N)
COOLER TEMP 3.6 °C
Received on ice? (Y / N)

SCS-W 23D0768
2023 City of Bristol Landfill Leach:
Recd: 04/14/2023 Due: 04/28/2023

v130325002

ENTHALPY ANALYTICAL

Sample Preservation Log

Order ID 23D0768 Date Performed: 4/14/23 Analyst Performing Check: RCJ

Sample ID	Container ID	Metals			Cyanide			Sulfide			Ammonia			TKN			Phos, Tot			NO3+NO2			DRO			Pesticide (8081/608/508) PCB DW only			SVOC (525/8270/625)			CrVI * **		Pest/PCB (508) / SVOC(525)			phenolics			COD		
		pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH	Received Res. Cl		final + or -	Received Res. Cl		final + or -	Received pH	Final pH	pH as Received		Final pH	pH as Received		Final pH	pH as Received		Final pH
		< 2	Other		> 12	Other		> 9	Other		< 2	Other		< 2	Other		< 2	Other		< 2	Other		< 2	Other		+	-		+	-				< 2	Other		< 2	Other		< 2	Other	
01	A		7	<2																																					
01	B																																				7	<2			
01	E													7	<2																										
01	M										7	<2																												
01	N																			7	<2																		
01	O																																					7	<2
02	A		7	<2																																				
02	B													7	<2																										
02	F																																				7	<2			
02	M																																						7	<2
02	N										7	<2																												
02	O																			7	<2																		

NaOH ID: _____ HNO3 ID: 3C03613 CrVI preserved date/time: _____ Analyst Initials: _____

** pH must be adjusted between 9.3 - 9.7*

H2SO4 ID: 3B01580 Na2S2O3 ID: _____ Buffer Sol'n ID: _____

HCL ID: _____ Na2SO3 ID: _____ 1N NaOH ID: _____ 5N NaOH: _____

Metals were received with pH =7 HNO3 was added on 17 April 2023 at 1003 by RCJ/DLJ in the Log-In room to bring pH= <2.
768 -01

**W.Va only certifies DISS CrVI and not T CrVI as an approved analyte under 40CFR136 for waste water.

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Certificate of Analysis

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Laboratory Order ID: 23D0768

Sample Conditions Checklist

Samples Received at:	**3.60°C**
How were samples received?	Logistics Courier
Were Custody Seals used? If so, were they received intact?	Yes
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	Yes
Are all volatile organic and TOX containers free of headspace?	Yes
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	Yes
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis.	No

Work Order Comments

All received samples required pH adjustment upon receiving. All samples have been adjusted to the required <2
Jennifer Robb notified via email
JNH 4/17/23 1311

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
Ammonia as N (mg/L)	November-2022	---	---	---	---	**1560**	---	**1400**	**1380**	---	---	50	50
	December-2022	**1700**	**2280**	**2110**	---	**1410**	**1310**	---	---	**1150**	**1780**	100	100
	January-2023	**1520**	---	---	**1500**	---	---	---	**1330**	---	---	50	50
		---	---	---	---	**2440**	---	---	---	---	---	100	100
	February-2023	---	---	---	---	---	---	---	---	---	**1490**	100	100
	March-2023	---	---	---	**667**	**1480**	---	---	---	---	---	73.1	100
	April-2023	---	---	---	**1410**	---	**1220**	---	---	---	---	73.1	100
Biological Oxygen Demand (mg/L)	November-2022	---	---	---	---	**15700**	---	**5860**	**5140**	---	---	0.2	2
	December-2022	**6440**	**12500**	**11400**	---	**9240**	**3330**	---	---	**8360**	**6770**	0.2	2
	January-2023	**9920**	---	---	**999**	**28100**	---	---	**7060**	---	---	0.2	2
	February-2023	---	---	---	---	---	---	---	---	---	**7230**	0.2	2
	March-2023	---	---	---	**1570**	**9190**	---	---	---	---	---	0.2	2
	April-2023	---	---	---	**8430**	---	**2860**	---	---	---	---	0.2	2
Chemical Oxygen Demand (mg/L)	November-2022	---	---	---	---	---	---	**9790**	**10800**	---	---	1000	1000
		---	---	---	---	**23500**	---	---	---	---	---	2000	2000
	December-2022	**7440**	---	---	---	---	---	---	---	---	---	1000	1000
		---	---	---	---	**13200**	**8000**	---	---	**20300**	**14100**	2000	2000
		---	---	**22400**	---	---	---	---	---	---	---	5000	5000
		---	**86800**	---	---	---	---	---	---	---	---	10000	10000
	January-2023	---	---	---	**3630**	---	---	---	---	---	---	500	500
		14900	---	---	---	---	---	---	**8430**	---	---	2000	2000
		---	---	---	---	**47600**	---	---	---	---	---	5000	5000
	February-2023	---	---	---	---	---	---	---	---	---	**9210**	1000	1000
	March-2023	---	---	---	**1690**	---	---	---	---	---	---	500	500
		---	---	---	---	**10600**	---	---	---	---	---	2000	2000
	April-2023	---	---	---	---	---	**7370**	---	---	---	---	1000	1000
		---	---	---	**16800**	---	---	---	---	---	---	2000	2000

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
Nitrate+Nitrite as N (mg/L)	November-2022	---	---	---	---	**2.91**	---	**0.16**	**0.33**	---	---	0.1	0.1
Nitrate as N (mg/L)	December-2022	---	---	---	---	---	---	---	---	ND	---	0.2	0.2
		---	---	---	---	---	ND	---	---	---	---	0.2	0.6
		ND	ND	ND	---	ND	---	---	---	---	---	1.1	5.1
		---	---	---	---	---	---	---	---	---	ND	1.5	5.5
	January-2023	---	---	---	ND	---	---	---	---	---	---	0.35	1.35
		---	---	---	---	---	---	---	ND	---	---	1.1	1.1
		3.9	---	---	---	---	---	---	---	---	---	2.1	2.1
		---	---	---	---	ND	---	---	---	---	---	2.2	2.2
	February-2023	---	---	---	---	---	---	---	---	---	ND	0.35	1.35
	March-2023	---	---	---	ND	ND	---	---	---	---	---	1.04	5.1
	April-2023	---	---	---	ND	---	ND	---	---	---	---	0.6	2.6
Nitrite as N (mg/L)	December-2022	---	---	---	---	---	**0.12 J**	---	---	---	---	0.1	0.5
		ND	ND	ND	---	ND	---	---	---	ND	ND	1	5
	January-2023	---	---	---	ND	---	---	---	---	---	---	0.25	1.25
		---	---	---	---	---	---	---	ND	---	---	1	1
		ND	---	---	---	ND	---	---	---	---	---	2	2
	February-2023	---	---	---	---	---	---	---	---	---	**0.48 J**	0.25	1.25
	March-2023	---	---	---	ND	ND	---	---	---	---	---	1	5
	April-2023	---	---	---	ND	---	ND	---	---	---	---	0.5	2.5
Total Kjeldahl Nitrogen (mg/L)	November-2022	---	---	---	---	---	---	**1290**	**1470**	---	---	20	50
		---	---	---	---	**2110**	---	---	---	---	---	50	125
	December-2022	**1510**	**3570**	**1790**	---	**1830**	**1490**	---	---	**1340**	**1940**	200	500
	January-2023	**1840**	---	---	**881**	---	---	---	**1410**	---	---	20	50
		---	---	---	---	**2970**	---	---	---	---	---	40	100
	February-2023	---	---	---	---	---	---	---	---	---	**1870**	16.8	50
	March-2023	---	---	---	**879**	**1920**	---	---	---	---	---	33.6	100
	April-2023	---	---	---	**1820**	---	**1510**	---	---	---	---	16.8	50

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
Total Recoverable Phenolics (mg/L)	November-2022	---	---	---	---	---	---	**5.68**	**3**	---	---	0.3	0.5
		---	---	---	---	**28.8**	---	---	---	---	---	0.75	1.25
	December-2022	---	---	---	---	---	**8.94**	---	---	---	---	0.3	0.5
		24.9	**54.6**	**28.3**	---	**32**	---	---	---	**20.2**	**36**	1.5	2.5
	January-2023	**27.2**	---	---	**1.3**	---	---	---	**20.2**	---	---	0.75	1.25
		---	---	---	---	**56.5**	---	---	---	---	---	1.5	2.5
	February-2023	---	---	---	---	---	---	---	---	---	**22.4**	1.5	2.5
	March-2023	---	---	---	**0.4**	---	---	---	---	---	---	0.03	0.05
		---	---	---	---	**13.9**	---	---	---	---	---	0.3	0.5
	April-2023	---	---	---	**18.7**	---	**5.1**	---	---	---	---	0.3	0.5
SEMI-VOLATILE ORGANIC COMPOUND (ug/L)													
Anthracene	November-2022	---	---	---	---	---	---	ND	ND	---	---	46.7	93.5
		---	---	---	---	ND	---	---	---	---	---	93.5	187
	December-2022	---	---	---	---	ND	ND	---	---	---	ND	9.35	9.35
		---	---	ND	---	---	---	---	---	ND	---	11.7	11.7
		---	ND	---	---	---	---	---	---	---	---	23.4	23.4
		ND	---	---	---	---	---	---	---	---	---	485	971
	January-2023	---	---	---	ND	---	---	---	---	---	---	243	485
		---	---	---	---	---	---	---	ND	---	---	253	505
		ND	---	---	---	---	---	---	---	---	---	490	980
		---	---	---	---	ND	---	---	---	---	---	500	1000
	February-2023	---	---	---	---	---	---	---	---	---	ND	187	374
	March-2023	---	---	---	---	ND	---	---	---	---	---	51	102
		---	---	---	ND	---	---	---	---	---	---	117	234
	April-2023	---	---	---	ND	---	---	---	---	---	---	37.4	74.8
		---	---	---	---	---	ND	---	---	---	---	38.8	77.7
TOTAL METAL (mg/L)													
Arsenic	November-2022	---	---	---	---	**0.863**	---	**0.464**	**1.3**	---	---	0.02	0.04
	December-2022	**1.02**	**0.406**	**0.174**	---	**1.69**	**0.49**	---	---	**0.159**	**0.574**	0.02	0.04
	January-2023	**0.285**	---	---	**0.596**	**0.225**	---	---	**0.846**	---	---	0.01	0.02
	February-2023	---	---	---	---	---	---	---	---	---	**0.29**	0.005	0.01
	March-2023	---	---	---	**1.07**	**1**	---	---	---	---	---	0.01	0.02
	April-2023	---	---	---	---	---	**0.11**	---	---	---	---	0.0005	0.001
		---	---	---	**0.36**	---	---	---	---	---	---	0.005	0.01

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	Monitoring Event	Concentration											
TOTAL METALS (mg/L)													
Barium	November-2022	---	---	---	---	**0.871**	---	**0.485**	**0.36**	---	---	0.01	0.02
	December-2022	**0.566**	**0.803**	**0.978**	---	**0.438**	**0.214**	---	---	**0.856**	**0.793**	0.01	0.02
	January-2023	**0.643**	---	---	**0.683**	**1.92**	---	---	**0.554**	---	---	0.005	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**1.04**	0.01	0.05
	March-2023	---	---	---	**0.406**	**0.683**	---	---	---	---	---	0.005	0.01
	April-2023	---	---	---	**1.21**	---	**0.326**	---	---	---	---	0.01	0.05
Cadmium	November-2022	---	---	---	---	ND	---	ND	ND	---	---	0.004	0.008
	December-2022	ND	**0.0104**	ND	---	ND	ND	---	---	ND	ND	0.004	0.008
	January-2023	ND	---	---	ND	ND	---	---	ND	---	---	0.002	0.004
	February-2023	---	---	---	---	---	---	---	---	---	**0.000297 J**	0.0001	0.001
	March-2023	---	---	---	ND	ND	---	---	---	---	---	0.002	0.004
	April-2023	---	---	---	**0.000158 J**	---	**0.000333 J**	---	---	---	---	0.0001	0.001
Chromium	November-2022	---	---	---	---	**0.208**	---	**0.112**	**0.354**	---	---	0.016	0.02
	December-2022	**0.503**	**1.08**	**1.76**	---	**0.274**	**0.319**	---	---	**0.499**	**0.822**	0.016	0.02
	January-2023	**0.31**	---	---	**0.488**	**0.178**	---	---	**0.155**	---	---	0.008	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**0.277**	0.004	0.01
	March-2023	---	---	---	**0.213**	**0.188**	---	---	---	---	---	0.008	0.01
	April-2023	---	---	---	---	---	**0.142**	---	---	---	---	0.0004	0.001
		---	---	---	**0.306**	---	---	---	---	---	---	0.004	0.01
Copper	November-2022	---	---	---	---	ND	---	ND	ND	---	---	0.016	0.02
	December-2022	ND	ND	ND	---	ND	ND	---	---	ND	ND	0.016	0.02
	January-2023	ND	---	---	**0.0127**	**0.0256**	---	---	ND	---	---	0.008	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**0.00365**	0.0003	0.001
	March-2023	---	---	---	ND	ND	---	---	---	---	---	0.008	0.01
	April-2023	---	---	---	**0.00664**	---	**0.00767**	---	---	---	---	0.0003	0.001
Lead	November-2022	---	---	---	---	ND	---	ND	**0.017 J**	---	---	0.012	0.02
	December-2022	ND	**0.0381**	ND	---	ND	ND	---	---	ND	ND	0.012	0.02
	January-2023	ND	---	---	ND	ND	---	---	ND	---	---	0.006	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**0.006**	0.001	0.001
	March-2023	---	---	---	ND	ND	---	---	---	---	---	0.006	0.01
	April-2023	---	---	---	**0.0022**	---	**0.0067**	---	---	---	---	0.001	0.001

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
TOTAL METALS (mg/L)													
Mercury	November-2022	---	---	---	---	---	---	**0.00169**	**0.00053**	---	---	0.0004	0.0004
		---	---	---	---	ND	---	---	---	---	---	0.0008	0.0008
	December-2022	**0.00051**	---	---	---	---	---	---	---	---	---	0.0004	0.0004
		---	---	**0.00118**	---	ND	**0.00588**	---	---	**0.0048**	ND	0.0008	0.0008
		---	ND	---	---	---	---	---	---	---	---	0.004	0.004
	January-2023	ND	---	---	ND	---	---	---	ND	---	---	0.0004	0.0004
		---	---	---	---	ND	---	---	---	---	---	0.004	0.004
	February-2023	---	---	---	---	---	---	---	---	---	ND	0.0004	0.0004
	March-2023	---	---	---	ND	---	---	---	---	---	---	0.0002	0.0002
		---	---	---	---	ND	---	---	---	---	---	0.0004	0.0004
	April-2023	---	---	---	---	---	**0.00128**	---	---	---	---	0.0002	0.0002
		---	---	---	ND	---	---	---	---	---	---	0.0004	0.0004
Nickel	November-2022	---	---	---	---	**0.0866**	---	**0.1344**	**0.173**	---	---	0.014	0.02
	December-2022	**0.1722**	**0.5025**	**0.2989**	---	**0.1299**	**0.287**	---	---	**0.1853**	**0.346**	0.014	0.02
	January-2023	**0.1074**	---	---	**0.1442**	**0.0407**	---	---	**0.0769**	---	---	0.007	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**0.1726**	0.001	0.001
	March-2023	---	---	---	**0.1254**	**0.1033**	---	---	---	---	---	0.007	0.01
	April-2023	---	---	---	**0.1143**	---	**0.1732**	---	---	---	---	0.001	0.001
Selenium	November-2022	---	---	---	---	ND	---	ND	ND	---	---	0.08	0.1
	December-2022	ND	ND	ND	---	ND	ND	---	---	ND	ND	0.08	0.1
	January-2023	ND	---	---	ND	ND	---	---	ND	---	---	0.04	0.05
	February-2023	---	---	---	---	---	---	---	---	---	**0.00199**	0.00085	0.001
	March-2023	---	---	---	ND	ND	---	---	---	---	---	0.04	0.05
	April-2023	---	---	---	**0.00189**	---	**0.00185**	---	---	---	---	0.00085	0.001
Silver	November-2022	---	---	---	---	ND	---	ND	ND	---	---	0.01	0.02
	December-2022	ND	**0.0187 J**	ND	---	ND	ND	---	---	ND	ND	0.01	0.02
	January-2023	ND	---	---	ND	ND	---	---	ND	---	---	0.005	0.01
	February-2023	---	---	---	---	---	---	---	---	---	ND	0.00006	0.001
	March-2023	---	---	---	ND	ND	---	---	---	---	---	0.005	0.01
	April-2023	---	---	---	ND	---	**0.00011 J**	---	---	---	---	0.00006	0.001

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
TOTAL METAL (mg/L)													
Zinc	November-2022	---	---	---	---	ND	---	**0.032**	**0.694**	---	---	0.02	0.02
	December-2022	**0.208**	**29.7**	**0.162**	---	**0.0686**	**0.75**	---	---	**0.364**	**0.286**	0.02	0.02
	January-2023	**0.133**	---	---	**0.15**	**0.074**	---	---	**0.0752**	---	---	0.01	0.01
	February-2023	---	---	---	---	---	---	---	---	---	**0.0851**	0.0025	0.005
	March-2023	---	---	---	**0.0689**	**0.0538**	---	---	---	---	---	0.01	0.01
	April-2023	---	---	---	**0.0539**	---	---	---	---	---	---	0.0025	0.005
		---	---	---	---	---	**0.414**	---	---	---	---	0.025	0.05
VOLATILE FATTY ACIDS mg/L													
Acetic Acid	November-2022	---	---	---	---	---	---	**1600**	---	---	---	25	100
		---	---	---	---	**3500**	---	---	**150 J**	---	---	62	250
	December-2022	**1800**	---	---	---	---	---	---	---	---	---	62	250
	January-2023	ND	---	---	ND	**4400**	---	---	ND	---	---	---	500
	February-2023	---	---	---	---	---	---	---	---	---	ND	---	500
	March-2023	---	---	---	ND	**640**	---	---	---	---	---	---	500
Butyric Acid	November-2022	---	---	---	---	---	---	**430**	---	---	---	12	100
		---	---	---	---	**830**	---	---	ND	---	---	29	250
	December-2022	ND	---	---	---	---	---	---	---	---	---	29	250
	January-2023	ND	---	---	ND	**1800**	---	---	ND	---	---	---	500
	February-2023	---	---	---	---	---	---	---	---	---	ND	---	500
	March-2023	---	---	---	ND	ND	---	---	---	---	---	---	500
Lactic Acid	November-2022	---	---	---	---	---	---	ND	---	---	---	11	100
		---	---	---	---	ND	---	---	ND	---	---	27	250
	December-2022	**90 J**	---	---	---	---	---	---	---	---	---	27	250
Propionic Acid	November-2022	---	---	---	---	---	---	**620**	---	---	---	11	100
		---	---	---	---	**1600**	---	---	**73 J**	---	---	27	250
	December-2022	**640**	---	---	---	---	---	---	---	---	---	27	250
	January-2023	ND	---	---	ND	**2000**	---	---	ND	---	---	---	500
	February-2023	---	---	---	---	---	---	---	---	---	ND	---	500
	March-2023	---	---	---	ND	ND	---	---	---	---	---	---	500
Pyruvic Acid	November-2022	---	---	---	---	---	---	**46 J**	---	---	---	12	100
		---	---	---	---	**98 J**	---	---	ND	---	---	30	250
	December-2022	ND	---	---	---	---	---	---	---	---	---	30	250

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
VOLATILE ORGANIC COMPOUNDS (ug/L)													
2-Butanone (MEK)	November-2022	---	---	---	---	**3510**	---	---	**1140**	---	---	30	100
		---	---	---	---	---	---	**15600**	---	---	---	300	1000
	December-2022	**3140**	---	---	---	---	**3390**	---	---	---	---	30	100
		---	**26800**	**27700**	---	**5670**	---	---	---	**21700**	**7150**	300	1000
	January-2023	**3480**	---	---	**632**	---	---	---	---	---	---	30	100
		---	---	---	---	**7840**	---	---	**5470**	---	---	300	1000
	February-2023	---	---	---	---	---	---	---	---	---	**14400**	600	2000
	March-2023	---	---	---	**257**	**2770**	---	---	---	---	---	30	100
	April-2023	---	---	---	**3420**	---	**5530**	---	---	---	---	750	2500
Acetone	November-2022	---	---	---	---	---	---	---	**4420**	---	---	70	100
		---	---	---	---	**16100**	---	**38300**	---	---	---	700	1000
	December-2022	---	---	---	---	**15600**	**5170**	---	---	---	**9800**	700	1000
		8500	---	---	---	---	---	---	---	---	---	1750	2500
		---	**53100**	**49900**	---	---	---	---	---	**45600**	---	3500	5000
	January-2023	---	---	---	**1530**	---	---	---	---	---	---	70	100
		---	---	---	---	**22200**	---	---	**14000**	---	---	700	1000
		8130	---	---	---	---	---	---	---	---	---	1750	2500
	February-2023	---	---	---	---	---	---	---	---	---	**23900**	1400	2000
	March-2023	---	---	---	**375**	---	---	---	---	---	---	70	100
		---	---	---	---	**6810**	---	---	---	---	---	700	1000
	April-2023	---	---	---	**8290**	---	**7560**	---	---	---	---	1750	2500
Benzene	November-2022	---	---	---	---	**7.4 J**	---	**2860**	**50.4**	---	---	4	10
	December-2022	**301**	**2960**	---	---	**6.3 J**	**622**	---	---	**1750**	**179**	4	10
		---	---	**6550**	---	---	---	---	---	---	---	40	100
	January-2023	**240**	---	---	**28.7**	**1620**	---	---	**167**	---	---	4	10
	February-2023	---	---	---	---	---	---	---	---	---	**1370**	4	10
	March-2023	---	---	---	**1540**	**727**	---	---	---	---	---	4	10
	April-2023	---	---	---	**3740**	---	**320**	---	---	---	---	4	10
Ethylbenzene	December-2022	**67.3**	**172**	**287**	---	ND	**48.5**	---	---	**108**	**27.4**	4	10
	November-2022	---	---	---	---	ND	---	**194**	**16.2**	---	---	4	10
	January-2023	**65.1**	---	---	ND	**93.9**	---	---	**20.8**	---	---	4	10
	February-2023	---	---	---	---	---	---	---	---	---	**151**	4	10
	March-2023	---	---	---	**131**	**71.5**	---	---	---	---	---	4	10
	April-2023	---	---	---	**186**	---	**43.4**	---	---	---	---	4	10

Historical LFG-EW Leachate Monitoring Results Summary

Well ID		EW-50	EW-52	EW-57	EW-58	EW-59	EW-60	EW-61	EW-65	EW-67	EW-68	LOD	LOQ
Parameter	**Monitoring Event**	**Concentration**											
VOLATILE ORGANIC COMPOUNDS (ug/L)													
Tetrahydrofuran	November-2022	---	---	---	---	**309**	---	---	**176**	---	---	100	100
		---	---	---	---	---	---	**8530**	---	---	---	1000	1000
	December-2022	**151**	---	---	---	**170**	**1120**	---	---	---	**663**	100	100
		---	**5210**	**19800**	---	---	---	---	---	**6130**	---	1000	1000
	January-2023	**183**	---	---	**566**	**1810**	---	---	**352**	---	---	100	100
	February-2023	---	---	---	---	---	---	---	---	---	**3760**	2000	2000
	March-2023	---	---	---	**353**	**464**	---	---	---	---	---	100	100
	April-2023	---	---	---	**2410**	---	**4790**	---	---	---	---	100	100
Toluene	November-2022	---	---	---	---	ND	---	**214**	**32.8**	---	---	5	10
	December-2022	**122**	**175**	**195**	---	ND	**113**	---	---	**113**	**48.3**	5	10
	January-2023	**122**	---	---	**8 J**	**139**	---	---	**35.3**	---	---	5	10
	February-2023	---	---	---	---	---	---	---	---	---	**224**	5	10
	March-2023	---	---	---	**182**	**98.1**	---	---	---	---	---	5	10
	April-2023	---	---	---	**303**	---	**94.4**	---	---	---	---	5	10
Xylenes, Total	November-2022	---	---	---	---	ND	---	**185**	**37.8**	---	---	10	30
	December-2022	**161**	**222**	**186**	---	ND	**112**	---	---	**197**	**59.9**	10	30
	January-2023	**138**	---	---	ND	**134**	---	---	**38.1**	---	---	10	30
	February-2023	---	---	---	---	---	---	---	---	---	**240**	10	30
	March-2023	---	---	---	**240**	**111**	---	---	---	---	---	10	30
	April-2023	---	---	---	**329**	---	**97.4**	---	---	---	---	10	30

--- = not applicable/available

J = Parameter was detected at a concentration greater than the laboratory's LOD, but less than the laboratory's LOQ. Concentration is considered estimated.

LOD = laboratory's Limit of Detection

LOQ = laboratory's Limit of Quantitation

mg/L = milligrams per liter

ND = Not Detected

ug/L = micrograms per liter

Appendix G

Notice to VDEQ on Perimeter LFG Wells Installation

May 1, 2023
File No. 02218208.14

Mr. Jonathan Chapman
Enforcement Specialist
VA DEQ – Southwest Regional Office
355-A Deadmore Street
Abingdon, Virginia

Subject: Design & Installation of Perimeter Gas Collection System Near Sidewalls
Integrated Solid Waste Management Facility – Solid Waste Permit #588
Bristol, Virginia

Dear Mr. Chapman:

SCS Engineers (SCS) submits this letter on behalf of the City of Bristol, Virginia (City) to notify the Virginia Department of Environmental (VDEQ or Department) that an expansion of the landfill gas (LFG) collection system constituting the "perimeter gas collection system near sidewalls with the intent of drawing gas away from sidewalls to reduce sidewall emissions" has been installed within the Permit #588 Landfill at the subject Facility. This letter notifies VDEQ of the Facility's conformance with the requirements of Item 2.i in Appendix A of the Consent Decree, dated 3/28/23.

SCS submitted documentation pertaining to design of the LFG collection system expansion within the Quarry Landfill to VDEQ on 12/31/22. Modifications to the dimensions and materials of the proposed vertical LFG extraction wells were also submitted to VDEQ. The LFG system expansion design incorporates LFG extraction components around the perimeter within the Quarry Landfill in close proximity to the quarry sidewalls, the intent of which is to collect LFG from the portions of the waste mass adjacent to the sidewall and thereby reduce fugitive LFG emissions at the sidewall liner system interface with the quarry rock sidewalls.

The milestone dates associated with accomplishing the installation and commissioning of the LFG extraction components around the perimeter within the Quarry Landfill are as follows:

- On 3/28/23, an on-site Pre-Construction Meeting between the City, SCS Engineers, SCS Field Services, and Recovery Drilling was convened.

- On 3/29/23, the Contractor commenced drilling and construction of Well EW-70, the first of the 18 proposed vertical LFG extraction wells designated as comprising the "perimeter gas collection system".

- On 4/15/23, the Contractor completed drilling and construction of Well EW-80, the last of the 18 proposed vertical LFG extraction wells designated as comprising the "perimeter gas collection system".

- On 4/18/23, the initial four of the 18 "perimeter" wells were equipped with a wellhead, connected to lateral piping that connected the well to the existing LFG system, and "activated" to apply vacuum which enabled LFG recovery from the well.

- On 4/27/23, the last of the 18 "perimeter" wells were equipped with a wellhead, connected to lateral piping that connected the well to the existing LFG system, and "activated" to apply vacuum which enabled LFG recovery from the well.

Accordingly, the design and installation of a "perimeter gas collection system near sidewalls" has been achieved in advance of the date stipulated in Item 2.i of the Consent Decree of May 1, 2023. The well drilling and construction logs, as-built drawing, and other record documentation associated with these components of the LFG collection system expansion will be submitted to VDEQ upon completion of the Stage 1 LFG Collection System Expansion construction project.

The wellhead valves are being adjusted by O&M personnel to balance and tune the wellfield in accordance with standard operating procedures. The well monitoring data will be submitted to VDEQ as part of the routine recordkeeping and reporting provisions of the Facility's air quality and solid waste permits.

If you have questions, please contact either of the undersigned at the letterhead address.

Sincerely,

D. Brandon King
Project Manager
SCS Engineers

Robert E. Dick, PE, BCEE
Project Director
SCS Engineers

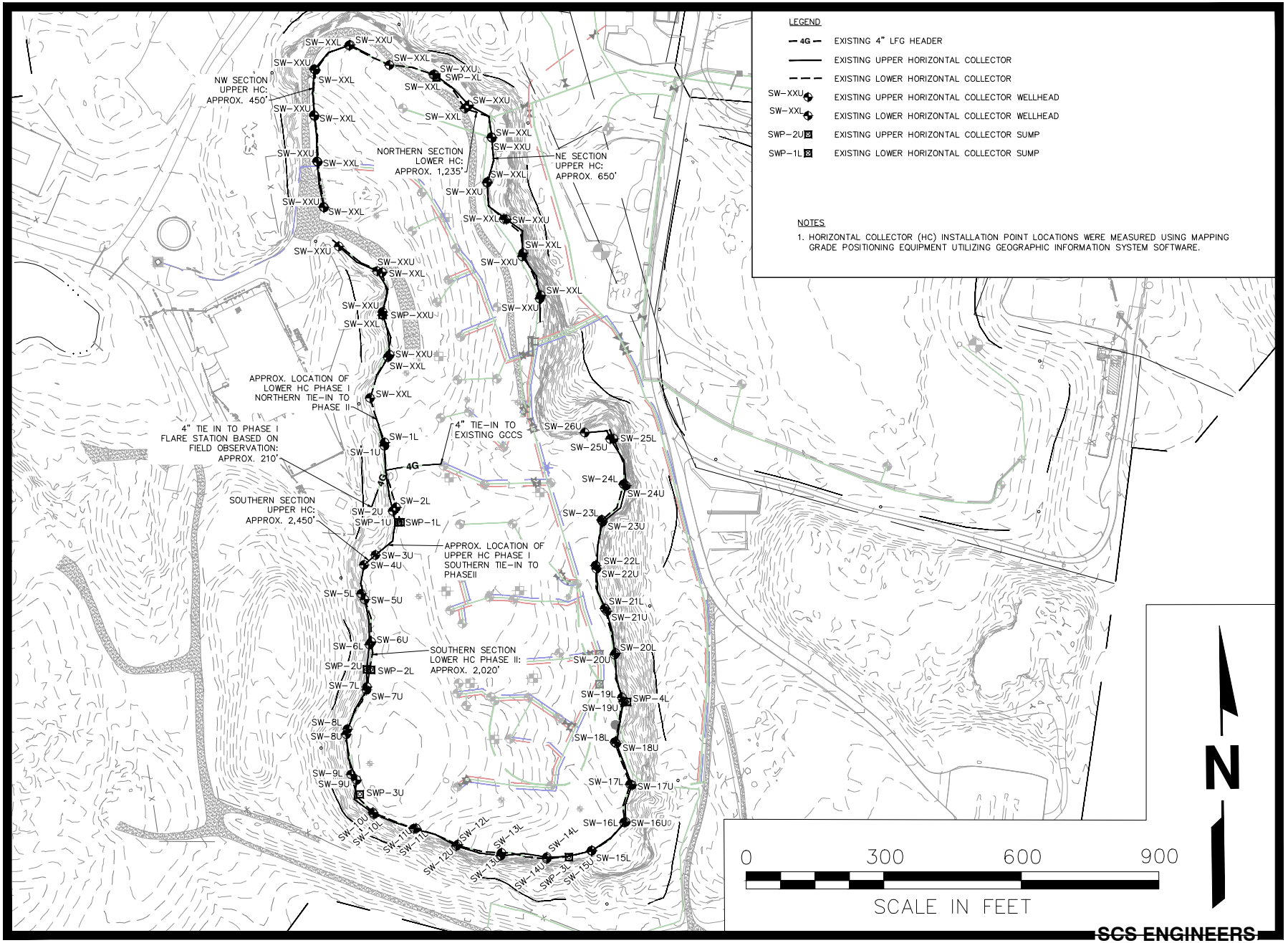
DBK/RED

cc: Randall Eads, City of Bristol
Mike Martin, City of Bristol
Joey Lamie, City of Bristol
Jake Chandler, City of Bristol
Jon Hayes, City of Bristol
Jeff Hurst, VDEQ
Susan Blalock, VDEQ
Stacy Bowers, VDEQ
Daniel Scott, VDEQ

Appendix H

Sidewall Odor Mitigation System Progress Drawings

DRAWN BY: HGW DATE: 5/3/23 FILE NAME: 02218208.11



SIDEWALL ODOR MITIGATION SYSTEM APPROXIMATE AS-BUILT LOCATIONS

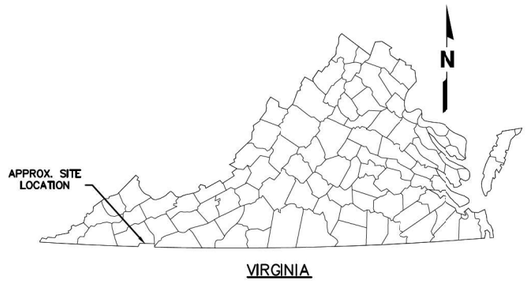
Appendix I

Solid Waste Permit No. 588 Stormwater Management Plan

BRISTOL, VIRGINIA INTEGRATED SOLID WASTE MANAGEMENT FACILITY
SOLID WASTE PERMIT #588

INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN

BRISTOL, VIRGINIA



STORMWATER MANAGEMENT PLAN SHEETS

PREPARED FOR:

CITY OF BRISTOL, VIRGINIA
300 LEE STREET
BRISTOL, VIRGINIA 24201

INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TURNPIKE, SUITE 305
MIDLOTHIAN, VIRGINIA 23113-7313
PH. (804) 378-7440 FAX. (703) 471-6676
WWW.SCSENGINEERS.COM

SCS PROJECT NO. 02218208.16

APRIL 28, 2023

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: COVER SHEET
PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK. MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX (804) 378-7563

PROJ. NO. 02218208.16
DSN. BY: TRW/CJW
DWN. BY: TRW/SHA
CHK. BY: CJW
S/A NVM BY:
APP. BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 1 of 21

Project\02218208.05\Drawings\EVOH Cover System Design – SWP588\Construction Plans\VREF

LEGEND:

- 1800 — EXISTING CONTOUR, MAJOR (TYP. 10')
- EXISTING CONTOUR, MINOR (TYP. 2')
- —1800— PROPOSED CONTOUR, MAJOR 10'
- PROPOSED CONTOUR, MINOR 2'
- EXISTING 2" AIR LINE
- EXISTING 4" FORCE MAIN
- LFG EXISTING LFG HEADER
- 4G EXISTING 4" LFG HEADER
- 6G EXISTING 6" LFG HEADER
- 8G EXISTING 8" LFG HEADER
- 12G EXISTING 12" LFG HEADER
- BUILDING
- L EXISTING LEACHATE PIPE
- L PROPOSED LEACHATE PIPE
- L LEACHATE CLEANOUT
- STORMWATER CONVEYANCE FEATURE
- EXISTING GRAVEL ROAD
- RIP RAP/ ROCKS
- SF SILT FENCE
- CELL BOUNDARY
- EDGE OF LINER
- FLOW PATH
- LANDFILL GAS PIPE
- LOD LIMITS OF DISTURBANCE
- S SOIL TYPE BOUNDARY
- DRAINAGE AREA
- STREAM OR WATERLINE
- CENTERLINE
- (TS) TEMPORARY SEEDING
- (PS) PERMANENT SEEDING
- (CIP) CULVERT INLET PROTECTION
- (OP) OUTLET PROTECTION
- (SF) SILT FENCE
- (CE) CONSTRUCTION ENTRANCE
- (MU) MULCHING
- (B/M) BLANKETS AND MATTING
- RUNOFF FLOW DIRECTION
- GS-## PROPOSED LFG COLLECTION STRIP
- EXISTING TEMPERATURE PROBE
- EXISTING WELLHEAD
- EXISTING AIR RELEASE VALVE
- EXISTING ISOLATION VALVE
- EXISTING LEACHATE CLEANOUT
- EXISTING U-TRAP
- EXISTING CONDENSATE PUMP STATION
- EXISTING HORIZONTAL COLLECTOR SUMP
- EXISTING LFG LIQUIDS CONTAINMENT TANK
- GP-5 EXISTING GAS PROBE
- MW-110 EXISTING GROUNDWATER MONITORING WELL
- EXISTING MANHOLE
- FACILITY BOUNDARY
- WASTE MANAGEMENT UNIT BOUNDARY
- APPROXIMATE EXTENT OF WASTE
- EXISTING ROAD OUTLINE
- x EXISTING FENCE
- EXISTING LFG HORIZONTAL COLLECTOR
- PROPOSED LFG HORIZONTAL COLLECTOR
- LFG EXISTING LFG COLLECTION PIPING
- LFG PROPOSED LFG COLLECTION PIPING
- 8G 8G PROPOSED 8" LFG COLLECTION PIPING
- 12G 12G PROPOSED 12" LFG COLLECTION PIPING
- 16G 16G PROPOSED 16" LFG COLLECTION PIPING
- 18G 18G PROPOSED 18" LFG COLLECTION PIPING
- 24G 24G PROPOSED 24" LFG COLLECTION PIPING
- 28G 28G PROPOSED 28" LFG COLLECTION PIPING
- 36G 36G PROPOSED 36" LFG COLLECTION PIPING
- PROPOSED 2" AIR LINE
- PROPOSED 4" FORCE MAIN
- ★ BENCHMARK

LEGEND NOTES:
1. UNLESS INDICATED OTHERWISE, EXISTING FEATURES ARE SHOWN IN HALF-TONE AND PROPOSED FEATURES ARE SHOWN IN FULL-TONE.
2. IF USED, ALTERNATIVE CONTOUR INTERVALS WILL BE NOTED ON THE RELEVANT SHEET.

EXISTING CONDITIONS:
THE EXISTING PROJECT SITE AREA INCLUDES THE SOLID WASTE PERMIT #588 (SWP #588) QUARRY LANDFILL, THE ACCESS ROAD INTO THE LANDFILL, THE TWO EXISTING STORMWATER BASINS LOCATED WEST OF THE QUARRY, AND AREAS ADJACENT TO EXISTING ROADS AND DITCHES FOR INSTALLATION OF STORMWATER DIVERSION CONTROLS. THE LARGER STORMWATER POND IS REFERRED TO AS THE "PRIMARY STORMWATER BASIN", AND THE SMALLER STORMWATER POND IS REFERRED TO AS THE "SECONDARY STORMWATER BASIN".

THE PRIMARY STORMWATER BASIN DRAINAGE AREA INCLUDES THE SURROUNDINGS TO THE BASIN'S NORTHEAST, EAST, SOUTHEAST, AND SOUTH. AN EXISTING STORM SEWER SYSTEM FROM THE OPERATIONS BUILDING WEST OF THE QUARRY CENTER DISCHARGES INTO THE BASIN.

THE PRIMARY STORMWATER BASIN DISCHARGES INTO AN EXISTING 12"X15" STEEL BOX RISER LOCATED IN THE SOUTHWEST CORNER OF THE BASIN. AN EXISTING 12"ø CORRUGATED METAL PIPE CULVERT DISCHARGES FROM THE STEEL BOX RISER INTO THE SECONDARY BASIN. A SPILLWAY CONSISTING OF 18"ø REINFORCED CONCRETE HALF PIPE IS POSITIONED DIRECTLY OVER THE 12"ø CULVERT.

THE SECONDARY STORMWATER BASIN IS LOCATED IMMEDIATELY WEST OF THE PRIMARY STORMWATER BASIN. THE SECONDARY BASIN DISCHARGES INTO AN EXISTING 12"ø STEEL CULVERT OUTFALL WITH A VALVE ON THE INLET SIDE. SHEET 5 PRESENTS THE EXISTNG STORMWATER BASIN FEATURES.

THE QUARRY LANDFILL CONSISTS OF RECENTLY DISTURBED COVER SOIL WITH UNDERLYING WASTE. THE EXISTING QUARRY TOPOGRAPHY GENERALLY SLOPES DOWNWARDS FROM NORTH TO SOUTH AND FROM WEST TO EAST. SLOPES GENERALLY RANGE FROM 5% TO 33%. STORMWATER WITHIN THE QUARRY LANDFILL IS CURRENTLY ALLOWED TO INFILTRATE INTO THE WASTE MASS AND IS MANAGED AS LEACHATE.

A SOIL REPORT OBTAINED FROM THE USDA NATURAL RESOURCES CONSERVATION SERVICE GENERALLY CLASSIFIES THE SITE SOIL IN PROXIMITY TO THE QUARRY AS UDORTHENTS. PAGES FROM THE SOIL REPORT ARE INCLUDED ON SHEET 13. BASED ON THE SOIL REPORT AND FIELD OBSERVATIONS, THE SITE SOIL HAS BEEN ASSIGNED TO HYDROLOGIC SOIL GROUP C FOR THE PURPOSE OF STORMWATER ANALYSIS.

STORMWATER MANAGEMEN" NOTES:

THE CITY OF BRISTOL MANAGES STORMWATER FOR THE LANDFILL PER THE VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES) INDUSTRIAL STORMWATER MANAGEMEN" PROGRAM (9VAC 25-151) UNDER A GENERAL PERMIT REGISTRATION NO: VAR050053 (EFFECTIVE JULY 1, 2019, EXPIRATION ON JUNE 30, 2024).

THE CITY OF BRISTOL, AS THE VPDES PERMITTEE, SHALL OVERSEE THE EVOH COVER SYSTEM CONTRACTOR'S ACTIVITIES TO ENSURE EXECUTION IN ACCORDANCE WITH THE VPDES PERMIT REQUIREMENTS AND THE APPROVED EVOH COVER SYSTEM CONSTRUCTION DRAWINGS.

STORMWATER MANAGEMEN" IS DESIGNED AS INDICATED IN THESE DRAWINGS WHICH INCLUDE PLANS, DETAILS, AND CALCULATIONS. THE INTERIM EVOH COVER SYSTEM IS DESIGNED TO CONVEY QUARRY STORMWATER TO A PROPOSED STORMWATER BASIN IN THE SOUTHEAST CORNER OF THE QUARRY. A PUMPING SYSTEM IS DESIGNED TO TRANSFER THE STORMWATER FROM THE STORAGE BASIN TO THE EXISTING PRIMARY STORMWATER BASIN LOCATED WEST OF THE QUARRY.

THE EXISTING STORMWATER BASINS WILL BE MODIFIED TO INCREASE STORAGE CAPACITY, AND NEW MULTIS"AGE OUTLET STRUCTURES AND EMERGENCY SPILLWAYS WILL BE INSTALLED FOR BOTH THE PRIMARY AND SECONDARY STORMWATER BASIN.

EROSION AND SEDIMENT CONTROL WILL BE ADDRESSED IN CONSTRUCTION DRAWINGS.

STORMWATER SAMPLING PROTOCOLS

STORMWATER SHALL BE MONTORED IN ACCORDANCE WITH THE FACILITY'S VPDES GENERAL PERMIT FOR DISCHARGE OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY WITH THE FOLLOWING ADDITIONAL REQUIRMENTS:

1. AN ADDITIONAL STORMWATER SAMPLE WILL BE COLLECTED AT THE DISCHARGE OF THE QUARRY STORMWATER PUMPING SYSTEM LOCATED IN THE UPPER STORMWATER BASIN.
2. A SAMPLE WILL BE COLLECTED DURING THE INITIAL DISCHARGE FROM THE QUARRY STORMWATER PUMPING SYSTEM.
3. SAMPLES WILL BE COLLECTED AND ANALYZED ON A MONTHLY BASIS IF THERE IS A DISCHARGE. A LOWER SAMPLING FREQUENCY MAY BE APPROVED IN WRITING BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY.
4. RESULTS OF WILL BE SUBMITTED ON A SEMI-ANNUAL BASIS AS OUTLINED IN THE FACILITY'S VPDES GENERAL PERMIT FOR DISCHARGE OF STORMWATER ASSOCIATED WITH INDUSTRIAL ACTIVITY.

GENERAL NOTES:

1. THESE DRAWINGS PRESENT A CONCEPTUAL STORMWATER MANAGEMENT PLAN FOR THE SWP #588 LANDFILL AND ARE NOT INTENDED FOR CONSTRUCTION. CONSTRUCTION DRAWINGS WILL BE SUBMITTED TO THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY AT A LATER DATE. THE CONSTRUCTION DRAWINGS WILL DEMONSTRATE THE ADEQUACY OF PROPOSED CHANGES TO THIS CONCEPTUAL STORMWATER MANAGEMENT PLAN.
2. OWNER/DEVELOPER: CITY OF BRISTOL, VIRGINIA
3. CONSULTING ENGINEER: SCS ENGINEERS, 15521 MIDLOTHIAN TURNPIKE #305, MIDLOTHIAN, VA 23113
4. LOCATION OF EXISTING SEWER, WATER, OR GAS LINES, CONDUITS, OR OTHER STRUCTURES ACROSS, UNDERNEATH, OR OTHERWISE ALONG THE LINE OF PROPOSED WORK ARE NOT NECESSARILY SHOWN ON THE PLANS, AND IF SHOWN ARE ONLY APPROXIMATELY CORRECT. CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF UNDERGROUND UTILITIES SHOWN ON THE PLANS IN AREAS OF CONSTRUCTION PRIOR TO STARTING WORK. CONTACT ENGINEER IMMEDIATELY IF LOCATION OF ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLANS, IF THERE APPEARS TO BE A CONFLICT, OR UPON DISCOVERY OF A UTILITY NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL OBTAIN FIELD UTILITY LOCATIONS BY CALLING "MISS UTILITY" FORTY EIGHT (48) HOURS PRIOR TO WORKING IN THE VICINITY OF EXISTING UTILITIES.
5. BOUNDARY INFORMATION TAKEN FROM OTHERS.
6. HORIZONTAL DATA IS BASED ON US STATE PLANE NAD 1983 VIRGINIA SOUTH ZONE. VERTICAL DATA BASED ON NAVD 88.
7. REFERENCE GRID LINES ARE SHOWN ON THE DRAWINGS WITH GRID SPACING AT 200 FEET.

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
GENERAL NOTES AND LEGEND

PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

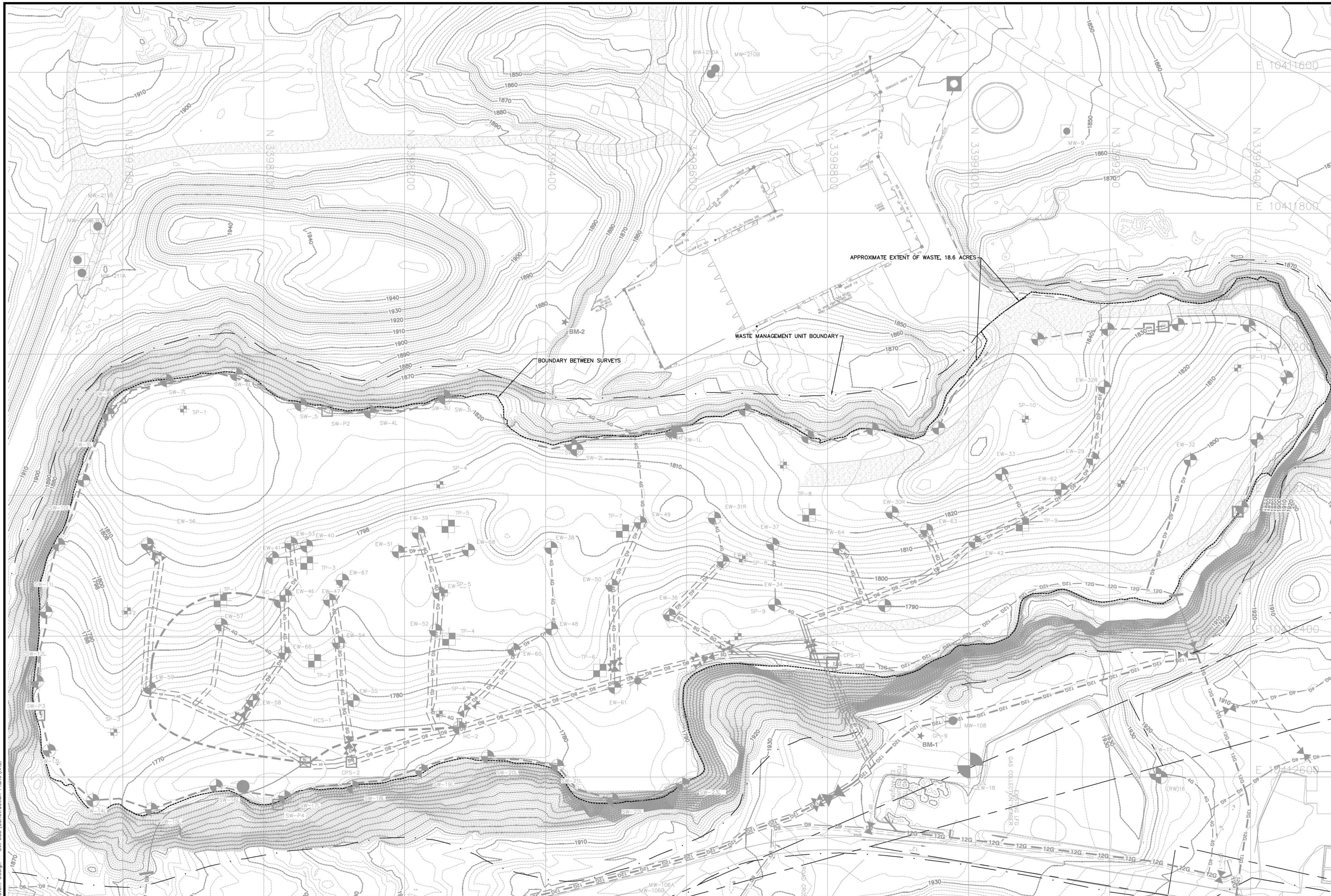
CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH: (804) 379-1444 FAX: (804) 379-7043

PROJ. NO. 02218206.16
DSN. BY: ITW/SHA
DRN. BY: ITW/CJW
CHK. BY: CJW
QA/QC BY: ARK BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **2** of **21**

Project\02218208.05\Drawings\EVOH Cover System Design - SWP588\Construction Plans\XREF



GENERAL NOTES

1. OUTSIDE OF THE QUARRY FOOTPRINT, GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022. WITHIN THE QUARRY, THE GRADES ARE BASED UPON AN SCS DRONE FLYOVER DATED MARCH 9, 2023.

2. PER A USDA SOIL REPORT OBTAINED ON JANUARY 26, 2023, THE QUARRY AND ITS IMMEDIATE SURROUNDINGS ARE CLASSIFIED AS UDORTHENTS.

N

0 50 100 150
SCALE IN FEET

Project\02218208.05\Drawings\EVOH Cover System Design – SWP588\Construction Plans\XREF

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
EXISTING CONDITIONS

PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
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PROJ. NO. 02218206.16	DWN. BY: TRW/SHA	Q/A RVW BY:
DSN. BY: TRW/CJW	CHK. BY: CJW	APP. BY: CJW

CADD FILE: 02218208.05

DATE: 4/28/23

SCALE: AS SHOWN

DRAWING NO.
3 of 21

GENERAL NOTES

1. OUTSIDE OF THE QUARRY FOOTPRINT, GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
2. WITHIN THE QUARRY FOOTPRINT, THE GRADES SHOWN REPRESENT AN APPROXIMATION OF ANTICIPATED FUTURE CONDITIONS FOLLOWING THE INSTALLATION OF THE SIDEWALL ODOR MITIGATION SYSTEM.

N

0 50 100 150
SCALE IN FEET

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: **ANTICIPATED CONDITIONS**

PROJECT TITLE: **SWP#598 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

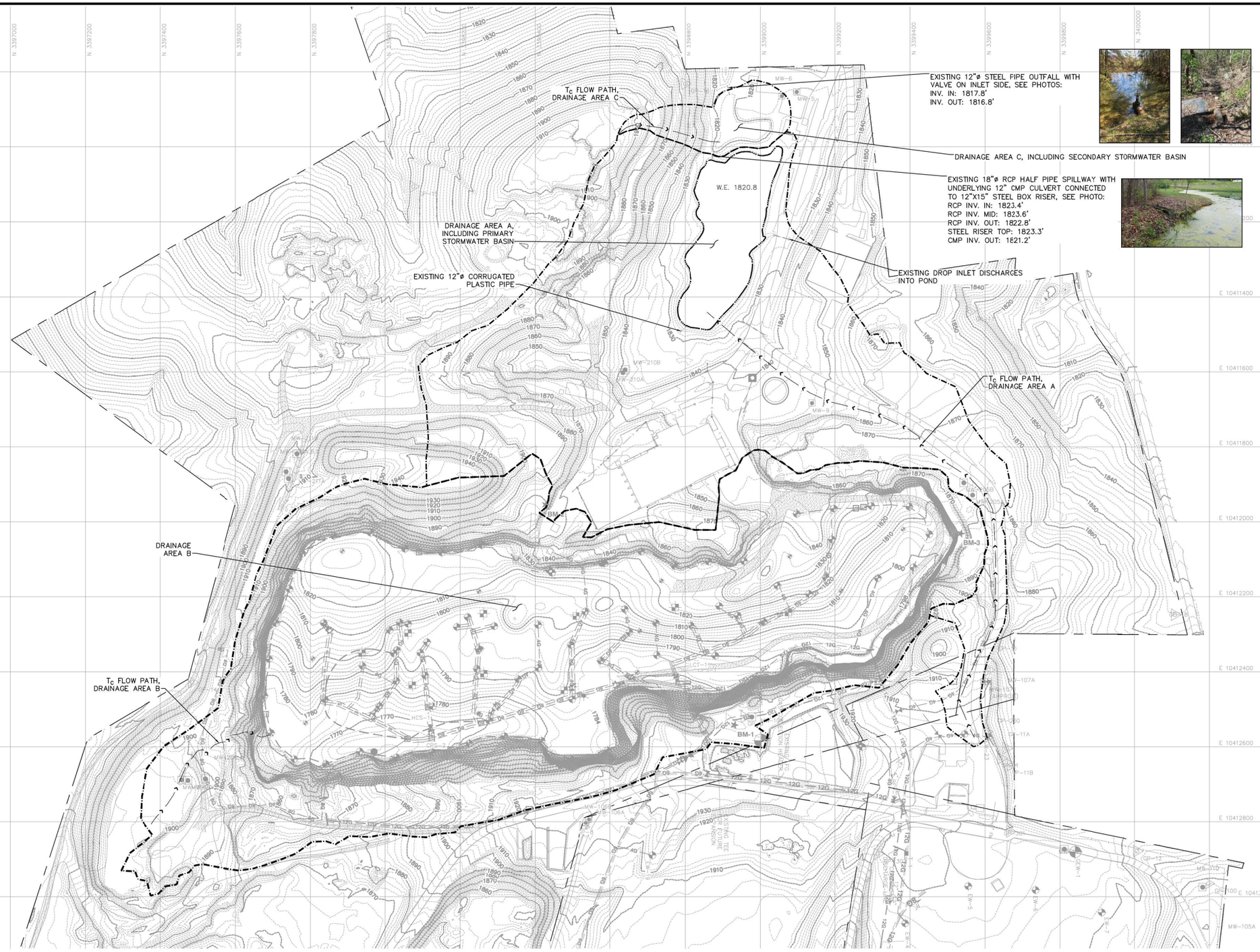
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
1621 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH: (804) 379-7444 FAX: (804) 378-7283

PROJ. NO. 02218208.16
DSN. BY: TRW/CJW
DWN. BY: TRW/SHA
CHK. BY: CJW
Q/A Rvw BY: JWF, CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **4** of **21**

Project\02218208.05\Drawings\EVOH Cover System Design - SWP598\Construction Plans\XREF



N

0 100 200 300

SCALE IN FEET

GENERAL NOTES

1. ALONG THE QUARRY FLOOR, THE HALF-TONE CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN SCS DRONE FLIGHT CONDUCTED ON MARCH 9, 2023.
2. OUTSIDE OF THE QUARRY, THE HALF TONE-CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
3. UNLESS INDICATED OTHERWISE, STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.

PRE-DEVELOPMENT DRAINAGE AREA CHARACTERISTICS (1-YEAR STORM CR AS SHOWN)

DRAINAGE AREA	DESCRIPTION	AREA (AC)	CN	T_C (MIN)	RUNOFF (IN)	RUNOFF VOLUME (AC×FT)	OUTLET DESCRIPTION	PEAK DISCHARGE FROM OUTLET, 1-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 2-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 10-YEAR STORM (CFS)
A	RUNOFF INTO EXISTING PRIMARY STORMWATER BASIN	22.67	81	21.0	0.70	1.33	EXISTING MULTISTAGE RISER DISCHARGES INTO SECONDARY BASIN	0.16	0.20	0.26
B	RUNOFF INTO QUARRY	35.78	90	24.7	1.22	3.65	NO EXISTING STORMWATER OUTLET	0	0	0
C	RUNOFF INTO EXISTING SECONDARY STORMWATER BASIN	1.19	81	9.9	0.56	0.06	EXISTING 12"ø STEEL PIPE OUTFALL WITH VALVE ON INLET SIDE	0.18	0.24	0.56

STORMWATER NOTES

1. THE DEPTHS OF THE EXISTING PRIMARY STORMWATER BASIN AND SECONDARY STORMWATER BASIN HAVE BEEN ASSUMED BASED ON FIELD OBSERVATION AND MEASUREMENTS OF THE DISCHARGE PIPE LOCATIONS AND ELEVATIONS.
2. THE EXISTING PRIMARY STORMWATER BASIN IS ASSUMED TO HAVE A 3"ø DEWATERING ORIFICE AT INVERT ELEVATION = 1821.5', AND THE 12"ø CMP CULVERT IS ASSUMED TO HAVE A 2.0% SLOPE. THE ASSUMPTIONS ARE BASED ON FIELD OBSERVATIONS OF THE EXISTING RISER AND ITS SURROUNDINGS.
3. ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SUBSEQUENT SHEETS, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS, RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND POND INFORMATION.

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: PRE-EVOH COVER SYSTEM EXISTING STORMWATER CONDITIONS

PROJECT TITLE: SWP#598 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1621 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
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PROJ. NO. 02218206.16
DWN. BY: TW/SHA
DSN. BY: TW/C.LW
CHK. BY: C.LW
Q/A Rvw BY: JWF, BP, C.LW

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PROPOSED LFG COLLECTION STRIP WITH VERTICAL CONNECTOR PIPE (TYP. OF 10), SEE DETAIL 3 (6 | 11)

APPROXIMATE PROPOSED STORMWATER PIPE ALIGNMENT, SEE PROFILE ON SHEET 9

APPROXIMATE EXTENT OF WASTE AND EVOH COVER SYSTEM, 18.6 ACRES, SEE DETAILS 1 (6 | 11), 4 (6 | 11)

ACCESS ROAD DOWN TO STORMWATER PUMPING STATION, SEE DETAILS 5 (6 | 11), 6 (6 | 11)

PROPOSED STORMWATER CONVEYANCE CHANNEL ℄, SEE DETAIL 2 (6 | 11)

PROPOSED STORMWATER CONVEYANCE CHANNEL ℄ AND ADJACENT ACCESS ROAD, SEE DETAILS AND PROFILE ON SHEET 9 2 (6 | 11), 6 (6 | 11)

PROPOSED ACCESS ROAD ALONG BENCH AT MIN. ELEV.=1769', SEE DETAIL 6 (6 | 11)

PROPOSED PREFABRICATED PUMPING STATION FOR QUARRY STORMWATER BASIN, SEE DETAILS 1 (6 | 14), 2 (6 | 14), 3 (6 | 14)

PROPOSED SUCTION PIPE INLET TO PUMP

GS-01 GS-02 GS-03 GS-04 GS-05 GS-06 GS-07 GS-08 GS-09 GS-10

GENERAL NOTES

1. WITHIN THE QUARRY FOOTPRINT, THE HALF-TONE CONTOURS REPRESENT AN APPROXIMATION OF ANTICIPATED FUTURE CONDITIONS FOLLOWING THE INSTALLATION OF THE SIDEWALL ODOR MITIGATION SYSTEM. THE FULL-TONE CONTOURS SHOW THE PROPOSED EVOH COVER SYSTEM INSTALLATION GRADE.
2. SCS PLANS TO EXPAND THE LANDFILL GAS SYSTEM TO INCORPORATE THE LFG COLLECTION STRIPS. SCS PLANS TO APPLY VACUUM PRESSURE TO THE VERTICAL COLLECTION PIPES NEAR THE TOP OF THE COLLECTION STRIPS.

N

0 50 100 150
SCALE IN FEET

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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: PROPOSED MEMBRANE DEPLOYMENT PLAN

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM - STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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PROJ. NO. 02206.16
DSN. BY: TRW/SHA
DRK. BY: TRW/C.DW
CHK. BY: C.DW
APP. BY: C.DW

CADD FILE: 02218208.05
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SCALE: AS SHOWN
DRAWING NO. 6 of 21

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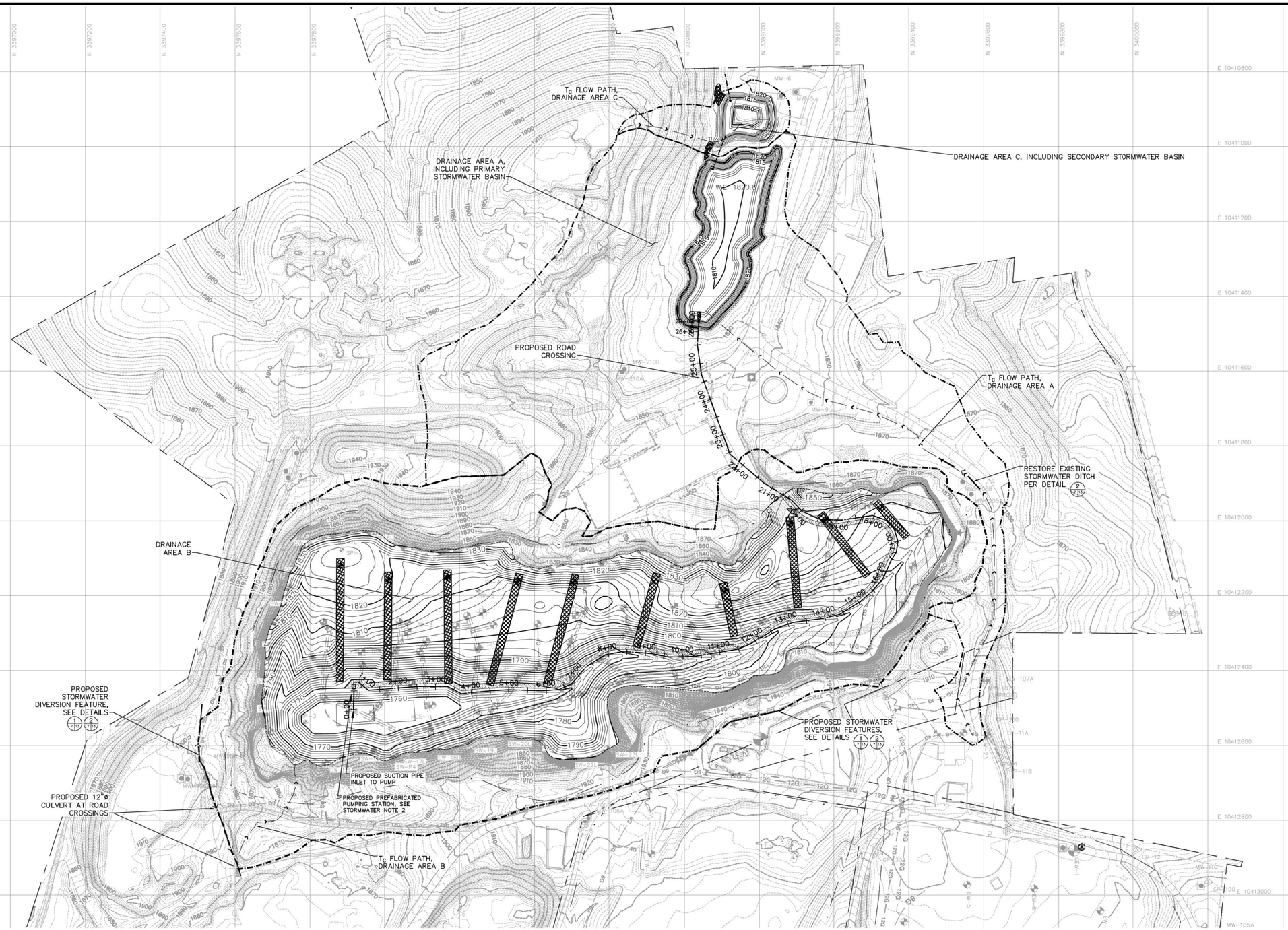

GENERAL NOTES

1. ALONG THE QUARRY FLOOR, THE FULL-TONE CONTOURS SHOW THE PROPOSED MEMBRANE DEPLOYMENT GRADE.
2. OUTSIDE OF THE QUARRY, THE HALF TONE-CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
3. UNLESS INDICATED OTHERWISE, EXISTING STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.
4. THE PROPOSED PRIMARY AND SECONDARY BASIN CONTOURS ARE SHOWN AT A 1' INTERVAL.

POST-DEVELOPMENT DRAINAGE AREA CHARACTERISTICS (1-YEAR STORM OR AS SHOWN)

DRAINAGE AREA	DESCRIPTION	AREA (AC)	CN	Tc (MIN)	RUNOFF (IN)	RUNOFF VOLUME (ACxFT)	OUTLET DESCRIPTION	PEAK DISCHARGE FROM OUTLET, 1-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 2-YEAR STORM (CFS)	PEAK DISCHARGE FROM OUTLET, 10-YEAR STORM (CFS)
A	RUNOFF INTO PRIMARY POND	22.67	81	21.0	0.70	1.33	PROPOSED MULTISTAGE RISER	0.42	0.47	0.56
B	RUNOFF INTO QUARRY	33.92	91.5	17.2	1.34	3.78	PUMP DISCHARGE INTO PRIMARY BASIN	2.45	2.45	2.45
C	RUNOFF INTO SECONDARY POND	1.19	81	9.9	0.69	0.07	PROPOSED MULTISTAGE RISER	0.22 SEE STORMWATER NOTE 3	0.24	0.38 SEE STORMWATER NOTE 4

STORMWATER NOTES

1. ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SHEETS 15-20, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND STORMWATER BASIN INFORMATION.
2. THE PROPOSED PUMPING SYSTEM WILL BE EQUIPPED WITH VARIABLE FREQUENCY DRIVE. THE PUMPING SYSTEM IS DESIGNED TO OPERATION AT 1100 GALLONS PER MINUTE. SEE PUMPING DETAILS ON SHEET 14.
3. COMPLIANCE WITH 9VAC25-870-66 FOR CHANNEL PROTECTION IS BASED ON THE FORESTED CONDITION ANALYSIS PER 9VAC25-870-66.B.3.
4. COMPLIANCE WITH 9VAC-25-870-66 FOR FLOOD PROTECTION IS ACHIEVED PER 9VAC25-870-66.C.2.b.

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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: POST-EVOH STORMWATER MANAGEMENT PLAN

PROJECT TITLE: SWP#598 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
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PROJ. NO. 02218208.16
DSN. BY: TW/JSHA
DRK. BY: CJW
CHK. BY: TW/CJW
QA/QC BY: JHP, WF, CJW

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DATE: 4/28/23
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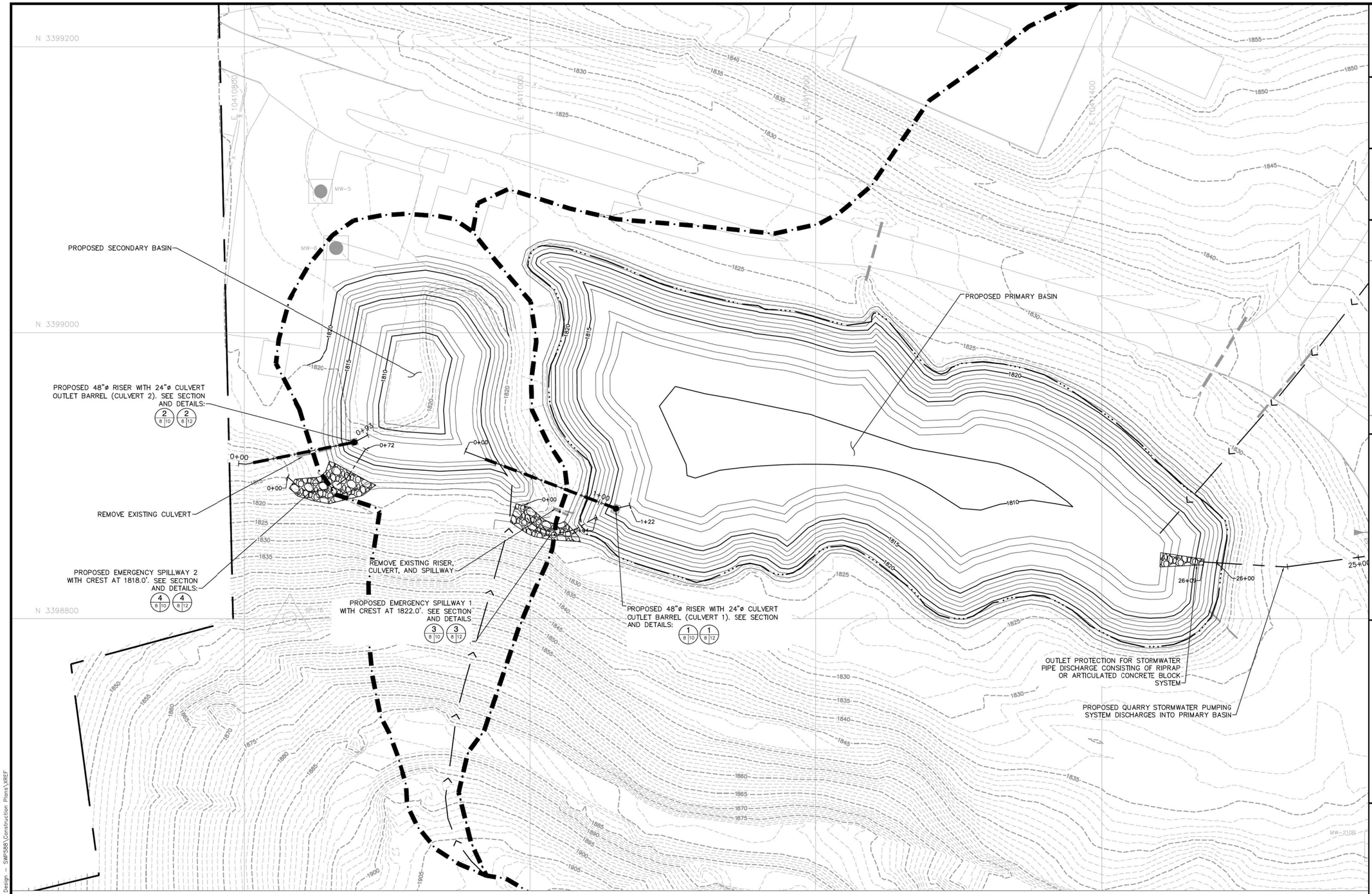

GENERAL NOTES

1. THE EXISTING GRADE AND PROPOSED BASIN GRADES ARE SHOWN USING 1' CONTOUR INTERVALS.
2. OUTSIDE OF THE QUARRY, THE HALF TONE–CONTOURS SHOW EXISTING TOPOGRAPHY BASED ON AN AERIAL SURVEY PERFORMED BY NV5 GEOSPATIAL DURING OCTOBER 2022.
3. UNLESS INDICATED OTHERWISE, EXISTING STORMWATER FEATURE INVERT ELEVATIONS ARE BASED ON A CITY OF BRISTOL SURVEY COMPLETED ON APRIL 12, 2023.

STORMWATER NOTES

1. ADDITIONAL STORMWATER INFORMATION AND CALCULATIONS ARE SHOWN ON SHEETS 15–20, INCLUDING WEIGHTED CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS, RUNOFF HYDROGRAPHS, ROUTING HYDROGRAPHS, AND STORMWATER BASIN INFORMATION.

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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: **PROPOSED STORMWATER BASINS**

PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VA 24201

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DRW. BY: CJW
CHK. BY: TRW/CJW
QA BY: APP. BY: CJW

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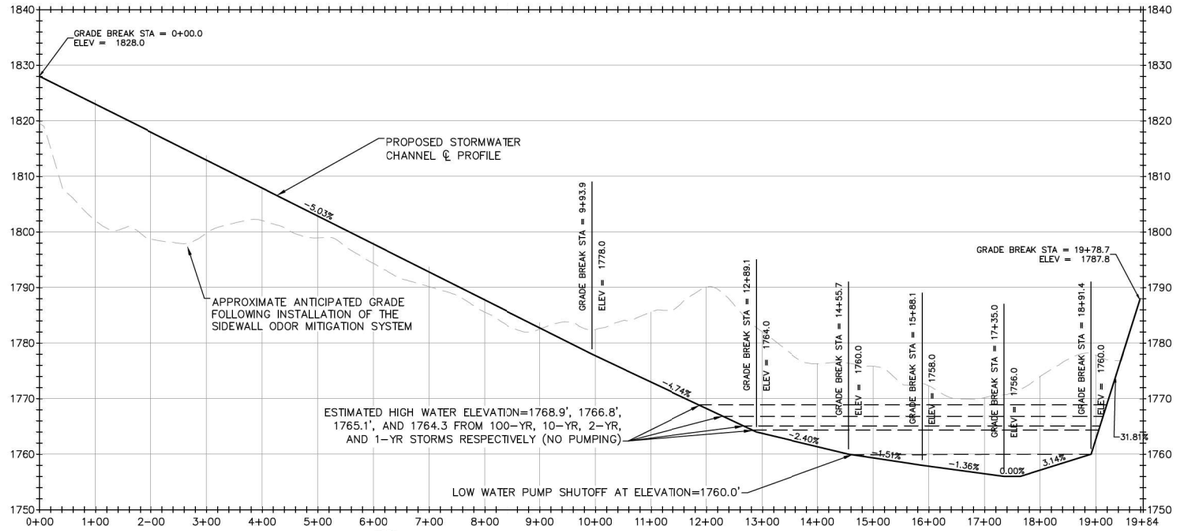
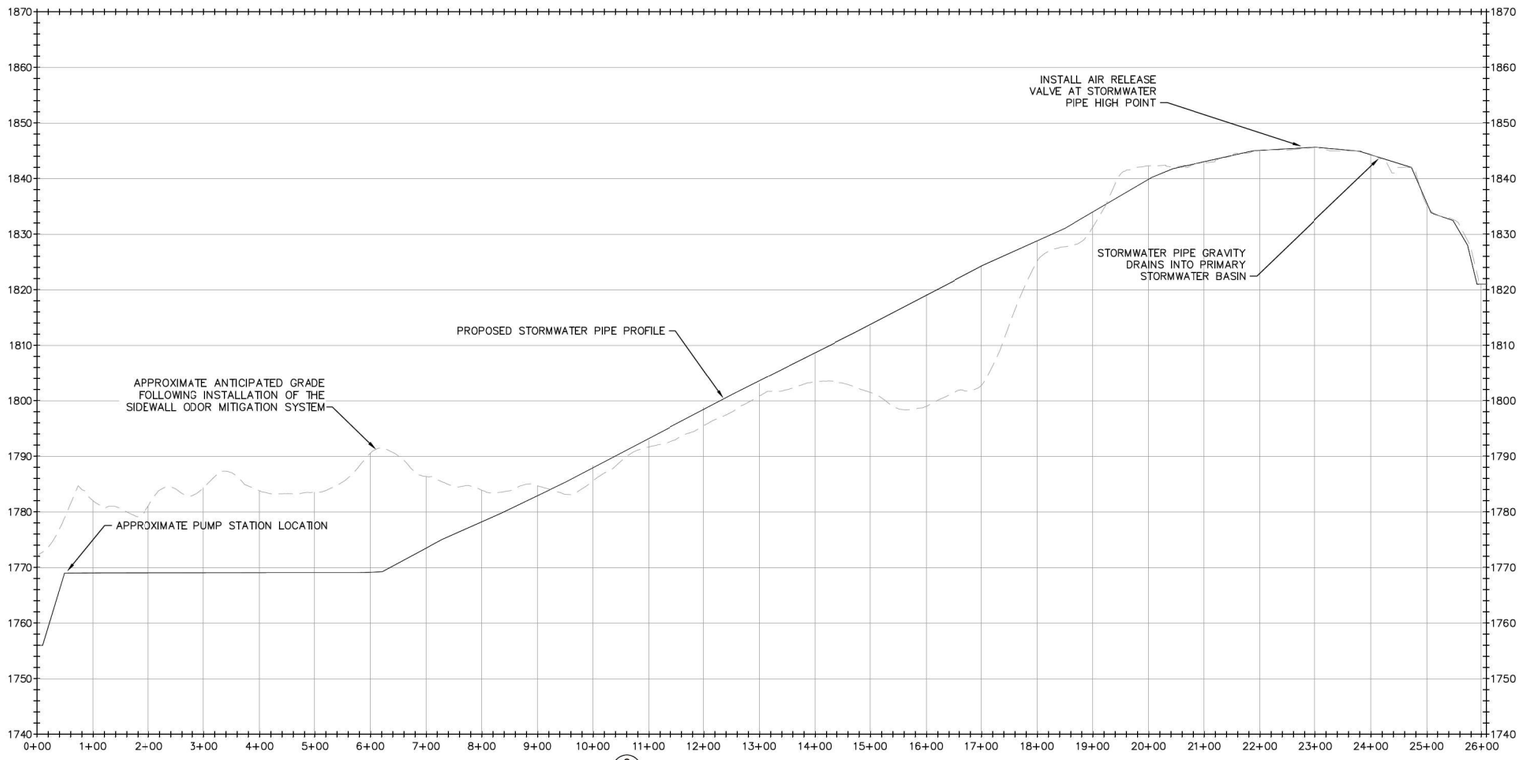


1/6/9 STORMWATER CHANNEL CENTERLINE PROFILE
SCALE: H: 1"=100', V: 1"=10'
NOTE: INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE



2/6/9 STORMWATER PIPE PROFILE
SCALE: H: 1"=100', V: 1"=10'
NOTE: INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

PERMIT DRAWINGS
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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: STORMWATER PROFILES 1

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN

CLIENT
CITY OF BRISTOL INTEGRATED SOLID
WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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PROJ. NO. 02218206.16
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DWN. BY: TRW/SHA
CHK. BY: TRW/CJW
QA/A RVW BY: CJW
APP. BY: CJW

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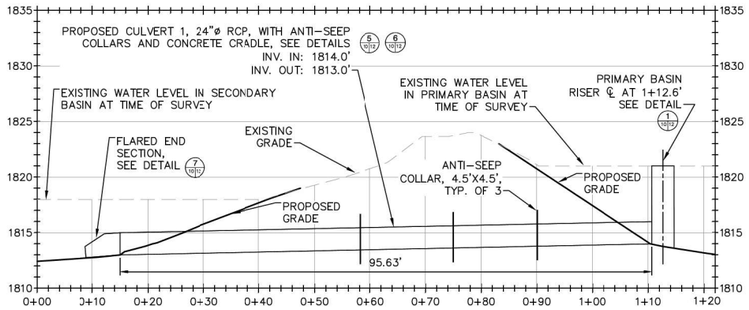
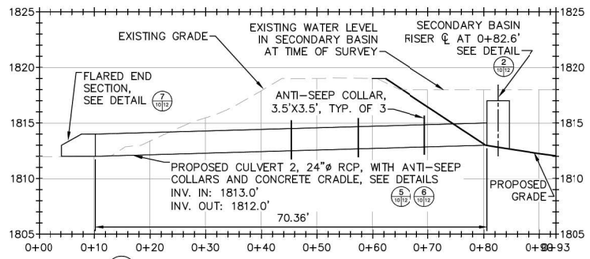


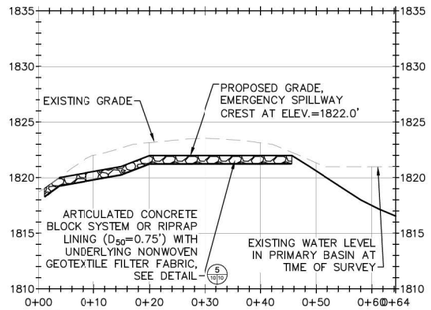
1/8/10 STORMWATER CULVERT 1 PROFILE
SCALE: H: 1"=10', V: 1"=5'
INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

NOTE: AS AN ALTERNATIVE TO ANT-SEEP COLLARS, A CUT-OFF TRENCH, SEEPAGE DIAPHRAGM, TOE DRAIN, AND/OR DRAINAGE BLANKET MAY BE USED.

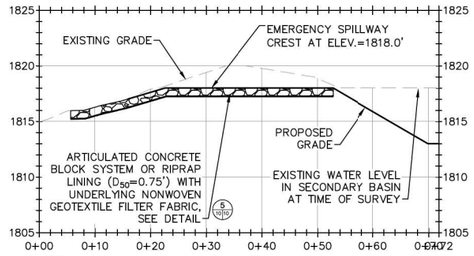


2/8/10 STORMWATER CULVERT 2 PROFILE
SCALE: H: 1"=10', V: 1"=5'
INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

NOTE: AS AN ALTERNATIVE TO ANTI-SEEP COLLARS, A CUT-OFF TRENCH, SEEPAGE DIAPHRAGM, TOE DRAIN, AND/OR DRAINAGE BLANKET MAY BE USED.



3/8/10 EMERGENCY SPILLWAY 1 PROFILE
SCALE: H: 1"=10', V: 1"=5'
INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE



4/8/10 EMERGENCY SPILLWAY 2 PROFILE
SCALE: H: 1"=10', V: 1"=5'
INDICATED SCALE MAY VARY DEPENDING ON PLOT SIZE

TABLE 3.19-D

REQUIREMENTS FOR FILTER FABRIC USED WITH RIPRAP

Physical Property	Test Method	Requirements
Equivalent Opening Size	Corps of Engineers CWO 2215-77	Equal or greater than U.S. No. 50 sieve
Tensile Strength* @ 20% (maximum)	VTM-52	30 lbs./linear in. (minimum)
Puncture Strength	ASTM D751*	80 lbs. (minimum)

* Tension testing machine with ring clamp, steel ball replaced with 5/16 diameter solid steel cylinder with hemispherical tip centered within the ring clamp.

Seams shall be equal in strength to basic material.

Additional fabric material or non-corrosive steel wire may be incorporated into the fabric to increase overall strength.

Source: VDOT Road and Bridge Specifications

5/10/10 NONWOVEN GEOTEXTILE FOR EMERGENCY SPILLWAYS

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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: STORMWATER PROFILES 2

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
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PROJ. NO. 02218208.16
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CHK. BY: CJW
APP. BY: CJW

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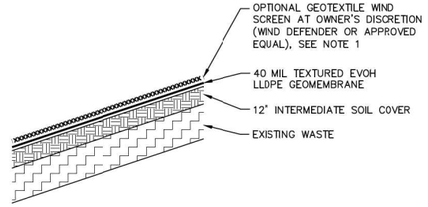
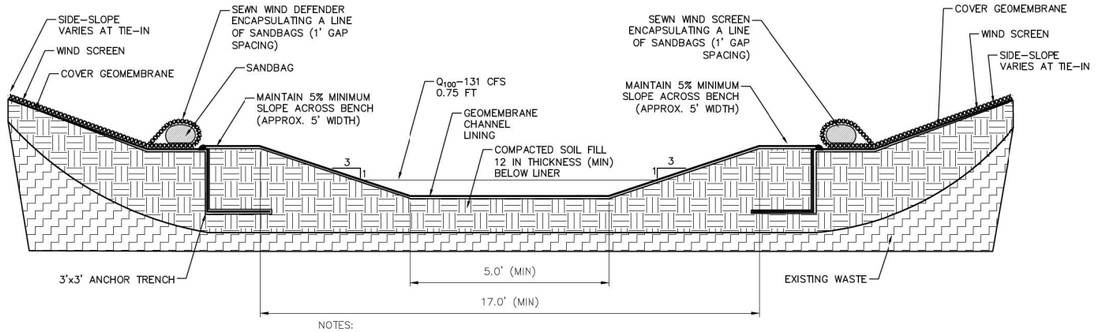


NOTES:

1. THE OWNER MAY OR MAY NOT ELECT TO INCLUDE A GEOTEXTILE WIND SCREEN. IF A WIND SCREEN IS NOT SPECIFIED, WIND CALCULATIONS WILL BE PROVIDED DEMONSTRATING THE LACK OF NEED.

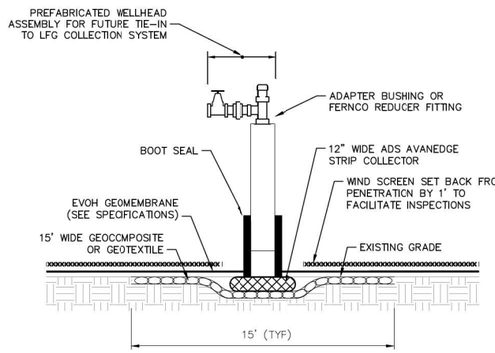
1 6 11 INTERIM EVOH COVER
NOT TO SCALE



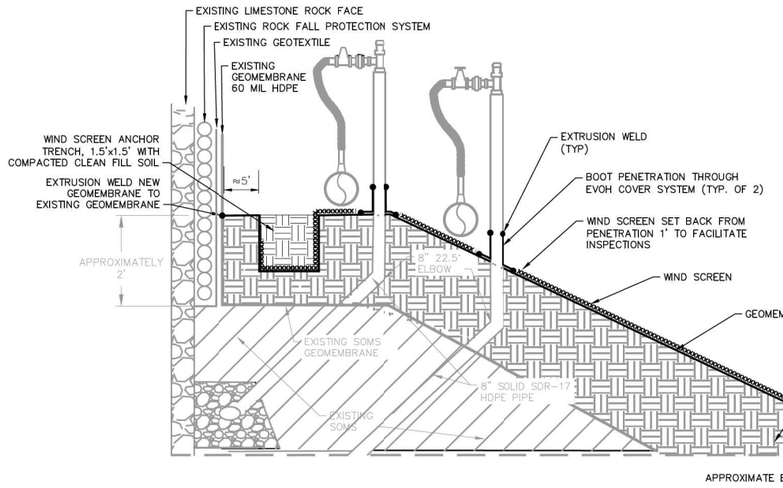
NOTES:

1. CHANNEL SLOPE IS APPROXIMATELY 5%. THE 100-YR FLOW DEPTH IS APPROX. 0.75 FT.

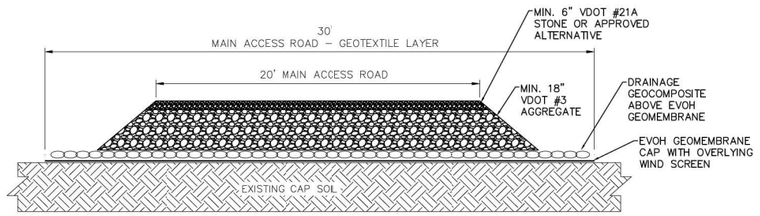
2 6 11 STORMWATER CHANNEL TIE-IN WITHOUT ADJACENT ROAD
NOT TO SCALE



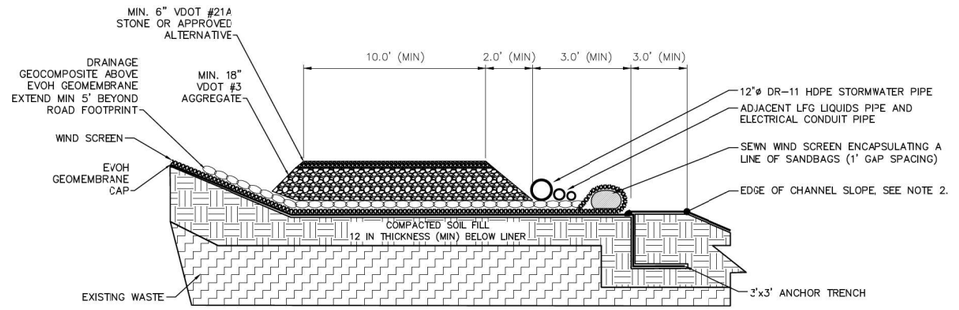
3 6 11 LFG COLLECTION STRIPS
NOT TO SCALE



4 6 11 EVOH COVER SYSTEM TIE-IN TO EXISTING SIDEWALL LINER
NOT TO SCALE



5 6 11 LIGHT-DUTY ACCESS ROAD
NOT TO SCALE



NOTES:

1. MAINTAIN 5% MINIMUM SLOPE ACROSS BENCH INTO STORMWATER CHANNEL.
2. MINIMUM BENCH ELEVATION = 1769.0'

6 6 11 LIGHT-DUTY ACCESS ROAD ALONG CHANNEL BENCH
NOT TO SCALE

PERMIT DRAWINGS
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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: DETAILS 1

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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PROJ. NO. 02218206.16
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CHK: RFI/CJW
QA: RFW
APP: RFI
CJW

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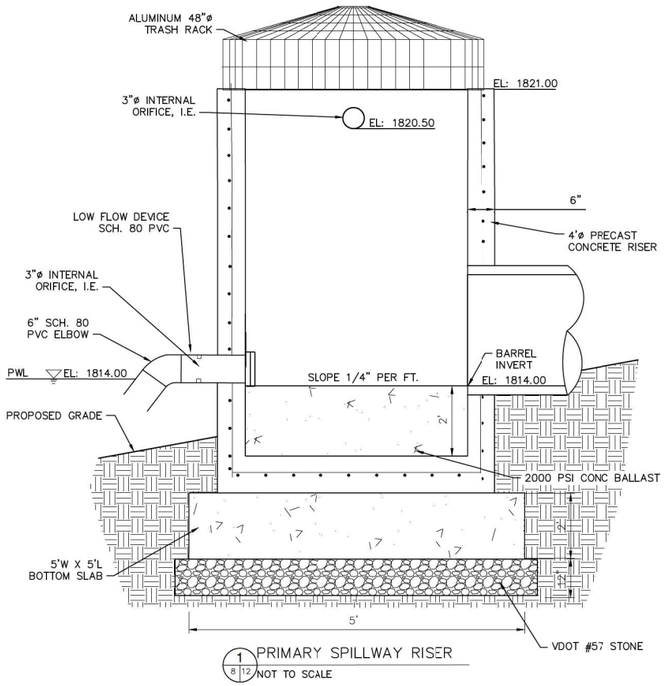
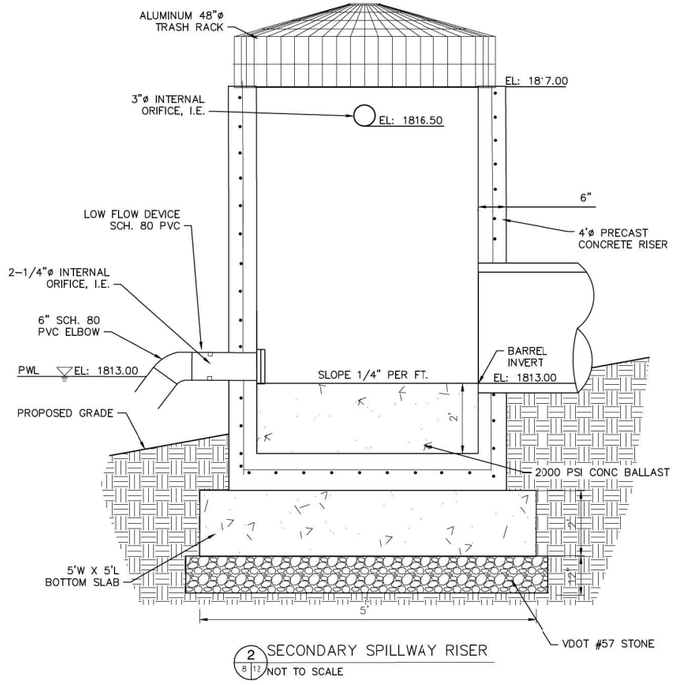
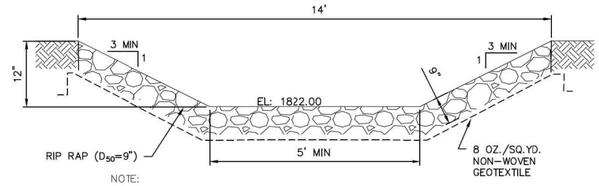


1 8 12 PRIMARY SPILLWAY RISER
NOT TO SCALE

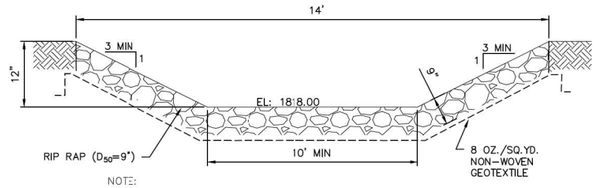


2 8 12 SECONDARY SPILLWAY RISER
NOT TO SCALE



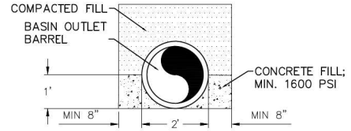
NOTE:
AN ARTICULATED CONCRETE BLOCK SYSTEM MAY BE USED AS AN ALTERNATIVE TO RIP RAP

3 6 12 PRIMARY EMERGENCY SPILLWAY CROSS SECTION DETAIL
NOT TO SCALE



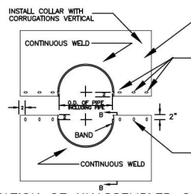
NOTE:
AN ARTICULATED CONCRETE BLOCK SYSTEM MAY BE USED AS AN ALTERNATIVE TO RIP RAP

4 8 12 SECONDARY EMERGENCY SPILLWAY CROSS SECTION DETAIL
NOT TO SCALE

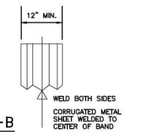


5 10 12 CONCRETE CRADLE FOR BARREL
NOT TO SCALE

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



ELEVATION OF UNASSEMBLED COLLAR



SECTION B-B

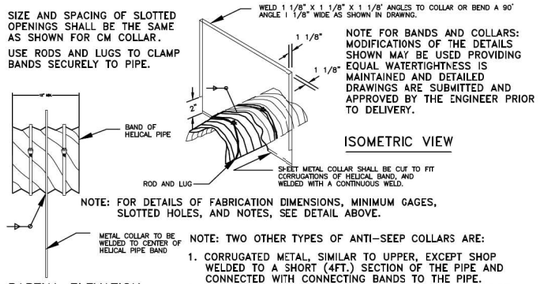
NOTES FOR COLLARS:

1. ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
2. WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR

SIZE AND SPACING OF SLOTTED OPENINGS SHALL BE THE SAME AS SHOWN FOR CM COLLAR.

USE RODS AND LUGS TO CLAMP BANDS SECURELY TO PIPE.



NOTE: FOR DETAILS OF FABRICATION DIMENSIONS, MINIMUM GAGES, SLOTTED HOLES, AND NOTES, SEE DETAIL ABOVE.

PARTIAL ELEVATION
REF: ENGR. FIELD MANUAL

NOTE FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

ISOMETRIC VIEW

NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

1. CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SHORT (4FT.) SECTION OF THE PIPE AND CONNECTED WITH CONNECTING BANDS TO THE PIPE.
2. CONCRETE, SIX INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 15" HORIZONTALLY AND VERTICALLY.

SOURCE: USDA-SCS

PLATE. 3.14-13

6 8 12 ANTI-SEEP COLLARS
NOT TO SCALE

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Suite 305
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804 378-7440 FAX 804 378-7433
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JOB NO.	02218208.16		
SUBJECT	Anti-Seep Collar Calculations for Culverts		
SHEET NC.	1	OF	1
CALCULATED BY	TRW	DATE	4/27/2023
CHECKED BY	CJW	DATE	4/28/2023

Anti-Seep Collars

A). Determine length of barrel within saturated zone, using Plate 3.14-11 or the equation below:

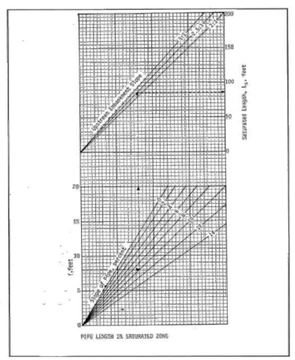
$$L_s = Y(Z+4)\left(1+\frac{S}{0.25-S}\right)$$

Variables:		Culvert 1	Culvert 2
S = Slope of the barrel in feet per foot	=	0.0104	0.014
Y = Depth of water in basin at spillway crest, (ft)	=	7	4
Z = Slope of upstream face of embankment, H:V ratio	=	3	3
Ls = Length of barrel in sat. zone (ft)	=	5'.1	29.7

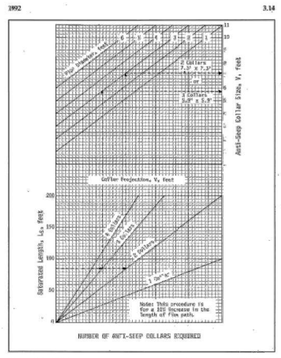
B.) Enter Plate 3.14-12 with Ls. Select collar number, then determine anti-seep collar size based upon barrel diameter. See Plate 3.14-13 for detai

	Culvert 1		Culvert 2	
Selected number of anti-seep collars:	2		2	Notes: Collar Spacing ≈14 x Projecion of collar above bo
Anti-Seep collar size	4.5	ft	3.5	ft Collars should not be located closer than 2 feet to a pipe joint

Note: An additional anti-seep collar for each culvert is proposed in the design profiles.

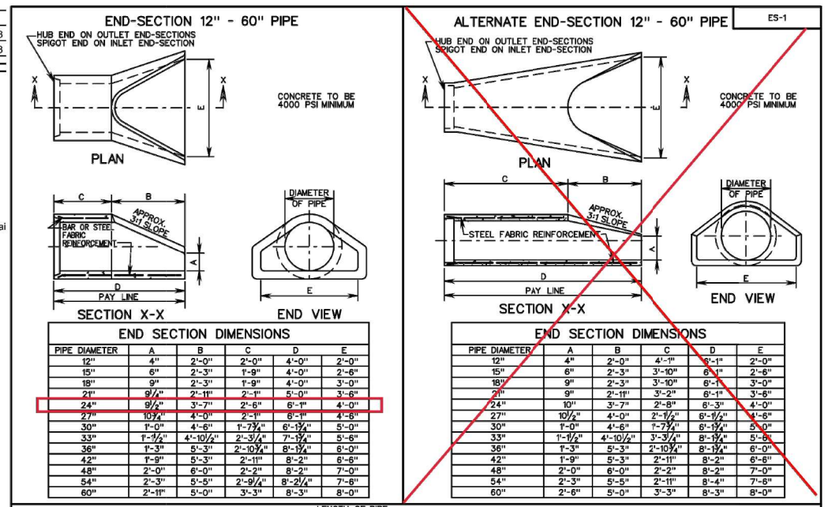


Source: USDA-SCS



Source: USDA-SCS

2016 ROAD & BRIDGE STANDARDS

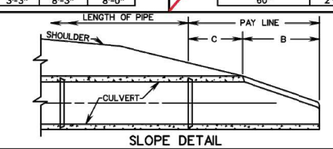


END SECTION DIMENSIONS

PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	2'-0"	4'-0"	2'-0"
15"	6"	2'-3"	1'-9"	4'-0"	2'-6"
18"	9"	2'-3"	1'-9"	4'-0"	3'-0"
21"	9"	2'-11"	2'-1"	5'-0"	3'-6"
24"	9¾"	3'-7"	2'-6"	6'-1"	4'-0"
27"	10½"	4'-0"	2'-1"	6'-1"	4'-6"
30"	1'-0"	4'-6"	1'-7¾"	6'-1½"	5'-0"
33"	1'-1½"	4'-10½"	2'-3¼"	7'-1½"	5'-6"
36"	1'-3"	5'-3"	2'-10¾"	8'-1½"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"
60"	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"

END SECTION DIMENSIONS

PIPE DIAMETER	A	B	C	D	E
12"	4"	2'-0"	4'-1"	2'-1"	2'-0"
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"
21"	9"	2'-11"	3'-2"	6'-1"	3'-6"
24"	10"	3'-7"	2'-8"	6'-3"	4'-0"
27"	10½"	4'-0"	2'-8½"	6'-9½"	4'-6"
30"	1'-0"	4'-6"	1'-7¾"	6'-10½"	5'-0"
33"	1'-1½"	4'-10½"	3'-3¼"	8'-1½"	5'-6"
36"	1'-3"	5'-3"	2'-10¾"	8'-1½"	6'-0"
42"	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"
48"	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"
54"	2'-3"	5'-5"	2'-11"	8'-4"	7'-6"
60"	2'-6"	5'-0"	3'-3"	8'-3"	8'-0"



NOTES:
PIPE LENGTHS SHOWN ON PLANS ARE BASED ON END-SECTION DESIGN SHOWN ON THE LEFT. IF THE CONTRACTOR ELECTS TO USE THE ALTERNATE DESIGN SHOWN ON THE RIGHT, LENGTHS WILL BE REDUCED BY THE DIFFERENCE IN DIMENSION "D".

SPECIFICATION REFERENCE	FLARED END SECTION	VDOT ROAD AND BRIDGE STANDARDS
302	12" - 60" CONCRETE PIPE CULVERTS VIRGINIA DEPARTMENT OF TRANSPORTATION	REVISION DATE: SHEET 1 OF 1 102.01

2016 ROAD & BRIDGE STANDARDS

7 8 12 FLARED PIPE END DETAIL
NOT TO SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: DETAILS 2

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
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PROJ. NO. 02218208.16
DSN. BY: TRW/SHA
DWN. BY: TRW/CJW
CHK. BY: CJW
QA/A PVW BY: CJW
APP. BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 12 of 21

Project\02218208.05\Drawings\EVOH Cover System Design - SWP588\Construction Plans\XREF

Minor Components

Clubcaf, silt loam, frequently flooded
Percent of map unit: 1 percent
Landform: Backswamps on flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Hydric Soils (G128XM005VA)
Hydric soil rating: Yes

45—Udorthents, 0 to 25 percent slopes

Map Unit Setting
National map unit symbol: kfdd
Elevation: 1,490 to 3,670 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 160 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents and similar soils: 70 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Fill material

Properties and qualities
Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

47—Udorthents-Urban land complex, 0 to 25 percent slopes

Map Unit Setting
National map unit symbol: kfrh
Elevation: 1,670 to 2,230 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 160 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents and similar soils: 40 percent
Urban land: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Fill material

Properties and qualities
Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very high
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Description of Urban Land

Setting
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Buildings, pavement

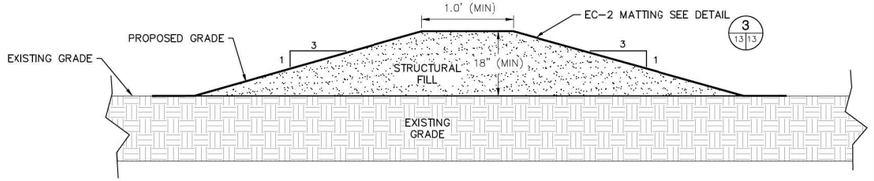
50D—Weikert silt loam, 15 to 25 percent slopes

Map Unit Setting
National map unit symbol: kfm4
Elevation: 1,360 to 2,530 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 52 to 55 degrees F

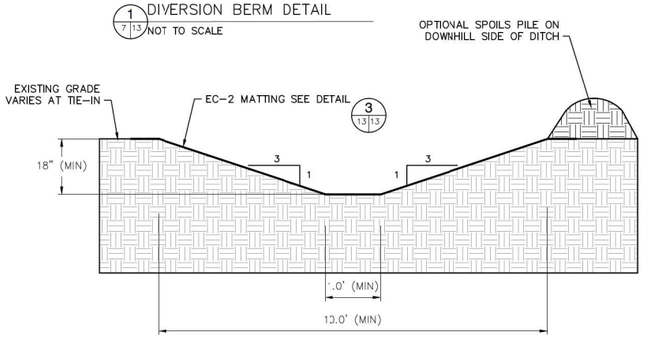
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CeC2	Collegedale-Etowah complex, 5 to 12 percent slopes, eroded	1.3	0.2%
CeD3	Collegedale-Etowah complex, 12 to 20 percent slopes, severely eroded	0.5	0.1%
CuD	Collegedale-Urban land complex, 5 to 20 percent slopes	0.0	0.0%
MoF	Montevallo channery silt loam, 35 to 50 percent slopes	0.1	0.0%
TbD2	Talbott-Rock outcrop-Bradyville complex, 12 to 20 percent slopes, eroded	0.1	0.0%
Subtotals for Soil Survey Area		**2.0**	**0.4%**
Totals for Area of Interest		**528.1**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2A	Atkins loam, 0 to 3 percent slopes, frequently flooded	5.7	1.1%
7A	Clubcaf silt loam, 0 to 3 percent slopes, frequently flooded	11.6	2.2%
16C	Frederick silt loam, 8 to 15 percent slopes	52.9	10.0%
16D	Frederick silt loam, 15 to 25 percent slopes	74.1	14.0%
17C	Frederick very gravelly silt loam, 7 to 15 percent slopes	6.3	1.2%
20D	Hagenstown silt loam, 15 to 25 percent slopes, very rocky	2.7	0.5%
23C	Hayter loam, 7 to 15 percent slopes	5.1	1.0%
45	Udorthents, 0 to 25 percent slopes	128.1	24.2%
47	Udorthents-Urban land complex, 0 to 25 percent slopes	103.2	19.5%
50D	Weikert silt loam, 15 to 25 percent slopes	81.1	15.4%
50E	Weikert silt loam, 25 to 50 percent slopes	42.8	8.1%
55B	Wyrick-Marbie complex, 2 to 7 percent slopes	9.7	1.8%
55C	Wyrick-Marbie complex, 7 to 15 percent slopes	2.8	0.5%



1 / 7|13 DIVERSION BERM DETAIL
NOT TO SCALE

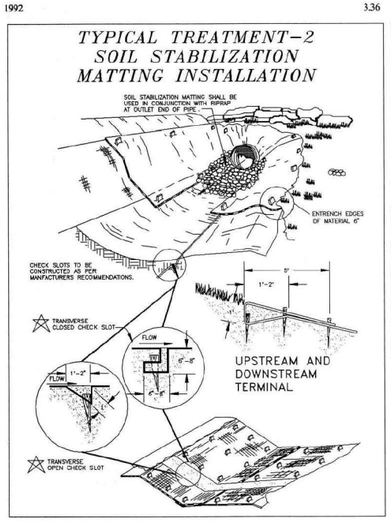


NOTES:
1. CHANNEL BOTTOM WIDTH AND SLOPE VARIES BASED ON CHANNEL

2 / 7|13 DIVERSION DITCH DETAIL
NOT TO SCALE

1992 3.36

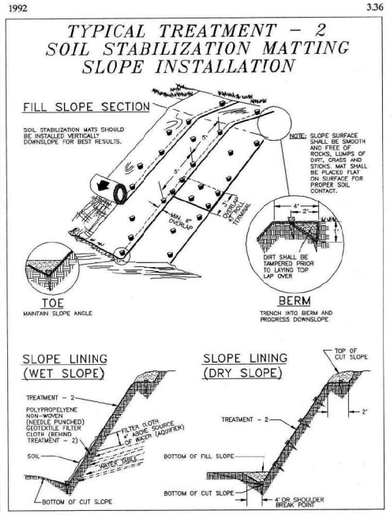
TYPICAL TREATMENT–2 SOIL STABILIZATION MATTING INSTALLATION



Source: VDOT Road and Bridge Standards Plate 3.36-4

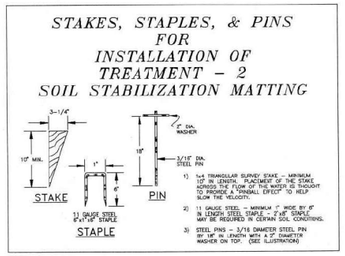
1992 3.36

TYPICAL TREATMENT – 2 SOIL STABILIZATION MATTING SLOPE INSTALLATION



Source: VDOT Road and Bridge Standards Plate 3.36-5

STAKES, STAPLES, & PINS FOR INSTALLATION OF TREATMENT – 2 SOIL STABILIZATION MATTING



Source: Product literature from Greenstreak, Inc. Plate 3.36-3

3 / 13|13 EC–2 MATTING DETAIL
NOT TO SCALE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: **DETAILS 3**

PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
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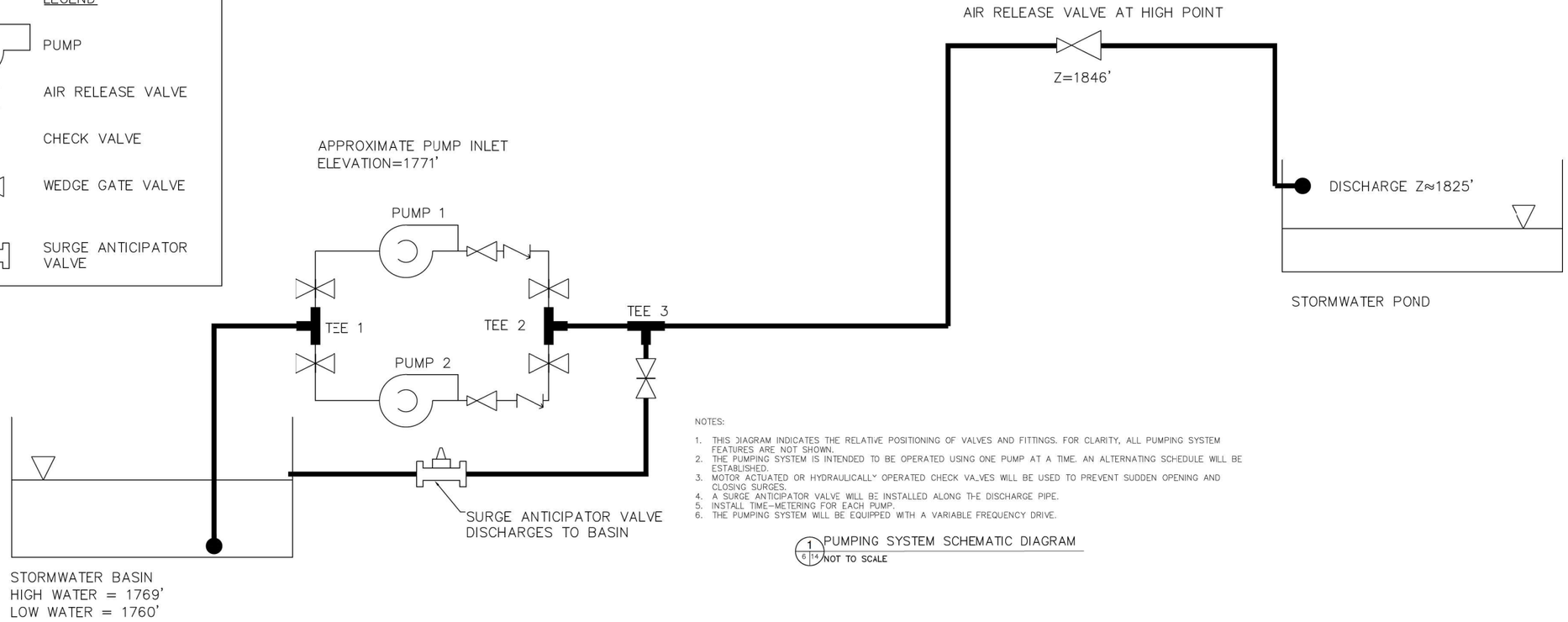
PROJ. NO. 02218206.16
DES. RFI
DWN. RFI/SHA
CHK. RFI
QA/A RVW BY:
APP. RFI
C.LW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **13** of **21**

LEGEND

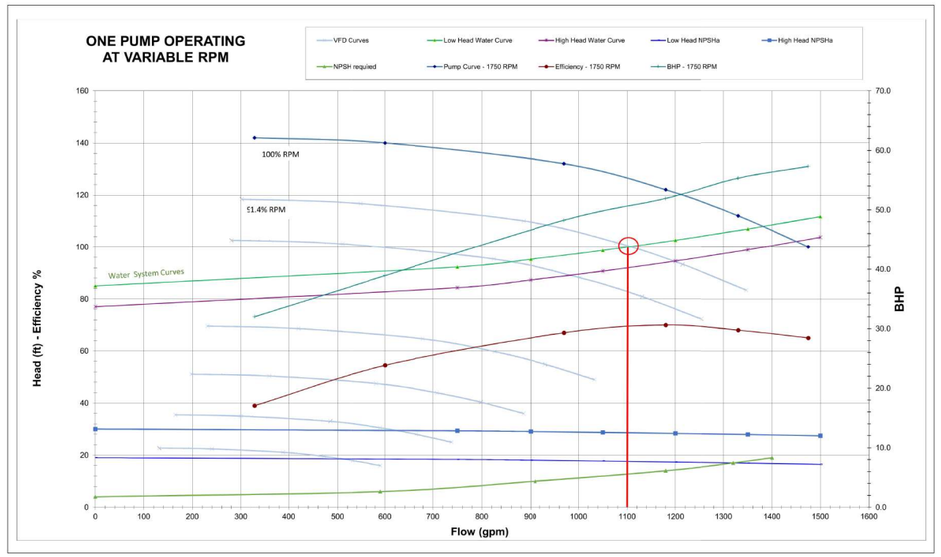
- PUMP
- AIR RELEASE VALVE
- CHECK VALVE
- WEDGE GATE VALVE
- SURGE ANTICIPATOR VALVE



NOTES:

1. THIS DIAGRAM INDICATES THE RELATIVE POSITIONING OF VALVES AND FITTINGS. FOR CLARITY, ALL PUMPING SYSTEM FEATURES ARE NOT SHOWN.
2. THE PUMPING SYSTEM IS INTENDED TO BE OPERATED USING ONE PUMP AT A TIME. AN ALTERNATING SCHEDULE WILL BE ESTABLISHED.
3. MOTOR ACTUATED OR HYDRAULICALLY OPERATED CHECK VALVES WILL BE USED TO PREVENT SUDDEN OPENING AND CLOSING SURGES.
4. A SURGE ANTICIPATOR VALVE WILL BE INSTALLED ALONG THE DISCHARGE PIPE.
5. INSTALL TIME-METERING FOR EACH PUMP.
6. THE PUMPING SYSTEM WILL BE EQUIPPED WITH A VARIABLE FREQUENCY DRIVE.

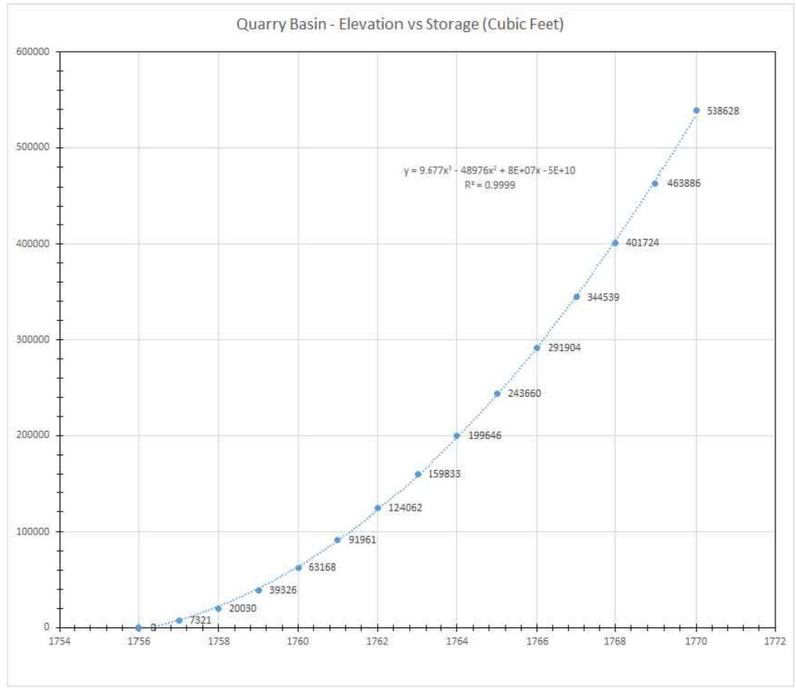
1 / 6 | 14 PUMPING SYSTEM SCHEMATIC DIAGRAM
NOT TO SCALE



NOTES:

1. THE PUMP CURVE IS BASED UPON A GORMAN-RUPP MODEL U6A-B PUMP. THE OWNER MAY ELECT TO CHOOSE A DIFFERENT PUMP MODEL WITH COMPARABLE PERFORMANCE SO LONG AS THE ADEQUACY OF THE PUMP IS DEMONSTRATED.

2 / 6 | 14 PUMPING SYSTEM CURVES
NOT TO SCALE



3 / 6 | 14 QUARRY BASIN STAGE STORAGE

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: DETAILS 4
PUMPING SYSTEM SCHEMATIC

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM
STORMWATER MANAGEMENT PLAN

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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PROJ. NO. 02218206.16
DSN. BY: TFW/SHA
DWK. BY: TFW
CHK. BY: TFW/CJW
S/A RVW BY:
APP. BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 14 of 21

Project\02218208.05\Drawings\EVOH Cover System Design - SWP588\Construction Plans\XREF

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www.scsengineers.com

JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 1 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Drainage Area A - Existing Primary Basin

Pre-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	7.63	34%	Good	C	70	Woods
B	6.45	28%	Good	C	98	Impervious Areas
C	0.65	3%	Good	C	92	Gravel Road
D	6.36	28%	Good	C	74	Open Space
E	1.58	7%	Good	C	89	Dirt Road/Dirt stockpile area
Total	22.67	100%			81	

Post-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	7.63	34%	Good	C	70	Woods
B	6.45	28%	Good	C	98	Impervious Areas
C	0.65	3%	Good	C	92	Gravel Road
D	6.36	28%	Good	C	74	Open Space
E	1.58	7%	Good	C	89	Dirt Road/Dirt stockpile area
Total	22.67	100%			81	

Land Use	Condition	% Impervious	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.)	Poor		68	79	86	89
	Fair		49	69	79	84
	Good		39	61	**74**	80
Impervious Areas	Any	100	98	98	**98**	98
Streets and Roads: Paved; curbs and storm sewers (excluding right-of-way)	Any		98	98	98	98
Streets and Roads: Paved; open ditches (including right-of-way)	Any		98	98	98	98
Streets and Roads: Gravel (including right-of-way)	Any		83	89	**92**	93
Streets and Roads: Dirt (including right-of-way)	Any		76	85	89	91
Urban Districts: Commercial and Business	Any	85	89	92	94	95
Urban Districts: Industrial	Any	72	81	88	91	93
Woods	Poor		45	66	77	83
	Fair		36	60	73	79
	Good		30	55	**70**	77

VESCH p. V-56 - V-59

SCS ENGINEERS

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Midlothian, VA 23113-7313
804 378-7440 FAX 804 378-7433
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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 2 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Runoff Curve Number - Drainage Arsa B- Runoff into Quarry

Pre-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	9.91	27.7%	Good	C	70	Woods
B	24.85	69.5%	Good	C	98	Impervious Areas (Including bottom-lined landfill area)
C	0.64	1.8%	Good	C	92	Gravel Road
D	0.09	0.3%	Good	C	74	Open Space
E	0.28	0.8%	Good	C	89	Dirt Road
Total	35.78	100%			90	

Post-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	8.57	25.3%	Fair	C	73	Woods
B	24.85	73.3%	Good	C	98	Impervious Areas
C	0.25	0.7%	Good	C	92	Gravel Road
D	0.09	0.3%	Good	C	74	Open Space
E	0.15	0.5%	Good	C	89	Dirt Road
Total	33.92	100%			91.5	

Land Use	Condition	% Impervious	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.)	Poor		68	79	86	89
	Fair		49	69	79	84
	Good		39	61	**74**	80
Impervious Areas	Any	100	98	98	**98**	98
Streets and Roads: Paved; curbs and storm sewers (excluding right-of-way)	Any		98	98	98	98
Streets and Roads: Paved; open ditches (including right-of-way)	Any		98	98	98	98
Streets and Roads: Gravel (including right-of-way)	Any		83	89	**92**	93
Streets and Roads: Dirt (including right-of-way)	Any		76	85	**89**	91
Urban Districts: Commercial and Business	Any	85	89	92	94	95
Urban Districts: Industrial	Any	72	81	88	91	93
Woods	Poor		45	66	77	83
	Fair		36	60	**73**	79
	Good		30	55	**70**	77

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Runoff Curve Number - Drainage Area C- Runoff into Secondary Basin

Pre-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	0.48	40.2%	Good	C	70	Woods
B	0.26	22.1%	Good	C	98	Impervious Areas (Including bottom-lined landfill area)
C		0.0%	Good	C	92	Gravel Road
D	0.45	37.7%	Good	C	74	Open Space
E		0.0%	Good	C	89	Dirt Road
Total	1.19	100%			78	

Post-development

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	0.48	40.2%	Good	C	70	Woods
B	0.41	34.5%	Good	C	98	Impervious Areas
C		0.0%	Good	C	92	Gravel Road
D	0.30	25.3%	Good	C	74	Open Space
E		0.0%	Good	C	89	Dirt Road
Total	1.19	100%			81	

Land Use	Condition	% Impervious	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.)	Poor		68	79	86	89
	Fair		49	69	79	84
	Good		39	61	**74**	80
Impervious Areas	Any	100	98	98	**98**	98
Streets and Roads: Paved; curbs and storm sewers (excluding right-of-way)	Any		98	98	98	98
Streets and Roads: Paved; open ditches (including right-of-way)	Any		98	98	98	98
Streets and Roads: Gravel (including right-of-way)	Any		83	89	**92**	93
Streets and Roads: Dirt (including right-of-way)	Any		76	85	**89**	91
Urban Districts: Commercial and Business	Any	85	89	92	94	95
Urban Districts: Industrial	Any	72	81	88	91	93
Woods	Poor		45	66	**77**	83
	Fair		36	60	**73**	79
	Good		30	55	**70**	77

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Runoff Curve Number - Forested Condition

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A	57.78	100.0%	Good	C	70	Woods
B		0.0%	Good	C	98	
C		0.0%	Good	C	92	
D		0.0%	Good	C	74	
E		0.0%	Good	C	89	
Total	57.78	100%			70	

Subarea	Area	Area %	Condition	Soil	CN	Land Use
A		0.0%				
B		0.0%				
C		0.0%				
D		0.0%				
E		0.0%				
Total	0.00	#DIV/0!			0	

Land Use	Condition	% Impervious	A	B	C	D
Open space (lawns, parks, golf courses, cemeteries, etc.)	Poor		68	79	86	89
	Fair		49	69	79	84
	Good		39	61	**74**	80
Impervious Areas	Any	100	98	98	**98**	98
Streets and Roads: Paved; curbs and storm sewers (excluding right-of-way)	Any		98	98	98	98
Streets and Roads: Paved; open ditches (including right-of-way)	Any		98	98	98	98
Streets and Roads: Gravel (including right-of-way)	Any		83	89	**92**	93
Streets and Roads: Dirt (including right-of-way)	Any		76	85	**89**	91
Urban Districts: Commercial and Business	Any	85	89	92	94	95
Urban Districts: Industria	Any	72	81	88	91	93
Woods	Poor		45	66	**77**	83
	Fair		36	60	**73**	79
	Good		30	55	**70**	77

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Runoff Calculations

DA-A

Pre-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	81	0.10	0.19
1-yr	2.15	81	0.70	1.33
2-yr	2.54	81	0.97	1.84
10-yr	3.34	81	1.58	2.99
25-yr	3.78	81	1.94	3.67
100-yr	4.45	81	2.51	4.74

Post-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	81	0.10	0.19
1-yr	2.15	81	0.70	1.33
2-yr	2.54	81	0.97	1.84
10-yr	3.34	81	1.58	2.99
25-yr	3.78	81	1.94	3.67
100-yr	4.45	81	2.51	4.74

DA-B

Pre-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	90	0.32	0.96
1-yr	2.15	90	1.22	3.65
2-yr	2.54	90	1.57	4.67
10-yr	3.34	90	2.30	6.85
25-yr	3.78	90	2.71	8.08
100-yr	4.45	90	3.35	9.98

Post-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	91.5	0.38	1.08
1-yr	2.15	91.5	1.34	3.78
2-yr	2.54	91.5	1.69	4.78
10-yr	3.34	91.5	2.44	6.90
25-yr	3.78	91.5	2.86	8.08
100-yr	4.45	91.5	3.50	9.91

DA-C

Pre-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	78	0.06	0.01
1-yr	2.15	78	0.56	0.06
2-yr	2.54	78	0.80	0.08
10-yr	3.34	78	1.36	0.13
25-yr	3.78	78	1.69	0.17
100-yr	4.45	78	2.23	0.22

Post-development

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	81	0.09	0.01
1-yr	2.15	81	0.69	0.07
2-yr	2.54	81	0.95	0.09
10-yr	3.34	81	1.56	0.15
25-yr	3.78	81	1.91	0.19
100-yr	4.45	81	2.48	0.25

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \qquad S = \frac{1000}{CN} - 10$$

Forested Condition - Whole Site Area

Storm	Rainfall (in)	CN	Runoff Q (in)	Vol ac*ft
WQ	1.00	70	0.005	0.02
1-yr	2.15	70	0.30	1.44
2-yr	2.54	70	0.47	2.28
10-yr	3.34	70	0.91	4.39
25-yr	3.78	70	1.19	5.71
100-yr	4.45	70	1.64	7.89

Rainfall

24-hr storm (in)	WQ	1-yr	2-yr	10-yr	25-yr	100-yr
Bristol	1.00	2.15	2.54	3.34	3.78	4.45

*Estimated from data provided by the National Oceanic and Atmospheric Administration

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Time of Concentration Pre-development Area A - E

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	987,549			987,549	
Sheet Flow						
Mannings Roughness Coefficient, n		0.24				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.03	0.01	0.01		
Time of Concentration	hr	0.23	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	1,600				
Watercourse slope, s	ft/ft	0.05				
Average velocity, V	ft/s	3.60	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.12	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.35	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	21.03	0.00	0.00	21.03	

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Time of Concentration Pre-development Drainage Area B - Quarry

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	1,558,377			1,558,377	
Sheet Flow						
Mannings Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.02	0.01	0.01		
Time of Concentration	hr	0.40	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	250				
Watercourse slope, s	ft/ft	0.16				
Average velocity, V	ft/s	6.50	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.41	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	24.74	0.00	0.00	24.74	

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Time of Concentration Pre-development Area A - E

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	51,960			51,960	
Sheet Flow						
Mannings Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.20	0.01	0.01		
Time of Concentration	hr	0.16	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	185				
Watercourse slope, s	ft/ft	0.37				
Average velocity, V	ft/s	10.00	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.17	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	9.90	0.00	0.00	9.90	

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Time of Concentration Post-development Drainage Area A

Post-development	Units	A	B	C	Total	Guidance
Surface Area	ft^2	987,549			987,549	
Sheet Flow						
Mannings Roughness Coefficient, n		0.24				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.03	0.01	0.01		
Time of Concentration	hr	0.23	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	1,600				
Watercourse slope, s	ft/ft	0.05				
Average velocity, V	ft/s	3.60	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.12	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.020	0.011	0.011		Table 5-8
Velocity	ft/s	74.50	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.35	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	21.03	0.00	0.00	21.03	

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Time of Concentration Post-development Drainage Area B - Quarry

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	1,477,498			1,477,498	
Sheet Flow						
Mannings Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.05	0.01	0.01		
Time of Concentration	hr	0.28	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	160				
Watercourse slope, s	ft/ft	0.10				
Average velocity, V	ft/s	5.00	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.29	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	17.24	0.00	0.00	17.24	

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Time of Concentration Post-development Area C - Secondary Basin

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	51,960			51,960	
Sheet Flow						
Mannings Roughness Coefficient, n		0.40				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.20	0.01	0.01		
Time of Concentration	hr	0.16	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	185				
Watercourse slope, s	ft/ft	0.37				
Average velocity, V	ft/s	10.00	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.01	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.17	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	9.90	0.00	0.00	9.90	

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Time of Concentration - Forested Condition (Assumed flow path based upon topography surrounding quarry)

Travel Path	Units	A	B	C	Total	Guidance
Surface Area	ft^2	2,517,007			2,517,007	
Sheet Flow						
Mannings Roughness Coefficient, n		0.80				Table 5-7
Flow Length, L (<= 100 ft)	ft	100				
2-yr 24-hr rainfall, P	in	2.54	2.54	2.54		
Land slope,s	ft/ft	0.03	0.01	0.01		
Time of Concentration	hr	0.59	0.00	0.00		
Shallow Concentrated Flow						
Flow length, L	ft	2,520				
Watercourse slope, s	ft/ft	0.03				
Average velocity, V	ft/s	2.80	1.00	1.00		Plate 5-23
Time of Concentration	hr	0.25	0.00	0.00		
Channel Flow						
Cross Sectional Flow Area, a	ft^2	1.00	1.00	1.00		
Wetted perimeter, pw	ft	1.00	1.00	1.00		
Hydralic Radius	ft	1.00	1.00	1.00		
Channel Slope, s	ft/ft	1.000	1.000	1.000		
Mannings Roughness Coefficient, n		0.011	0.011	0.011		Table 5-8
Velocity	ft/s	135.45	135.45	135.45		
Flow Length, L	ft	0				
Time of Concentration	hr	0.00	0.00	0.00		
Total						
Total Time of Concentration	hr	0.84	0.00	0.00		
Weight	%	100%	0%	0%		
Weighted Total	min	50.68	0.00	0.00	50.68	

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Water Quantity Calculation 9VAC25-870-66.B.3. - Forested Condition

Objective: Calculate the maximum allowable peak flow rate of runoff for the one-year 24-hour storm from the developed site per the forested condition equation given below:

$$Q_{Developed} \leq \left[\frac{Q_{Forest} RV_{Forest}}{RV_{Developed}}\right]$$

where:

$Q_{Developed}$ = Allowable peak rate of runoff from the developed site for the one-year 24-hour storm

Q_{Forest} = Peak flow rate of runoff from the site in a forested condition (see hydraflow hydrograph)

RV_{Forest} = Volume of runoff from the site in a forested condition (see calculation sheet 5)

$RV_{Developed}$ = Volume of runoff from the site in the developed condition (see calculation sheet 5)

and:

Q_{Forest} = 6.830 cfs

RV_{Forest} = 1.443 ac*ft

$RV_{Developed}$ = 1.330 ac*ft + 3.776 ac*ft + 0.068 ac*ft

= 5.174 ac*ft

Resulting in:

$$Q_{Developed} = \frac{6.830\ \text{cfs} \times 1.443\ \text{ac*ft}}{5.174\ \text{ac*ft}}$$

$Q_{Developed}$ = **1.90 cfs** — Maximum allowable peak flow rate of runoff for the one-year 24-hour storm from the developed site

SCS ENGINEERS

Environmental Consultants & Contractors
15521 Midlothian Turnpike
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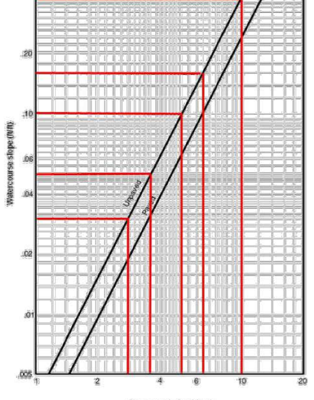
804 378-7440 FAX 804 378-7433
www.scsengineers.com

JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 14 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Plate 5-23



VESCH p. V-53

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SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 15 OF 16
CALCULATED BY TRW DATE 4/27/2023
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Table 5-7: Manning's "n" Values for Sheet Flow

Surface Description	n
Smooth surfaces (concrete, asphalt,gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods	
Light underbrush	0.40
Dense underbrush	0.80

VESCH p. V-61

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JOB NO. 02218208.16
SUBJECT Bristol 588 Stormwater Calculations
SHEET NO. 16 OF 16
CALCULATED BY TRW DATE 4/27/2023
CHECKED BY CJW DATE 4/27/2023

Manning's "n" Values

Surface	Best	Good	Fair	Bad
Uncoated cast-iron pipe	0.012	0.013	0.014	0.015
Coated cast-iron pipe	0.011	0.012	0.013	
Commercial wrought-iron pipe, black	0.012	0.013	0.014	0.015
Riveted and spiral steel pipe, galvanized	0.013	0.015	0.017	
Common clay drainage tile	0.011	0.012	0.014	0.017
Neat cement surfaces	0.010	0.011	0.012	0.013
Cement mortar surfaces	0.011	0.012	0.013	0.015
Concrete pipe	0.012	0.013	0.015	0.016
Concrete-lined channels	0.012	0.014	0.016	0.018
Cement-rubble surface	0.017	0.020	0.025	0.030
Dry-rubble surface	0.025	0.030	0.033	0.035
Canals and ditches				
Earth, straight and uniform	0.017	0.020	0.0225	0.025
Rock cuts, smooth and uniform	0.025	0.030	0.033	0.035
Rock cuts, jagged and irregular	0.035	0.040	0.045	
Winding sluggish canals	0.0225	0.025	0.0275	0.030
Dredged earth channels	0.025	0.0275	0.030	0.033
Canals with rough stony beds, weeds on earth banks	0.025	0.030	0.035	0.040
Natural Stream Channels				
Clean, straight bank, full stage, no rifts or deep pools	0.025	0.0275	0.030	0.033
Same as #1, but some weeds and stones	0.030	0.033	0.035	0.040
Winding, some pools and shoals, clean	0.033	0.035	0.040	0.045
Same as #3, lower stages, more ineffective slope and sections	0.040	0.045	0.050	0.055
Same as #3, some weeds and stones	0.035	0.040	0.045	0.050
Same as #4, stony sections	0.045	0.050	0.055	0.060
Sluggish river reaches, rather weedy or with very deep pools	0.050	0.060	0.070	0.080
Very weedy reaches	0.075	0.100	0.125	0.150

VESCH p. V-62

PERMIT DRAWINGS
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DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
STORMWATER CALCULATIONS 1

PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH. (804) 378-7440 FAX. (804) 378-7433

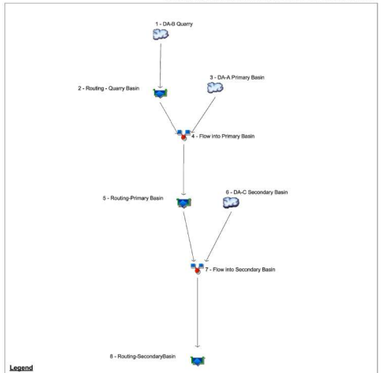
PROJ. NO. 02218206.16 | DWN. BY: TRW/SHA | Q/A RVW BY:
DSN. BY: TRW/CJW | CHK. BY: CJW | APP. BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **15** of **21**

1

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCADB Civil3DB 2018 by Autodesk, Inc. v2018.3



Legend

Hyd.	Origin	Description
1	SCS Runoff	DA-B Quarry
2	Reservoir	Routing - Quarry Basin
3	SCS Runoff	DA-A Primary Basin
4	Combine	Flow into Primary Basin
5	Reservoir	Routing-Primary Basin
6	SCS Runoff	DA-C Secondary Basin
7	Combine	Flow into Secondary Basin
8	Reservoir	Routing-SecondaryBasin

Project: __Existing Stormwater Routing.gpw | Thursday, 04 / 27 / 2023

2

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	44.66	1	728	156,835	-----	-----	-----	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1	1762.97	158,835	Routing - Quarry Basin
3	SCS Runoff	16.83	1	727	58,297	-----	-----	-----	DA-A Primary Basin
4	Combine	16.83	1	727	58,297	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.161	1	1456	18,928	4	1822.16	302,105	Routing-Primary Basin
6	SCS Runoff	1.043	1	720	2,466	-----	-----	-----	DA-C Secondary Basin
7	Combine	1.056	1	720	21,380	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.177	1	1442	20,092	7	1818.00	13,570	Routing-SecondaryBasin

__Existing Stormwater Routing.gpw | Return Period: 1 Year | Thursday, 04 / 27 / 2023

3

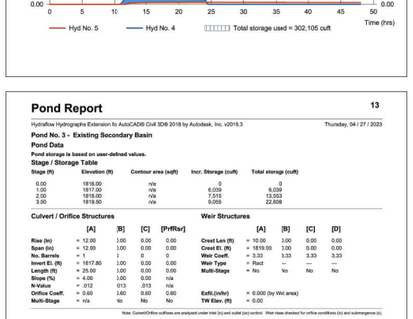
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 44.66 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 158,835 cuft
Drainage area	= 35.780 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



4

Hydrograph Report

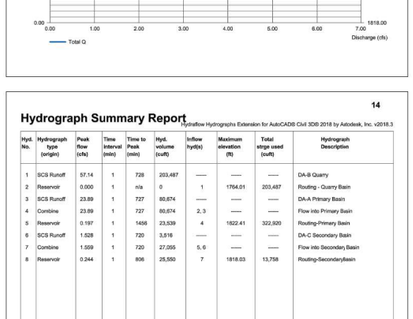
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1762.57 ft
Reservoir name	= Quarry Basin	Max. Storage	= 158,835 cuft

Storage Indication method used.



5

Pond Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk Inc. v2018.3 — Thursday, 04 / 27 / 2023

Pond No. 1 - Quarry Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1756.00	n/a	0	0
1.00	1757.00	n/a	4,686	4,686
2.00	1758.00	n/a	9031	13,727
3.00	1759.00	n/a	14819	28,546
4.00	1760.00	n/a	24283	52,839
5.00	1761.00	n/a	32197	85,036
6.00	1762.00	n/a	39301	124,337
7.00	1763.00	n/a	46335	170,672
8.00	1764.00	n/a	43335	203,227
9.00	1765.00	n/a	47641	250,868
10.00	1766.00	n/a	51881	302,749
11.00	1767.00	n/a	56284	359,033
12.00	1768.00	n/a	60838	419,871
13.00	1769.00	n/a	65633	485,504
14.00	1770.00	n/a	78289	563,773

Culvert / Orifice Structures

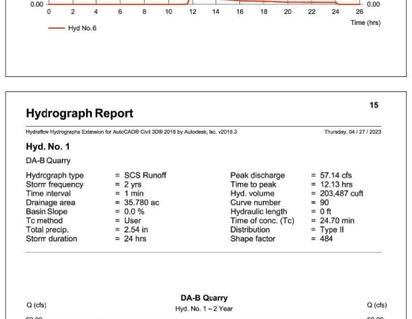
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



6

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 16.83 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 58,297 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

7

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 16.83 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 58,297 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac

8

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.161 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.27 hrs
Time interval	= 1 min	Hyd. volume	= 18,928 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1822.16 ft
Reservoir name	= Existing Primary Basin	Max. Storage	= 302,105 cuft

Storage Indication method used. Wet pond routing start elevation = 1821.50 ft.

9

Pond Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Pond No. 2 - Existing Primary Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1818.00	n/a	0	0
1.00	1819.00	n/a	66,448	66,448
2.00	1820.00	n/a	70,324	136,772
3.00	1821.00	n/a	74,260	211,032
4.00	1822.00	n/a	78,258	289,290
5.00	1823.00	n/a	82,311	371,601
6.00	1824.00	n/a	71,328	442,929

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	Inactive	Inactive
Span (in)	= 12.00	3.00	12.00	0.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 1821.50	1821.50	1818.00	0.00
Length (ft)	= 15.00	0.00	30.00	0.00
Slope (%)	= 2.00	0.00	5.00	n/a
N-Value	= .013	.013	.011	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.50	1.00	0.00	0.00
Crest El. (ft)	= 1823.30	1823.60	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

10

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 1.043 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 2,466 cuft
Drainage area	= 1.190 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

11

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 1.056 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 21,393 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac

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Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.177 cfs
Storm frequency	= 1 yrs	Time to peak	= 24.03 hrs
Time interval	= 1 min	Hyd. volume	= 20,092 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1818.00 ft
Reservoir name	= Existing Secondary Basin	Max. Storage	= 13,570 cuft

Storage Indication method used. Wet pond routing start elevation = 1817.80 ft.

13

Pond Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Pond No. 3 - Existing Secondary Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1816.00	n/a	0	0
1.00	1817.00	n/a	6,039	6,039
2.00	1818.00	n/a	7,515	13,553
3.00	1819.00	n/a	9,055	22,609

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	0.00	0.00
Span (in)	= 12.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1817.80	3.00	0.00	0.00
Length (ft)	= 25.00	3.00	0.00	0.00
Slope (%)	= 4.00	3.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	3.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	3.00	0.00	0.00
Crest El. (ft)	= 1819.00	3.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

14

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	57.14	1	728	203,487	-----	-----	-----	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1	1764.01	203,487	Routing - Quarry Basin
3	SCS Runoff	23.89	1	727	80,674	-----	-----	-----	DA-A Primary Basin
4	Combine	23.89	1	727	80,674	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.197	1	1456	23,539	4	1822.41	322,920	Routing-Primary Basin
6	SCS Runoff	1.528	1	720	3,816	-----	-----	-----	DA-C Secondary Basin
7	Combine	1.599	1	720	27,055	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.244	1	806	25,550	7	1818.03	13,758	Routing-SecondaryBasin

__Existing Stormwater Routing.gpw | Return Period: 2 Year | Thursday, 04 / 27 / 2023

15

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 57.14 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 203,487 cuft
Drainage area	= 35.780 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: **STORMWATER CALCULATIONS 2**

PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH: (804) 379-1441 FAX: (804) 379-1563

PROJ. NO. 02218208.16
DES. RFI
DRN. RFI
CHK. TFW/CJW
QA/QC TFW/SHA
APP. TFW
CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **16** of **21**

EXISTING CONDITIONS STORMWATER ANALYSIS:

Hydrograph Report

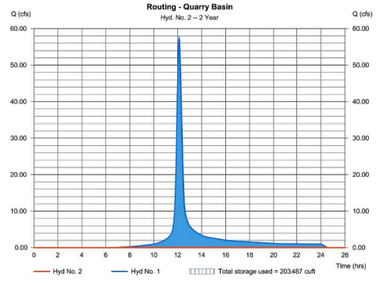
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1764.01 ft
Reservoir name	= Quarry Basin	Max. Storage	= 203,487 cuft

Storage Indication method used.



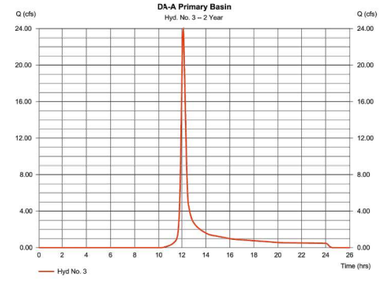
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 23.89 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 80,674 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



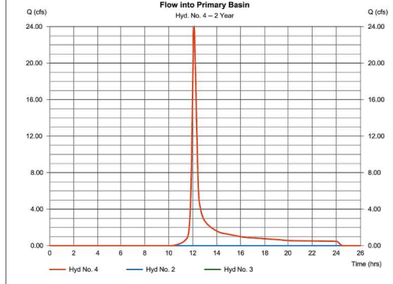
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 23.89 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 80,674 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac



Hydrograph Report

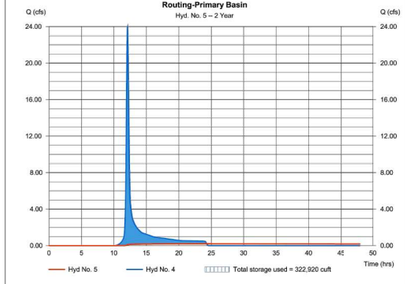
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.197 cfs
Storm frequency	= 2 yrs	Time to peak	= 24.27 hrs
Time interval	= 1 min	Hyd. volume	= 23,535 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1822.41 ft
Reservoir name	= Existing Primary Basin	Max. Storage	= 322,920 cuft

Storage Indication method used. Wet pond routing start elevation = 1821.50 ft.



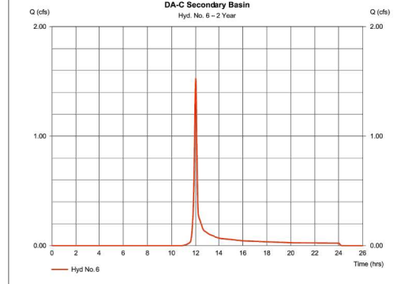
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 1.528 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 3,516 cuft
Drainage area	= 1.190 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



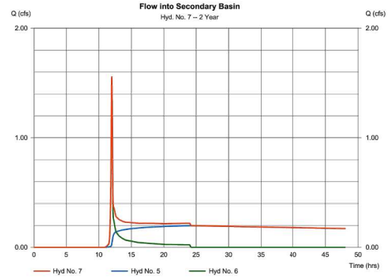
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 1.559 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 27,055 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac



Hydrograph Report

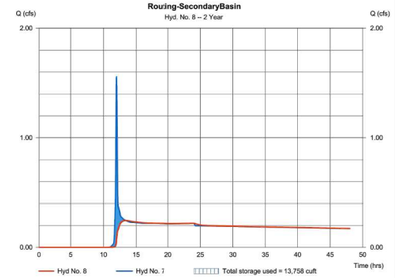
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.244 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.43 hrs
Time interval	= 1 min	Hyd. volume	= 25,550 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1818.03 ft
Reservoir name	= Existing Secondary Basin	Max. Storage	= 13,758 cuft

Storage Indication method used. Wet pond routing start elevation = 1817.80 ft.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	83.16	1	728	298,546	-----	-----	-----	DA-B Quarry
2	Reservoir	0.000	1	n/a	0	1	1765.92	298,546	Routing - Quarry Basin
3	SCS Runoff	39.71	1	726	131,267	-----	-----	-----	DA-A Primary Basin
4	Combine	39.71	1	726	131,267	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.263	1	1457	31,997	4	1822.99	370,642	Routing-Primary Basin
6	SCS Runoff	2.627	1	720	5,948	-----	-----	-----	DA-C Secondary Basin
7	Combine	2.713	1	720	37,944	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.555	1	740	36,256	7	1818.17	14,581	Routing-SecondaryBasin

__Existing Stormwater Routing.gpw | Return Period: 10 Year | Thursday, 04 / 27 / 2023

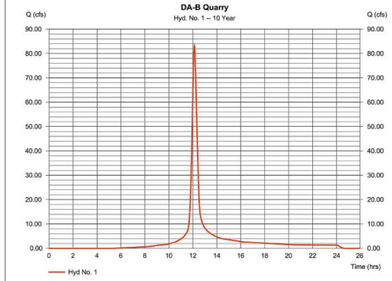
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 83.16 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 1 min	Hyd. volume	= 298,546 cuft
Drainage area	= 35.780 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

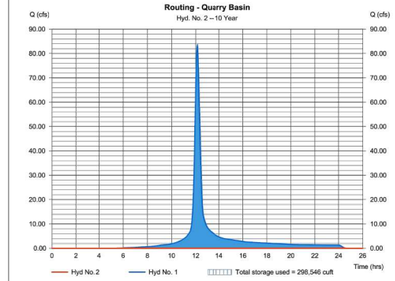
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1765.92 ft
Reservoir name	= Quarry Basin	Max. Storage	= 298,546 cuft

Storage Indication method used.



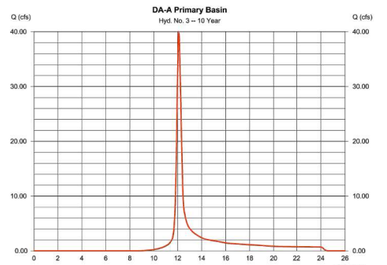
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 39.71 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 131,267 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



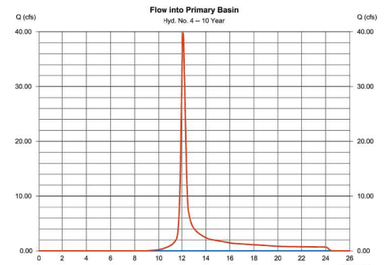
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 39.71 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 131,267 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac



Hydrograph Report

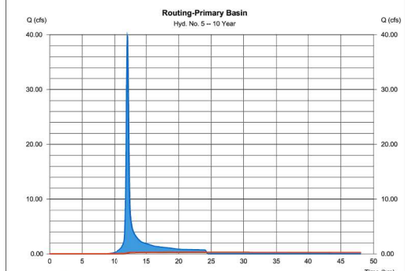
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.263 cfs
Storm frequency	= 10 yrs	Time to peak	= 24.28 hrs
Time interval	= 1 min	Hyd. volume	= 31,997 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1822.99 ft
Reservoir name	= Existing Primary Basin	Max. Storage	= 370,642 cuft

Storage Indication method used. Wet pond routing start elevation = 1821.50 ft.



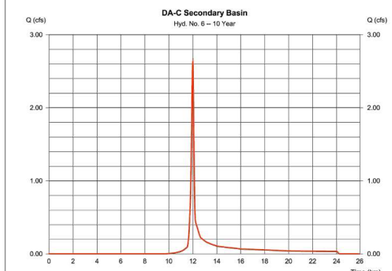
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 2.627 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 5,948 cuft
Drainage area	= 1.190 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



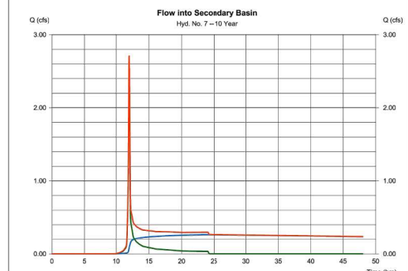
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 2.713 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 37,944 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac



Project:\02218208.05\Drawings\EVOH Cover System Design – SWP588\Construction Plans\XREF

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: **STORMWATER CALCULATIONS 3**

PROJECT TITLE: **SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN**

CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
10521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH: (804) 379-4440 FAX: (804) 379-7343

PROJ. NO. 02218208.16
DSN. BY: TRW/SHA
DWN. BY: TRW/SHA
CHK. BY: C.LW
QA/QC BY: C.LW
APP. BY: C.LW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 17 of 21

EXISTING CONDITIONS STORMWATER ANALYSIS:

POST-EVOH COVER SYSTEM INSTALLATION STORMWATER ANALYSIS:

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

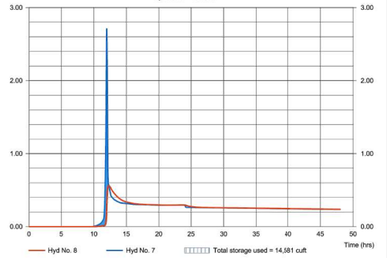
Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.555 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.33 hrs
Time interval	= 1 min	Hyd. volume	= 36,256 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1818.17 ft
Reservoir name	= Existing Secondary Basin	Max. Storage	= 14,581 cuft

Storage Indication method used. Wet pond routing start elevation = 1817.80 ft.

Routing-SecondaryBasin
Hyd. No. 8 – 10 Year



EXISTING CONDITIONS STORMWATER ANALYSIS: TABLE OF CONTENTS

Hydraflow Table of Contents

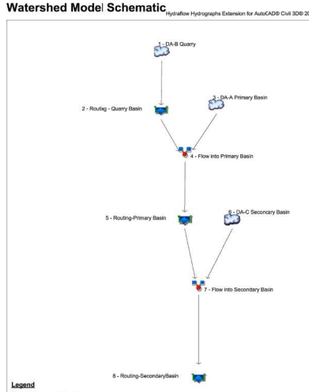
__Existing Stormwater Routing.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v2018.3 — Thursday, 04 / 27 / 2023

END OF EXISTING CONDITIONS STORMWATER ANALYSIS

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3



Legend

Hyd.	Origin	Description
1	SCS Runoff	DA-B Quarry
2	Reservoir	Routing - Quarry Basin
3	SCS Runoff	DA-A Primary Basin
4	Combine	Flow into Primary Basin
5	Reservoir	Routing-Primary Basin
6	SCS Runoff	DA-C Seconcary basin
7	Combine	Flow into Secondary Basin
8	Reservoir	Routing-SecondaryBasin

Project: __Proposed SWMP V2.gpw — Friday, 04 / 28 / 2023

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	54.57	1	724	162,331	-----	-----	-----	DA-B Quarry
2	Reservoir	2.450	1	719	162,252	1	1762.71	148,683	Routing - Quarry Basin
3	SCS Runoff	16.83	1	727	58,297	-----	-----	-----	DA-A Primary Basin
4	Combine	19.28	1	727	220,549	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.417	1	1956	48,143	4	1817.38	314,773	Routing-Primary Basin
6	SCS Runoff	1.320	1	720	3,031	-----	-----	-----	DA-C Secondary Basin
7	Combine	1.390	1	720	51,174	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.221	1	2880	20,179	7	1815.94	30,990	Routing-SecondaryBasin

__Proposed SWMP V2.gpw — Return Period: 1 Year — Friday, 04 / 28 / 2023

Hydrograph Report

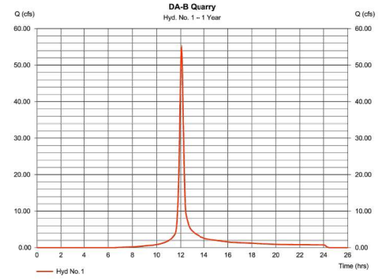
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 54.57 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 162,331 cuft
Drainage area	= 33.920 ac	Curve number	= 91.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.20 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

DA-B Quarry
Hyd. No. 1 – 1 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

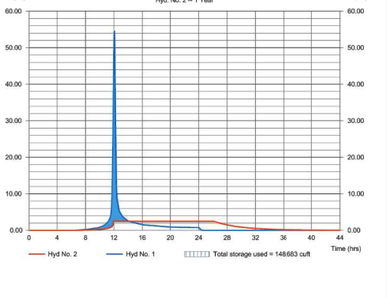
Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.450 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 162,252 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1762.71 ft
Reservoir name	= Quarry Basin	Max. Storage	= 148,683 cuft

Storage Indication method used. Wet pond routing start elevation = 1760.00 ft.

Routing - Quarry Basin
Hyd. No. 2 – 1 Year



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Pond No. 1 - Quarry Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1756.00	n/a	0	0
1.00	1757.00	n/a	4,699	4,699
2.00	1758.00	n/a	9,031	13,727
3.00	1759.00	n/a	14,819	28,546
4.00	1760.00	n/a	24,293	52,839
5.00	1761.00	n/a	32,197	85,036
6.00	1762.00	n/a	35,571	120,607
7.00	1763.00	n/a	39,285	159,892
8.00	1764.00	n/a	43,377	203,269
9.00	1765.00	n/a	47,641	250,908
10.00	1766.00	n/a	51,881	302,789
11.00	1767.00	n/a	56,284	359,033
12.00	1768.00	n/a	60,838	419,871
13.00	1769.00	n/a	65,633	485,504
14.00	1770.00	n/a	78,269	563,773

Culvert/ Orifice Structures

	[A]	[B]	[C]	[PrfRar]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

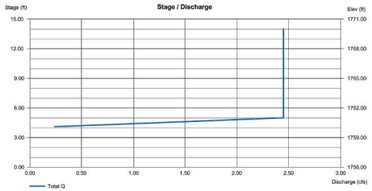
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 6.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge



Hydrograph Report

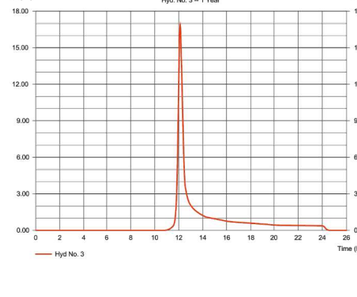
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 16.83 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 58,297 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

DA-A Primary Basin
Hyd. No. 3 – 1 Year



Hydrograph Report

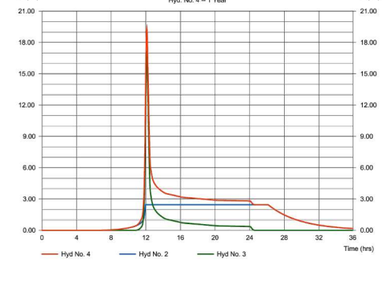
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 19.28 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 220,549 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.67C ac

Flow into Primary Basin
Hyd. No. 4 – 1 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

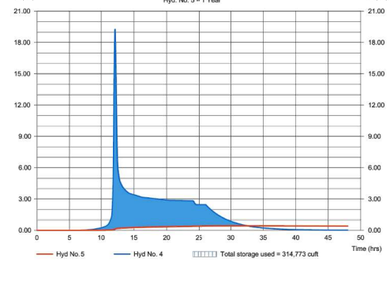
Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.417 cfs
Storm frequency	= 1 yrs	Time to peak	= 32.60 hrs
Time interval	= 1 min	Hyd. volume	= 48,143 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1817.38 ft
Reservoir name	= Proposed Primary Basin	Max. Storage	= 314,773 cuft

Storage Indication method used. Wet pond routing start elevation = 1814.00 ft.

Routing-Primary Basin
Hyd. No. 5 – 1 Year



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Pond No. 2 - Proposed Primary Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1810.00	n/a	0	0
1.00	1811.00	n/a	12,836	12,836
2.00	1812.00	n/a	31,318	44,154
3.00	1813.00	n/a	36,424	80,578
4.00	1814.00	n/a	44,452	125,030
5.00	1815.00	n/a	51,805	176,835
6.00	1816.00	n/a	55,323	232,158
7.00	1817.00	n/a	58,948	291,106
8.00	1818.00	n/a	62,644	353,750
9.00	1819.00	n/a	66,446	420,181
10.00	1820.00	n/a	70,323	490,504
11.00	1821.00	n/a	74,260	564,764
12.00	1822.00	n/a	78,259	643,023
13.00	1823.00	n/a	67,969	710,992

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRar]
Rise (in)	= 24.00	3.00	3.00	Inactive
Span (in)	= 24.00	3.00	3.00	0.00
No. Barrels	= 1	1	1	1
Invert El. (ft)	= 1814.00	1814.00	1820.50	0.00
Length (ft)	= 95.63	0.00	30.00	0.00
Slope (%)	= 1.05	0.00	5.00	n/a
N-Value	= .011	.013	.011	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.57	Inactive	8.00	0.00
Crest El. (ft)	= 1821.00	1820.00	1822.00	0.00
Weir Coeff.	= 3.33	0.22	3.33	3.33
Weir Type	= 1	10-deg/	Rect	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 1.320 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 3,031 cuft
Drainage area	= 1.190 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 2.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

DA-C Secondary Basin
Hyd. No. 6 – 1 Year

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 1.390 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 51,174 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac

Flow into Secondary Basin
Hyd. No. 7 – 1 Year

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.221 cfs
Storm frequency	= 1 yrs	Time to peak	= 48.00 hrs
Time interval	= 1 min	Hyd. volume	= 20,175 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1815.54 ft
Reservoir name	= Proposed Secondary Basin	Max. Storage	= 30,99C cuft

Storage Indication method used.

Routing-SecondaryBasin
Hyd. No. 8 – 1 Year

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Ponc No. 3 - Proposed Secondary Basin

Pond Data

Pond storage is based on user-defined values.

Stage / Storage Tabe

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1810.00	n/a	0	0
1.00	1811.00	n/a	9368	9,368
2.00	1812.00	n/a	10555	19,923
3.00	1816.00	n/a	11836	31,759
4.00	1817.00	n/a	13227	44,986
5.00	1818.00	n/a	14703	59,689
6.00	1819.00	n/a	16348	76,037

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRar]
Rise (in)	= 24.0	2.25	3.00	0.00
Span (in)	= 24.0	2.25	3.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1811.00	1813.00	1816.50	0.00
Length (ft)	= 70.35	0.00	0.00	0.00
Slope(%)	= 1.42	0.00	0.00	n/a
N-Value	= .011	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Wer Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.57	10.00	Inactive	0.00
Crest El. (ft)	= 1817.00	1818.00	1816.00	0.00
Wea Coeff.	= 3.33	3.33	0.11	3.33
Wea Type	= 1	Rect	5 deg/v	---
Multi-Stage	= Yes	No	Yes	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 6.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Discharge

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: STORMWATER CALCULATIONS 4

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
15521 MIDLOTHIAN TNPK - MIDLOTHIAN, VA 23113
PH: (804) 379-2040 FAX: (804) 379-2324

PROJ. NO. 02206.16
DSN. BY: TRV
DWN. BY: TRV/SHA
CHK. BY: JEW/C-JW
QA'K. BY: C-JW
APP. BY: C-JW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. 18 of 21

Project:\02218208.05\Drawings\EVOH Cover System Design - SWP588\Construction Plans\XREF

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCADB Civil3DB 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	68.65	1	724	205,492	-----	-----	-----	DA-B Quarry
2	Reservoir	2.450	1	714	205,213	1	1763.48	180,583	Routing - Quarry Basin
3	SCS Runoff	23.89	1	727	80,674	-----	-----	-----	DA-A Primary Basin
4	Combine	26.34	1	727	285,887	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.471	1	2204	53,820	4	1818.25	370,124	Routing-Primary Basin
6	SCS Runoff	1.848	1	720	4,194	-----	-----	-----	DA-C Secondary Basin
7	Combine	1.959	1	720	58,015	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.236	1	2880	21,859	7	1816.33	36,149	Routing-SecondaryBasin

__Proposed SWMP V2.gpw | Return Period: 2 Year | Friday, 04 / 28 / 2023

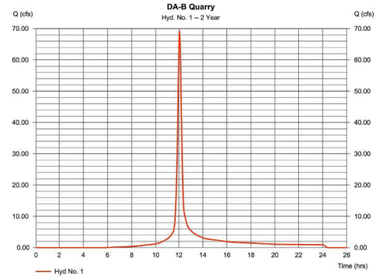
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2011 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 68.65 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 205,492 cuft
Drainage area	= 33.920 ac	Curve number	= 91.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.20 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

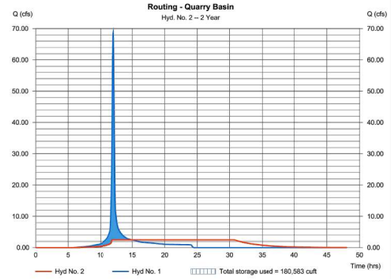
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.450 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.90 hrs
Time interval	= 1 min	Hyd. volume	= 205,213 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1763.48 ft
Reservoir name	= Quarry Basin	Max. Storage	= 180,583 cuft

Storage Indication method used. Wet pond routing start elevation = 1760.00 ft.



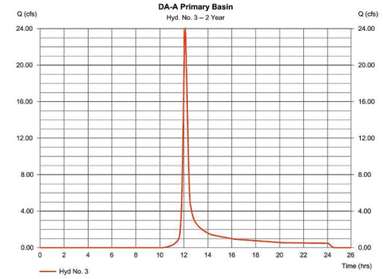
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 23.89 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 80,674 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



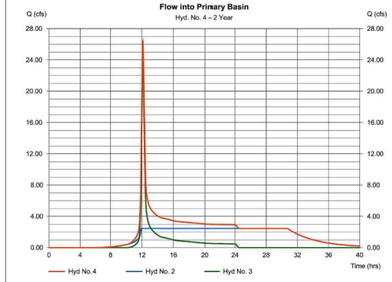
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 26.34 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 285,887 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac



Hydrograph Report

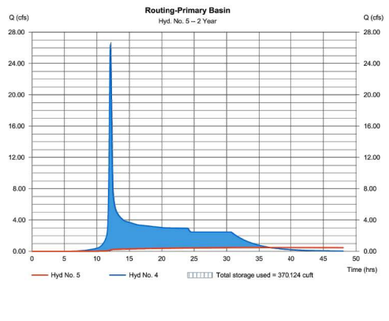
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.471 cfs
Storm frequency	= 2 yrs	Time to peak	= 36.73 hrs
Time interval	= 1 min	Hyd. volume	= 53,820 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1818.25 ft
Reservoir name	= Proposed Primary Basin	Max. Storage	= 370,124 cuft

Storage Indication method used. Wet pond routing start elevation = 1814.00 ft.



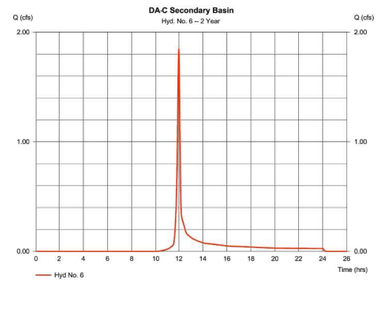
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2011 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 1.848 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 4,194 cuft
Drainage area	= 1.190 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 2.54 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



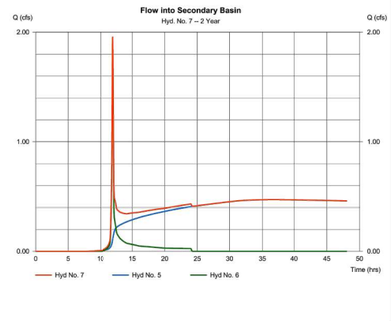
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 1.959 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 58,015 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac



Hydrograph Report

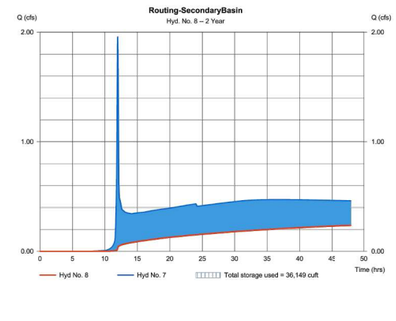
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.236 cfs
Storm frequency	= 2 yrs	Time to peak	= 48.00 hrs
Time interval	= 1 min	Hyd. volume	= 21,855 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1816.33 ft
Reservoir name	= Proposed Secondary Basin	Max. Storage	= 36,145 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	97.68	1	724	296,608	-----	-----	-----	DA-B Quarry
2	Reservoir	2.450	1	705	292,714	1	1765.01	251,477	Routing - Quarry Basin
3	SCS Runoff	39.71	1	726	131,267	-----	-----	-----	DA-A Primary Basin
4	Combine	42.16	1	726	423,982	2, 3	-----	-----	Flow into Primary Basin
5	Reservoir	0.562	1	2740	62,765	4	1819.96	487,488	Routing-Primary Basin
6	SCS Runoff	3.017	1	719	6,825	-----	-----	-----	DA-C Secondary Basin
7	Combine	3.187	1	720	69,590	5, 6	-----	-----	Flow into Secondary Basin
8	Reservoir	0.375	1	2880	26,089	7	1816.89	43,496	Routing-SecondaryBasin

__Proposed SWMP V2.gpw | Return Period: 10 Year | Friday, 04 / 28 / 2023

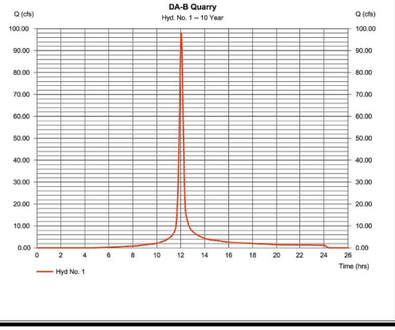
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 97.68 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 1 min	Hyd. volume	= 296,608 cuft
Drainage area	= 33.920 ac	Curve number	= 91.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.20 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

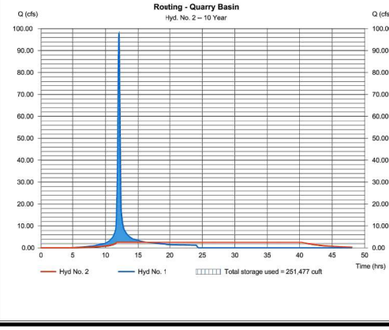
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2011 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.450 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.75 hrs
Time interval	= 1 min	Hyd. volume	= 292,714 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1765.01 ft
Reservoir name	= Quarry Basin	Max. Storage	= 251,477 cuft

Storage Indication method used. Wet pond routing start elevation = 1760.00 ft.



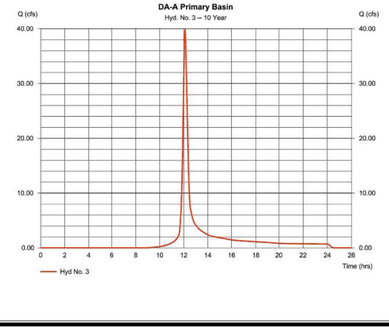
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 39.71 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 131,267 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



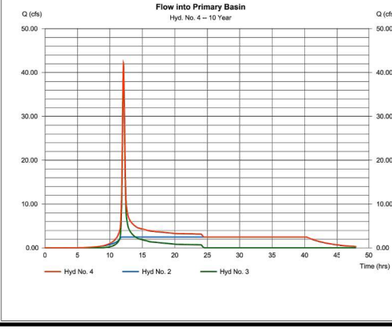
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 42.16 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 423,982 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac



Hydrograph Report

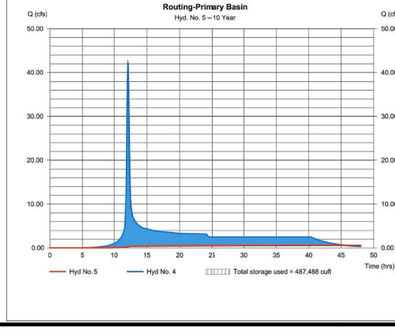
Hydraflow Hydrographs Extension for AutoCADB Civil 3DB 2018 by Autodesk, Inc. v2018.3 | Friday, 04 / 28 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.562 cfs
Storm frequency	= 10 yrs	Time to peak	= 45.67 hrs
Time interval	= 1 min	Hyd. volume	= 62,765 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1819.96 ft
Reservoir name	= Proposed Primary Basin	Max. Storage	= 487,488 cuft

Storage Indication method used. Wet pond routing start elevation = 1814.00 ft.



PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

DATE
REVISION
NO.

SHEET TITLE: STORMWATER CALCULATIONS 5

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

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PROJ. NO. 02218206.15
DWN: TFW/SHA
CHK: WF
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S/A: KW
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CADD FILE: 02218208.05
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DRAWING NO. 19 of 21

Project\02218208.05\Drawings\EVOH Cover System Design – SWP588\Construction Plans\XREF

Hydrograph Report
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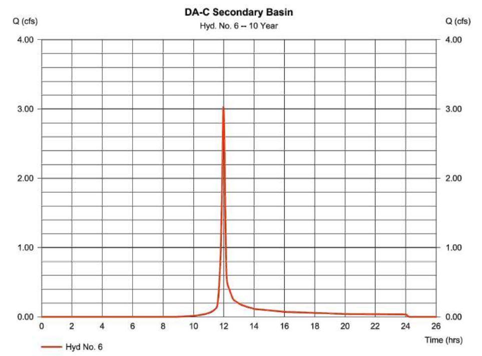
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 3.017 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 6,825 cuft
Drainage area	= 1.190 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 3.34 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report
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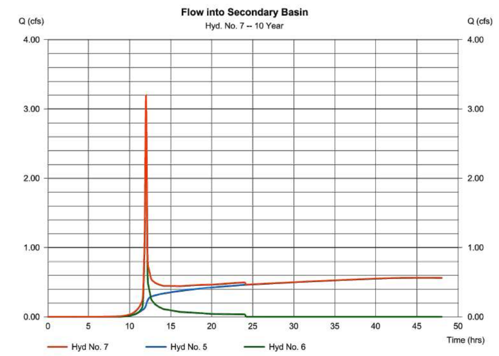
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 3.187 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 1 min	Hyd. volume	= 69,590 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac



Hydrograph Report
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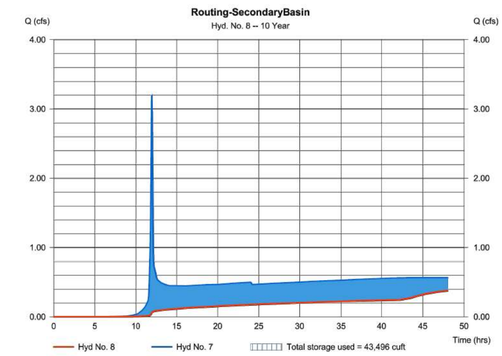
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 0.375 cfs
Storm frequency	= 10 yrs	Time to peak	= 48.00 hrs
Time interval	= 1 min	Hyd. volume	= 26,089 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1816.89 ft
Reservoir name	= Proposed Secondary Basin	Max. Storage	= 43,496 cuft

Storage Indication method used.



Hydrograph Summary Report
32

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	137.93	1	723	426,229	------	------	------	DA-B Quarry
2	Reservoir	2.450	1	671	342,092	1	1766.99	358,553	Routing - Quarry Basin
3	SCS Runoff	63.36	1	726	208,114	------	------	------	DA-A Primary Basin
4	Combine	65.81	1	726	550,206	2, 3	------	------	Flow into Primary Basin
5	Reservoir	2.439	1	2880	101,534	4	1821.11	573,719	Routing-Primary Basin
6	SCS Runoff	4.763	1	719	10,820	------	------	------	DA-C Secondary Basin
7	Combine	4.999	1	719	112,354	5, 6	------	------	Flow into Secondary Basin
8	Reservoir	2.436	1	2880	65,474	7	1817.13	46,880	Routing-SecondaryBasin

STORMWATER ANALYSIS SUMMARY
FOR 10-YEAR STORM EVENT

__Proposed SWMP V2.gpw — Return Period: 100 Year — Friday, 04 / 28 / 2023

Hydrograph 100 YEAR STORM EVENT HYDROGRAPHS:
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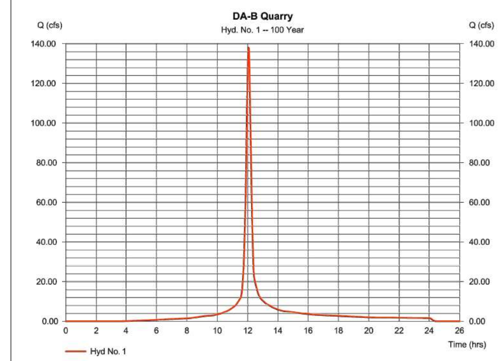
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 137.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 426,229 cuft
Drainage area	= 33.920 ac	Curve number	= 91.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.20 min
Total precip.	= 4.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report
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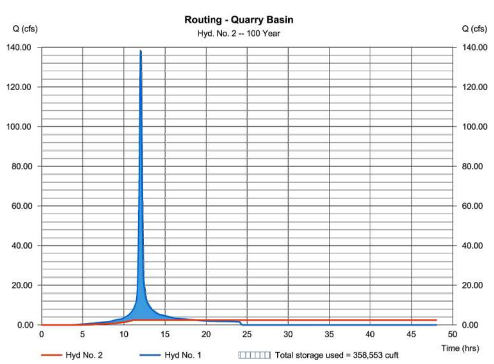
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 2

Routing - Quarry Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.450 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.18 hrs
Time interval	= 1 min	Hyd. volume	= 342,092 cuft
Inflow hyd. No.	= 1 - DA-B Quarry	Max. Elevation	= 1766.99 ft
Reservoir name	= Quarry Basin	Max. Storage	= 358,553 cuft

Storage Indication method used. Wet pond routing start elevation = 1760.00 ft.



Hydrograph Report
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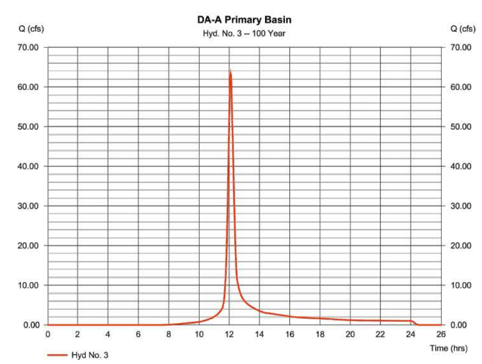
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 3

DA-A Primary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 63.36 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 208,114 cuft
Drainage area	= 22.670 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.00 min
Total precip.	= 4.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report
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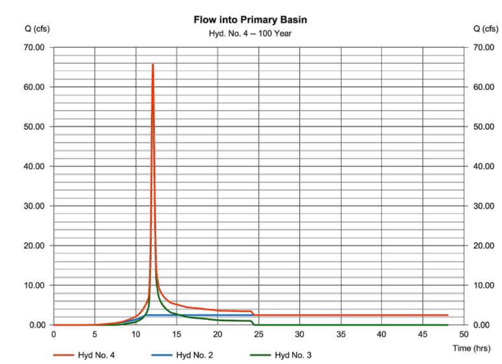
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 4

Flow into Primary Basin

Hydrograph type	= Combine	Peak discharge	= 65.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 1 min	Hyd. volume	= 550,206 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 22.670 ac



Hydrograph Report
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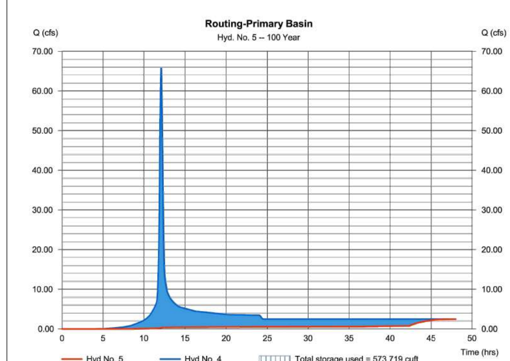
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 5

Routing-Primary Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.439 cfs
Storm frequency	= 100 yrs	Time to peak	= 48.00 hrs
Time interval	= 1 min	Hyd. volume	= 101,534 cuft
Inflow hyd. No.	= 4 - Flow into Primary Basin	Max. Elevation	= 1821.11 ft
Reservoir name	= Proposed Primary Basin	Max. Storage	= 573,719 cuft

Storage Indication method used. Wet pond routing start elevation = 1814.00 ft.



Hydrograph Report
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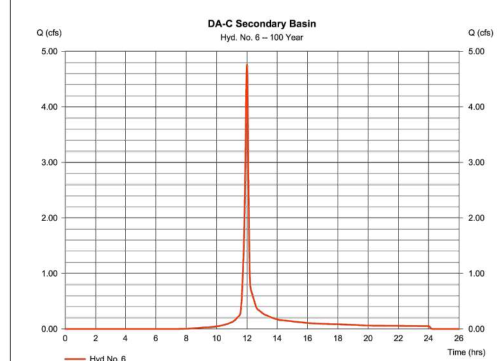
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 6

DA-C Secondary Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 4.763 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 10,820 cuft
Drainage area	= 1.190 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 9.90 min
Total precip.	= 4.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report
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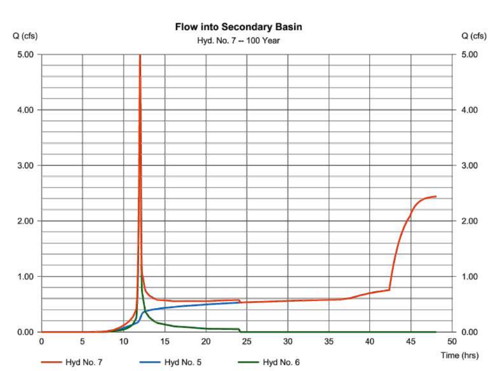
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 7

Flow into Secondary Basin

Hydrograph type	= Combine	Peak discharge	= 4.999 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 112,354 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 1.190 ac



Hydrograph Report
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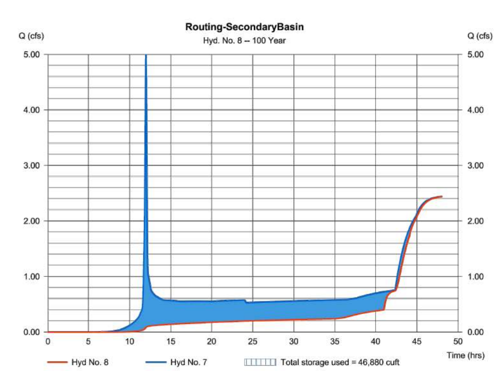
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Hyd. No. 8

Routing-SecondaryBasin

Hydrograph type	= Reservoir	Peak discharge	= 2.436 cfs
Storm frequency	= 100 yrs	Time to peak	= 48.00 hrs
Time interval	= 1 min	Hyd. volume	= 65,474 cuft
Inflow hyd. No.	= 7 - Flow into Secondary Basin	Max. Elevation	= 1817.13 ft
Reservoir name	= Proposed Secondary Basin	Max. Storage	= 46,880 cuft

Storage Indication method used.



Hydraflow Table of Contents

__Proposed SWMP V2.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk, Inc. v2018.3 — Friday, 04 / 28 / 2023

Contents continued...

__Proposed SWMP V2.gpw

END OF POST-EVOH COVER SYSTEM
INSTALLATION 10-YEAR STORMWATER ANALYSIS

PERMIT DRAWINGS
NOT FOR CONSTRUCTION
DATE: 04/28/2023

COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE
STORMWATER CALCULATIONS 6

PROJECT TITLE
SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
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PROJ. NO. 02218206.16	DWN. BY: TRW/SHA	Q/A RVW BY:
DSN. BY: TRW/CJW	CHK. BY: CJW	APP. BY: CJW

CADD FILE: 02218208.05
DATE: 4/28/23
SCALE: AS SHOWN
DRAWING NO. **20** of **21**

THE FOLLOWING HYDROGRAPHS AND FIGURES ARE PRESENTED AS SUPPORTING INFORMATION:

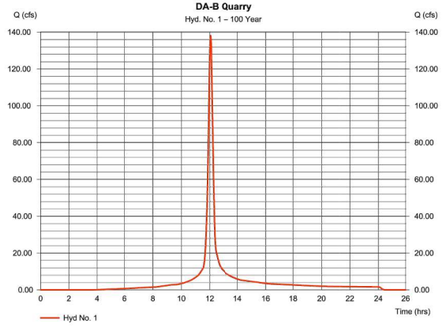
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2018 by Autodesk Inc. v2018.3 — Thursday 04 / 27 / 2023

Hyd. No. 1

DA-B Quarry

Hydrograph type	= SCS Runoff	Peak discharge	= 137.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 426,229 cuft
Drainage area	= 33.920 ac	Curve number	= 91.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.20 min
Total precip.	= 4.45 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



100-YEAR RUNOFF ESTIMATE INTO THE QUARRY BASIN, USED FOR BASIN SIZING

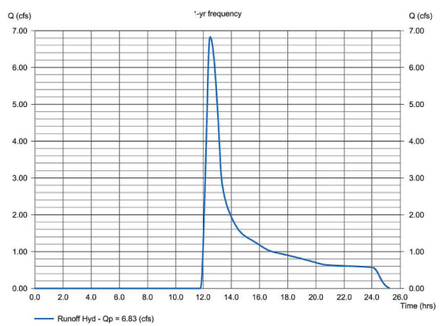
Hydrology Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. — Thursday, Apr 27 2023

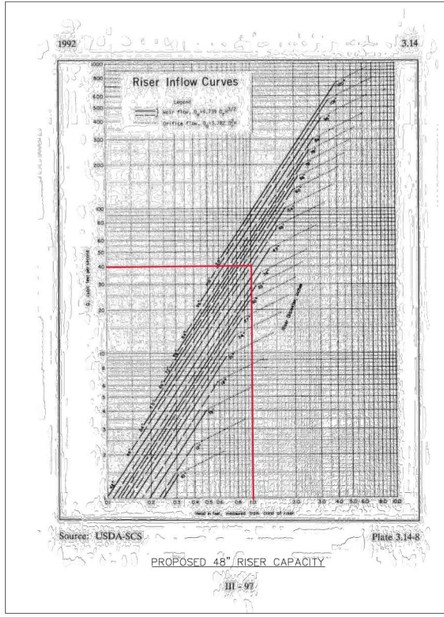
Forested Site Condition - Runoff Hydrograph

Hydrograph type	= SCS	Peak discharge (cfs)	= 6.827
Storm frequency (yrs)	= 1	Time interval (min)	= 1
Drainage area (ac)	= 57.780	Curve number (CN)	= 70
Basin Slope (%)	= n/a	Hydraulic length (ft)	= n/a
Tc method	= User	Time of conc. (min)	= 51
Total precip. (in)	= 2.15	Storm Distribution	= Type II
Storm duration (hrs)	= 24	Shape factor	= 484

Hydrograph Volume = 61,097 (cuft); 1.449 (acft)



FORESTED CONDITION HYDROGRAPH



PROPOSED 48" RISER CAPACITY

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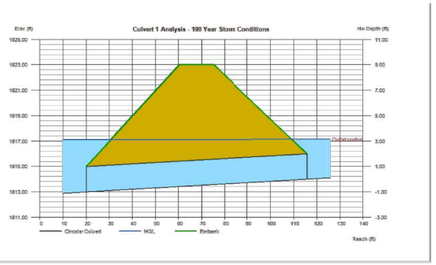
Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. — Friday, Apr 28 2023

Culvert 1 Analysis - 100 Year Storm Conditions

Invert Elev Dn (ft)	= 1813.00	**Calculations**	
Pipe Length (ft)	= 95.63	Qmin (cfs)	= 2.44
Slope (%)	= 1.05	Qmax (cfs)	= 2.44
Invert Elev Up (ft)	= 1814.00	Tailwater Elev (ft)	= 1817.13
Rise (in)	= 24.0		
Shape	= Circular	**Highlighted**	
Span (in)	= 24.0	Qtotal (cfs)	= 2.44
No. Barrels	= 1	Qpipe (cfs)	= 2.44
n-Value	= 0.012	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Concrete	Veloc Dn (ft/s)	= 0.78
Culvert Entrance	= Square edge w/headwall (C)	Veloc Up (ft/s)	= 0.76
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5	HGL Dn (ft)	= 1817.13
		HGL Up (ft)	= 1817.14
Embankment		Hw Elev (ft)	= 1817.15
Top Elevation (ft)	= 1823.00	Hw/D (ft)	= 1.58
Top Width (ft)	= 15.00	Flow Regime	= Outlet Control
Crest Width (ft)	= 100.00		

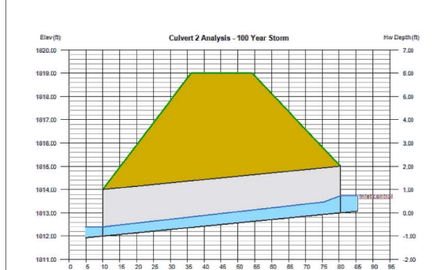


Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. — Friday Apr 28 2023

Culvert 2 Analysis - 100 Year Storm

Invert Elev Dn (ft)	= 1812.00	**Calculations**	
Pipe Length (ft)	= 70.36	Qmin (cfs)	= 2.44
Slope (%)	= 1.42	Qmax (cfs)	= 2.44
Invert Elev Up (ft)	= 1813.00	Tailwater Elev (ft)	= 0.00
Rise (in)	= 24.0		
Shape	= Circular	**Highlighted**	
Span (in)	= 24.0	Qtotal (cfs)	= 2.44
No. Barrels	= 1	Qpipe (cfs)	= 2.44
n-Value	= 0.012	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Concrete	Veloc Dn (ft/s)	= 5.57
Culvert Entrance	= Square edge w/headwall (C)	Veloc Up (ft/s)	= 3.54
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5	HGL Dn (ft)	= 1812.39
		HGL Up (ft)	= 1813.54
Embankment		Hw Elev (ft)	= 1813.73
Top Elevation (ft)	= 1819.00	Hw/D (ft)	= 0.36
Top Width (ft)	= 18.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 50.00		

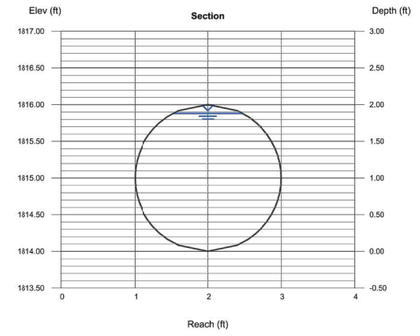


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. — Friday, Apr 28 2023

Culvert 1 - Open Channel Capacity

Circular		**Highlighted**	
Diameter (ft)	= 2.00	Depth (ft)	= 1.88
		Q (cfs)	= 27.01
		Area (sqft)	= 3.07
Invert Elev (ft)	= 1814.00	Velocity (ft/s)	= 8.81
Slope (%)	= 1.05	Wetted Perim (ft)	= 5.30
N-Value	= 0.012	Crit Depth, Yc (ft)	= 1.81
		Top Width (ft)	= 0.94
Calculations		EGL (ft)	= 3.09
Compute by:	Q vs Depth		
No. Increments	= 50		

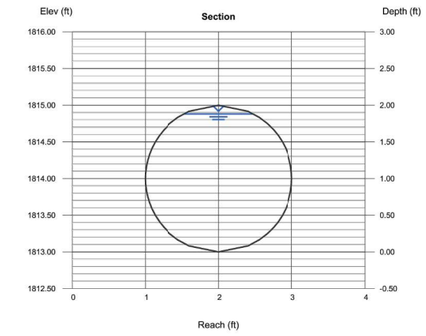


Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. — Friday, Apr 28 2023

Culvert 2 - Open Channel Capacity

Circular		**Highlighted**	
Diameter (ft)	= 2.00	Depth (ft)	= 1.88
		Q (cfs)	= 31.41
		Area (sqft)	= 3.07
Invert Elev (ft)	= 1813.00	Velocity (ft/s)	= 10.24
Slope (%)	= 1.42	Wetted Perim (ft)	= 5.30
N-Value	= 0.012	Crit Depth, Yc (ft)	= 1.89
		Top Width (ft)	= 0.94
Calculations		EGL (ft)	= 3.51
Compute by:	Q vs Depth		
No. Increments	= 50		



PERMIT DRAWINGS
NOT FOR CONSTRUCTION
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COMMONWEALTH OF VIRGINIA
CHARLES WARREN
#053809
4/28/23
PROFESSIONAL ENGINEER

NO.	REVISION	DATE

SHEET TITLE: STORMWATER CALCULATIONS 7

PROJECT TITLE: SWP#588 INTERIM EVOH COVER SYSTEM STORMWATER MANAGEMENT PLAN

CLIENT: CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
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DRAWING NO. 21 of 21