

January Monthly Compliance Report

Solid Waste Permit #498
Bristol Integrated Solid Waste Management Facility
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SCS ENGINEERS

02218208.05-18 | February 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 in Appendix B of the Consent Decree between the City and VDEQ. This report covers the Solid Waste Permit (SWP) #498 Landfill during the month of January.

1.0 LEACHATE PUMP STATION

The City is in the process of repairing the pumps and addressing other concerns related to the leachate pump station. The steps taken by the City are outlined in the following sections.

1.1 FLOATING MATERIAL

On July 6, 2022 SCS received the results of samples taken from the Solid Waste Permit 498 Wet Well on May 25, 2022. Based on SCS' review of the data, the data indicated the liquid is non-hazardous. SCS submitted a letter to the City on July 7, 2022 with SCS' review of the data and the underlying lab analysis. A copy of this letter was included in the October Monthly Compliance Report for the SWP #498 Landfill

As described in the October Monthly Compliance Report for the SWP #498 Landfill, the floating material in the wet well was resolved.

1.2 PUMP REPLACEMENT

The City contracted with Buchanan Pump Service (Buchanan) to complete repairs to the pumps and infrastructure at the 498 pump station. Buchanan completed repairs to one pump (in addition to the pump currently operating at the pump station. Buchanan delivered a third pump to the site, however the electrical requirements of the pump exceeded what could be supported with existing infrastructure. Buchanan is now in the process of procuring another pump that will operate utilizing the existing electrical infrastructure.

1.3 ALARM/NOTIFICATION SYSTEM

The City's Information Technology (IT) department has inspected, diagnosed, and repaired the existing pump station alarm/notification system. The alarm system is now functional and sending alerts to landfill staff via text message.

2.0 COVER INTEGRITY AND EXPOSED WASTES

The sections below describe steps taken by the City to address cover integrity and exposed wastes.

2.1 INTERMEDIATE COVER

The City continued hauling soil to the landfill to install an intermediate cover across the entire landfill. The City has completed intermediate cover installation on large portions of the landfill. City staff estimate that intermediate cover has been placed on more than 85 percent of the landfill area. The slopes of the landfill continue to present challenging conditions for the City. Inclement weather

has continued to prevent the City from safely placing cover on the slopes. In addition, placement of intermediate cover on the slopes has been slowed by the presence of thick vegetation that must be removed prior to placement. The City intends to complete soil placement on the Solid Waste Permit #498 landfill during the month of February if weather permits.

2.2 SURFACE EMISSIONS MONITORING

On December 19, 2022, SCS performed surface emissions monitoring (SEM) on the landfill. During the monitoring event no exceedances were detected on the serpentine route or at pipe penetrations. Details of the SEM were included in the December Monthly Compliance Report for the SWP #498 Landfill.

SCS understands that the Solid Waste Permit #498 Landfill is subject to quarterly SEM and therefore SEM was not required to be performed this month. The first quarter SEM for the SWP #498 landfill will occur in February or March.

3.0 GAS COLLECTION

The City has taken steps to optimize gas collection and minimize air intrusion as outlined in the sections below.

3.1 SYSTEM OPTIMIZATION

The City and its contractor completed repairs to the SWP #498 LFG header and restored vacuum to EW-20 and EW-21. These wells were monitored and adjusted by SCS Field Services (SCS-FS) on January 25, 2023. SCS-FS also replaced the orifice plate on EW-19 to improve control of the flow rate from that well.

3.2 OPTIMIZATION PLAN AND REPORTING

3.2.1 Optimization Plan

On December 1, 2022, on behalf of the City, SCS submitted a plan that provides for means and methods for optimizing the performance of the existing gas extraction system in the Solid Waste Permit #498 landfill. Additional details about that plan were included along with a copy of the plan in the November Monthly Compliance Report for the SWP #498 Landfill.

3.2.2 Optimization Actions

During the month of January actions were taken to implement the submitted Optimization Plan. The following actions were taken at the SWP #498 Landfill in accordance with the plan:

- As outlined in Section 3.1 the existing landfill gas collection and control system (LFGCCS) was repaired
- A liquid level measurement event was performed.
- A concept LFGCCS expansion design was developed in conjunction with the closure plans developed for the landfill as described in Section 4.0

SCS prepared a report that detailed the results of each of these activities and recommendations for further optimization of the well field. The report was submitted to VDEQ on February 1, 2023 and a copy is included in Appendix B.

3.2.3 Monthly Wellhead Monitoring

On January 6, 2023 and January 25, 2023, SCS-FS visited the landfill and performed monitoring of the landfill gas wells. The results of the monthly monitoring were submitted to VDEQ on February 1, 2023 and are included in Appendix A.

4.0 GRADING, GEOMETRIC CONFIGURATION AND GAS EXPANSION

The City has taken the steps outlined in the sections below to grade the surface of the SWP #498 Landfill to an appropriate geometric configuration to allow for final closure.

4.1 CLOSURE AND LFGCCS PLAN

SCS prepared plans on the City's behalf for closing and installing final cover on the Solid Waste Permit #498. The plans also include a comprehensive gas collection and control system and comprehensive stormwater management plan. The design addressed the gas collection infrastructure, grading work to be completed prior to installation, estimates of stormwater volumes, stormwater calculations, and construction materials to be used.

The drawings (16 sheets) titled "SWP #498 Final Closure System Permit Modification Design Plans" were submitted to VDEQ on January 31, 2023. Supporting documentation was also included for the purposes of the modification to the facility's Solid Waste Permit. The drawings included the layout and details of the proposed final cover installation and are included in Appendix C.

4.2 FINAL COVER AND LFGCCS INSTALLATION

The drawings described in Section 4.1 will be used as the basis of bid drawings used for procurement of a contractor to complete final cover and LFGCCS installation. The drawings used for the purposes of bidding, procurement and construction of the final closure, gas collection system, and stormwater controls will generally conform to the layout and details in the attached drawings. In addition to the drawings SCS will prepare a detailed project manual including technical specifications. SCS will also continue to work with VDEQ to complete the permit modification incorporating the revised closure design into the facility's solid waste permit.

5.0 LEACHATE SEEPS AND PONDING

The sections below outline the steps taken by the City to address leachate seeps and ponding.

5.1 PERIODIC INSPECTIONS

The City initiated a process of tracking precipitation events that have the potential to create ponding and leachate seeps. Inspections are made following events that exceed 0.25 inches as recorded by the on-site weather station. For the purposes of these inspections, if precipitation is continuous for at

least 8 hours during a storm that lasts multiple days, that storm will be considered a single event requiring a single inspection. After each such event, City personnel will inspect the landfill for ponding and leachate seeps. Locations of ponding and seeps will be marked in the field.

The City performed inspections as appropriate during the month of January. Section 6 describes the self-inspection logs that were used to record observations during the inspections. Inspection forms will be scanned and stored on the landfill computer server in a folder designated for the purpose of storing environmental records. Completed inspection forms are available for VDEQ to review upon request.

5.2 COMPLETION OF WORK ACTIVITIES

During the month of January, the City began the process of addressing the conditions, identified in the inspections described in Section 5.1, as requiring remediation. These actions are performed as part of intermediate cover placement and grading activities. The City will also address any conditions that require remedial actions identified in future inspections.

6.0 STORMWATER DRAINAGE AND MANAGEMENT

The sections below outline the steps by the City to improve stormwater management and drainage.

6.1 STORMWATER MANAGEMENT PLAN

As noted in Section 4.1 the plans that SCS prepared for Closure of SWP #498 included measures to address stormwater management on the landfill. The proposed grading on the landfill will promote sheet flow across the landfill surface. A series of diversion berms will direct stormwater to a central channel or the facility's perimeter channels. The central channel will discharge into a downchute pipe that discharges into a perimeter channels. The existing stormwater basin will be utilized for stormwater storage. The drawings and stormwater management calculations are included in Appendix C.

6.2 CLEANOUT OF STORMWATER DIVERSION CHANNEL/TRENCH BERM

The City has begun the process of cleaning out the stormwater diversion channel/trench berm. The efforts will continue during the month of February and the City will take steps to stabilize the channel.

7.0 SELF-INSPECTION AND RECORDKEEPING

SCS prepared two self-inspection log templates, the Stormwater Management Inspection Log and the Daily Landfill Inspection Log. SCS provided updated self-inspection logs for SWP 498 to the City and VDEQ and completed self-inspection training with facility staff on November 30, 2022.

7.1 UPDATED SELF-INSPECTION LOGS

Copies of updated self-inspection log templates were submitted to VDEQ on November 30, 2022. Details about these log and the intended inspection process were detailed in the November Monthly

Compliance Report for the SWP #498 Landfill. Copies of the log templates are also included in that report.

7.2 FACILITY TRAINING

On November 30, 2022, SCS personnel, Ryan Mahon, met members of the Facility staff to complete self-inspection training. A summary of this training and a record of attendees was included in the November Monthly Compliance Report for the SWP #498 Landfill.

7.3 SELF-INSPECTION AND RECORDKEEPING ASSIGNMENTS

Completed inspections will be held on-site at the facility office available for review by VDEQ upon request. Currently, self-inspections are being completed by Jonathan Hayes. Dave Cochran will serve as the primary alternate for inspections with the other members of the staff trained on inspection procedures filling in as needed. Inspection forms will be scanned and stored on the landfill computer server in a folder designated for the purpose of storing environmental records.

Appendix A

January Monthly Wellhead Monitoring Data

February 1, 2023
File No. 07220028.00 Task 6

MEMORANDUM

TO: Jonathan Chapman, VDEQ – SWRO

FROM: Mike Gibbons, SCS Field Services

SUBJECT: Monthly Landfill Gas System Wellhead Monitoring Data
for January, 2023 Landfill Permit Areas 221 and 498
Bristol Integrated Solid Waste Management Facility, Bristol, Virginia

SCS Field Services (SCS) is submitting this data on behalf of the City of Bristol per DEQ request for monthly landfill gas (LFG) wellhead monitoring data for Solid Waste Permit Areas #221 and #498 for the month of January, 2023.

Area 221

There are currently 15 vertical extraction wells in the SWP #221 Landfill Area (Well Nos. 1 – 15). In waste disposal units where the age of the buried wastes is greater than 40 years, as is the case at SWP #221 landfill, the rate and quantity of decomposition gas production declines significantly compared to the rate and quantity of LFG generated in more recently buried wastes. There is no historical evidence of elevated temperatures in SWP #221. Also, the #221 Landfill Area is not believed to be a significant source of fugitive LFG emissions or odors.

Adjustments are made during wellhead monitoring to optimize gas quality and applied vacuum on the Area 221 wells. All Area 221 are under vacuum. During the January monitoring event, slight valve adjustments were made at wells GW-03 and -08, wellhead. The average gas composition in the Area 221 wells is shown in Table 1. Methane and carbon dioxide concentrations decreased over the previous month while oxygen concentration increased since the previous month, this is likely attributed to the corresponding increase in applied vacuum. SCS performed an evaluation of the wellheads in Area 221 by disassembling the wellheads and inspecting the components SCS cleaned the Pitot tubes as needed prior to reassembly. The PVC wellheads are weathered and brittle and prone to small air leaks. Pitot tubes on GW-03, -06, and -09, needed for flow rate measurements, have fallen off. SCS recommends replacing some of these wellheads with QED Precision wellheads. Details of the inspection results and recommendations are summarized in Table 2. SCS is developing a repair parts list and working with the City to make improvements to the wellheads.



Table 1. Monthly Average Wellhead LFG Composition – Area 221 Wells

| Month | Average CH ₄ (% Vol) | Average CO ₂ (% Vol) | Average O ₂ (% Vol) | Average Pressure (inches w.c.) |
|--------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| October '22 | 40.0 | 29.2 | 6.4 | -14.9 |
| November '22 | 47.4 | 33.7 | 3.3 | -11.9 |
| December '22 | 58.7 | 39.6 | 0.3 | -2.7 |
| January '23 | 39.8 | 27.0 | 6.0 | -20.6 |

Table 2. Bristol Landfill Area 221 Wellhead Assessment 1/18/2023

| Well# | Fernco Condition | Flex Hose Condition | Valve Condition | Pitot Tube Condition | Comments | Recommendations |
|-------|------------------|---------------------|-----------------|----------------------|--|---|
| GW-1 | OK | Good | OK | OK | clogged, flushed out; temp port broken | Replace port |
| GW-2 | OK | OK | Poor | OK | Valve is bad and will not close | Replace wellhead |
| GW-3 | OK | Poor | OK | Missing | | Replace wellhead |
| GW-4 | OK | Poor | OK | OK | flushed out debris | Replace flex hose |
| GW-5 | OK | OK | OK | Poor | flushed out and tube is warped | Replace wellhead |
| GW-6 | OK | OK | Poor | Missing | Valve is broken, No pitot tube | Replace wellhead |
| GW-7 | OK | OK | OK | OK | flushed out debris | |
| GW-8 | OK | Poor | OK | N/A | Unable to open; screws are stripped | Replace wellhead |
| GW-9 | OK | OK | Poor | Missing | | Replace wellhead |
| GW-10 | OK | OK | OK | OK | flushed out debris | |
| GW-11 | OK | OK | OK | OK | flushed out debris | |
| GW-12 | Poor | Poor | OK | OK | flushed out debris | Replace 6" lateral fernco and flex hose |
| GW-13 | OK | Poor | Poor | OK | flushed out debris, Valve broken | Replace wellhead |
| GW-14 | OK | Poor | OK | OK | flushed out debris | Replace flex hose |
| GW-15 | OK | Poor | Poor | OK | flushed out debris, Valve broken | Replace wellhead |
| GW-16 | OK | Poor | OK | Good | | Replace flex hose |
| GW-17 | OK | OK | OK | OK | flushed out debris | |
| GW-18 | OK | OK | OK | Good | | |

KEY:

- Good Good condition
- OK Not leaking, not new
- Poor Bad, Broken, Leaking need to be replaced
- Missing Part is missing
- N/A Unable to check

Area 498

The SWP #498 Landfill is approximately 12.0 acres and is located south of the SWP #221 Landfill and east of the SWP #588 Landfill. As of September 2022, mining in Permit #498 has concluded. The majority of the SWP #498 Landfill does not have an active LFG collection system, due to mining operations which have occurred since waste placement was completed. The current system includes four vertical wells (GW-19, GW-20, GW-21, and GW-22) and a condensate trap (CT-1) at the low point. Field reconnaissance efforts in September/October 2022 identified that the header pipe serving the four wells had been severed, blocked, or otherwise compromised. Vacuum was restored to GW-19 in November 2022. As of January 18, 2023, the blocked header piping was replaced, restoring vacuum to wells GW-20 and -21. These wells were monitored and adjusted on January 25, 2023. The buried wastes in SWP #498 Landfill Area is greater than 25 years old, thus, the rate and quantity of decomposition gas production has declined significantly compared to the rate and quantity of LFG generated in more recently buried wastes. Accordingly, the methane concentration tends to be substantially lower, the oxygen and nitrogen concentrations tend to be substantially greater, and the quantity of LFG collected declines substantially compared to the years immediately after waste placement. Furthermore, much of the organic wastes in the upper layer have likely decomposed aerobically (i.e., were composted) because of the mining operations. There is no historical evidence of elevated temperatures in SWP #498; however, the methane-to-carbon dioxide ratio measured in the wellheads can sometimes be less than 1 due to the fact that the wastes are becoming biochemically stabilized (meaning organic wastes have been more fully decomposed) and the rate of methanogenesis has declined. Also, the #498 Landfill Area is not believed to be a significant source of odors.

To better control flow rate from GW-19, SCS replaced the 1.25-inch orifice plate in the wellhead with a 1.0-inch orifice. Extraction wells GW-16, -17, -18, and -23 are perimeter migration control wells affiliated with Permit #498. These wells were monitored and adjusted as needed to control migration.

Bristol Virginia Landfill - Permit 221 and 498 Well Data - 01/01/2023 to 01/31/2023

| Point Name | Record Date | CH4 (% by vol) | CO2 (% by vol) | O2 (% by vol) | Bal Gas (% by vol) | Init Static Pressure ("H2O) | Adj Static Pressure ("H2O) | Temp (F) | System Pressure ("H2O) | Comments |
|--|-----------------|-------------------|-------------------|------------------|-----------------------|-----------------------------------|----------------------------------|-------------|------------------------------|-----------------------|
| 01 | 1/5/2023 12:28 | 60.3 | 39.7 | 0.0 | 0.0 | -24.3 | -24.2 | 67.6 | -24.2 | |
| 02 | 1/5/2023 12:24 | 27.4 | 17.8 | 11.5 | 43.3 | -24.2 | -24.4 | 66.3 | -24.2 | |
| 03 | 1/5/2023 12:16 | 13.0 | 9.0 | 15.7 | 62.3 | -17.5 | -16.9 | 55.9 | -24.1 | Closed Valve > 1 Turn |
| 04 | 1/5/2023 12:11 | 48.2 | 35.3 | 3.1 | 13.4 | -15.1 | -15.0 | 64.8 | -24.3 | |
| 05 | 1/5/2023 13:09 | 58.7 | 41.3 | 0.0 | 0.0 | -24.3 | -24.3 | 65.5 | -24.2 | |
| 06 | 1/5/2023 13:05 | 14.4 | 8.6 | 16.0 | 61.0 | -23.4 | -23.2 | 69.0 | -24.2 | |
| 07 | 1/5/2023 13:02 | 59.0 | 39.9 | 0.0 | 1.1 | -14.0 | -14.1 | 65.9 | -24.5 | |
| 08 | 1/5/2023 12:58 | 1.9 | 1.6 | 20.3 | 76.2 | -0.9 | -0.5 | 67.1 | -24.2 | Closed Valve > 1 Turn |
| 09 | 1/5/2023 12:50 | 56.6 | 38.3 | 1.1 | 4.0 | -24.2 | -24.1 | 65.4 | -24.2 | |
| 10 | 1/5/2023 12:46 | 58.1 | 41.9 | 0.0 | 0.0 | -23.1 | -24.8 | 62.1 | -24.2 | |
| 11 | 1/5/2023 12:36 | 29.5 | 20.2 | 10.7 | 39.6 | -24.3 | -24.4 | 60.9 | -24.1 | |
| 12 | 1/5/2023 12:32 | 19.2 | 13.0 | 14.6 | 53.2 | -24.1 | -24.1 | 58.0 | -24.1 | |
| 13 | 1/5/2023 12:19 | 59.9 | 40.1 | 0.1 | 0.0 | -24.2 | -24.2 | 56.9 | -24.2 | |
| 14 | 1/5/2023 12:55 | 31.7 | 19.1 | 11.1 | 38.1 | -20.6 | -20.6 | 65.8 | -24.2 | |
| 15 | 1/5/2023 12:41 | 59.5 | 39.0 | 0.0 | 1.5 | -24.2 | -24.2 | 56.9 | -24.1 | |
| Average Permit 221 | | 39.8 | 27.0 | 6.9 | 26.2 | -20.6 | | | | |
| | | | | | | | | | | |
| 16 | 1/5/2023 13:14 | 32.4 | 35.0 | 0.0 | 32.6 | -22.8 | -22.8 | 56.3 | -24.2 | |
| 17 | 1/5/2023 13:16 | 56.3 | 38.1 | 0.0 | 5.6 | -24.5 | -24.5 | 63.8 | -24.6 | |
| 18 | 1/5/2023 13:26 | 47.9 | 38.0 | 0.0 | 14.1 | -17.2 | -17.1 | 66.7 | -24.2 | |
| 23 | 1/5/2023 13:20 | 0.1 | 0.6 | 20.6 | 78.7 | -0.1 | -0.1 | 57.9 | -24.4 | |
| Average Perimeter Migration Control Wells | | 34.2 | 27.9 | 5.2 | 32.8 | -16.2 | | | | |
| | | | | | | | | | | |
| 19 | 1/6/2023 08:13 | 3.3 | 14.1 | 3.7 | 78.9 | -17.8 | -17.8 | 41.3 | -24.1 | |
| 20 | 1/25/2023 11:38 | 8.6 | 10.6 | 6.0 | 74.8 | -0.1 | -0.4 | 68.4 | | Closed Valve > 1 Turn |
| 21 | 1/25/2023 11:41 | 7.0 | 5.7 | 15.9 | 71.4 | -1.4 | -1.4 | 63.2 | | Closed Valve > 1 Turn |
| Average Permit 498 | | 6.3 | 10.1 | 8.5 | 75.0 | -6.4 | | | | |

Appendix B

Landfill Gas Collection and Control System Optimization Results

Landfill Gas Collection and Control System Optimization Results Bristol Integrated Solid Waste Management Facility Solid Waste Permits #221 and 498



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02218208.05 | February 1, 2023

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| D | Zone of Influence Maps |
| E | Proposed Conceptual LFG Expansion Plan |

1.0 INTRODUCTION

Per a request by the Virginia Department of Environmental Quality (VDEQ or Department), SCS prepared a LFG Collection and Control System Optimization Plan (Plan) to assess and improve the LFG collection in the Solid Waste Permit (SWP) #221 and 498 landfills at the Bristol Integrated Solid Waste Management Facility (ISWMF) and mitigate potential for subsurface LFG migration. The report was submitted to VDEQ on behalf of the City of Bristol, Virginia (City) on December 1, 2022. The Optimization Plan was divided into the following tasks for Each Landfill:

- Review and Evaluation of Existing LFG System Data
- LFG System Design and Construction Considerations
- LFG System Performance Field Activities

The results of these efforts are presented in the following two sections, with a summary and recommendations in Section 4.

2.0 PERMIT #221 LANDFILL

2.1 DEDICATED WELLFIELD BALANCING AND TUNING EVENT

A dedicated LFG wellfield balancing and tuning event by an experienced field technician to optimize the performance at each individual wellhead for the quality and quantity of LFG removal was performed by SCS staff on January 16, 2023. Methane content, carbon dioxide, oxygen, balance gas (assumed to be nitrogen), pressure, and temperature were measured at each of the wells GW-1 through GW-15. The full results are presented in Appendix A, and summarized as follows:

- All wells appear to be receiving appropriate system vacuum (~24 in. H₂O)
- Eight of the 15 wells recorded oxygen concentrations greater than 5 percent, indicating excess air intrusion. Vacuum adjustments have been/will be made at these wells to reduce vacuum with the intension to reduce air intrusion.
- Only one of the 15 wells recorded methane concentrations greater than 58 percent, indicating need for additional gas extraction. Vacuum adjustments have been/will be made at this well to increase vacuum.

In addition to the dedicated tuning event, SCS-FS performed reconnaissance efforts on the wellfield to identify operations and maintenance issues with the existing wellfield infrastructure. SCS-FS flushed out debris and made observations on several broken valves, flex hoses, and other parts. In addition, it is recommended that the Facility consider replacing several wellheads with new 1" wellheads to enable fine tuning adjustments, and enable the landfill operator to measure flow rates to assist with optimization activities. SCS-FS and the City are coordinating on the replacement and repair of the wellheads.

2.2 LIQUID LEVEL MEASUREMENT AND DOWN-WELL CAMERA EVENT

SCS staff inspected and measured total depth and liquid level measurements with a camera on January 24 and 25, 2023 to investigate the extent of liquid blockage and/or physical obstructions in

existing wells. Obstructions were encountered in four wells. The full results are presented in Appendix B, and summarized as follows:

- Eleven of the 15 wells had less than 10 feet of liquid in the well casing, indicating a relatively dry wellfield.
- The average depth to bottom or obstruction for the 15 wells was approximately 29 feet. This indicates relatively shallow wells in older waste
- A pump was observed in seven of the 15 wells; however these pumps are no longer active. The Facility should consider if these pumps can be reactivated, if they should be reactivated, and if they could potentially be moved to some of the wells that are experiencing higher levels of liquid blockages

2.3 VOLUNTARY SEM EVENT TO IDENTIFY FUGITIVE EMISSIONS “HOT SPOTS”;

A voluntary Surface Emissions Monitoring (SEM) event was conducted on January 26, 2023 to identify fugitive emissions “hot spots.” SCS staff used a Thermo Scientific TVA-2020 Flame Ionization Detector (FID) to measure methane concentrations at the surface of the landfill. SCS targeted surface cover penetrations and any locations on the landfill that are potential locations of fugitive emissions (lack of vegetation, erosion rills, etc.). Most of the points exhibited methane concentrations less than 5 ppm. Surface penetrations at GW-7 and GW-15 exhibited methane concentrations of 82.4 ppm and 421 ppm, respectively. The Facility will consider general cover improvements to reduce fugitive emissions at these specific points, however these SEM results generally indicate sufficient collection of gas at the SWP 221 landfill. A map of the monitoring route and detailed results of the event are included in Appendix C.

2.4 ZONE OF INFLUENCE MAP OF THE LFGCCS

SCS developed a theoretical zone of influence at each vertical LFG well in the Permit #221 Landfill, using the current depth measured by field personnel, multiplied by a value of 3 to obtain a radius, then translating the radius into a circular area to assess the “horizontal” coverage of the LFGCCS. In order to assess the potential influence of liquids in LFG collection capacity, an adjusted radius and circle were calculated by only accounting for depth that is not structurally impaired or blocked by liquids.

A map of coverage areas based on the theoretical and adjusted zones of influence is included in Appendix D. The results of this exercise indicate that the current wellfield has been designed with appropriate coverage. Many of the zones of influence are overlapping and there are very few gaps in coverage. The adjusted zones of influence show some opportunity to increase coverage through dewatering activities.

2.5 LFGCCS EXPANSION CONCEPT DESIGN

SCS considered a design to incorporate additional wells, mostly in central areas of the landfill. Based on the data collected and reviewed, SCS is not recommending an expansion at this time.

3.0 PERMIT #498 LANDFILL

3.1 REPAIR EXISTING GCCS COMPONENTS

Site personnel have made repairs to the existing main header pipe that connects wells GW-19, GW-20, and GW-21 to the main system header as of January 19, 2022. Beginning in February 2023, these wells will be included in monthly wellfield monitoring events.

3.2 LIQUID LEVEL MEASUREMENT EVENT

Wells GW-19, GW-20, and GW-21 were inspected and total depth and liquid level were measured to determine if they should be utilized in the design of an LFG system expansion within this waste disposal unit. Sounding data indicates partial liquid blockages (less than 50 percent of total depth) in all three wells, with the wells, on average, around 31 feet deep. There were no obstructions observed at these three wells, and therefore these wells are likely suitable to continue to serve as functional extraction components.

3.3 LFGCCS EXPANSION CONCEPT DESIGN

SCS reviewed the existing LFG components as well as any available information about the waste depth and planned final cover grading, and determined that the approximately 20 feet of waste in the Permit #498 Landfill lent itself best to horizontal LFG collectors. These will also be helpful under the final cap currently in the design phase, to mitigate LFG bubbling to the surface under the geotextile. The horizontal collectors are arranged in the design drawing (Appendix E), in order to expand coverage from the minimal number of collectors on the southern boundary of the landfill to stretch into the central parts of the landfill where SCS suspects the most waste is located.


As part of the final closure Permit modification application, design drawings for a permanent GCCS were included, expanding coverage throughout the footprint of the 498 landfill with four horizontal collectors and an extension of the 8-inch header pipe to create a redundant loop. These drawings are included in the Permit Modification that was submitted to DEQ on January 31, 2023.

4.0 CONCLUSIONS/RECOMMENDATIONS

Once design plans are completed for the LFG expansion project, these action items can proceed as an extension of this Optimization Plan (*after* the February 1, 2023 deadline).

- Reconnaissance efforts at the SWP 221 landfill indicated maintenance needs at several wellheads. See Table 2 in the January Monthly LFG System Monitoring Data for SWP 221 and 498, submitted by Mike Gibbons of SCS Engineers on January 31, 2023 for recommendations.
- Install one-inch wellheads on the wells in SWP 221. Plans to do this are already in motion, which will make it more feasible to make fine tuning to lower oxygen and lower methane at select wells. In addition, these adjustments should be performed on the extraction components in SWP 498 once monitoring begins on those components in February.
- The Facility should consider adding additional cover soil at the two locations identified in Section 2.3 (surface cover penetrations at GW-7 and GW-15), which appeared to have slightly elevated surface methane levels.

- In general, it appears that the City is appropriately addressing liquid infiltration in LFG wells via the installation of pumps, but could consider shifting pumps from drier wells to wells with higher liquid levels as measured during the sounding/camera event.
- While the existing extraction components in SWP 498 are functional, additional components are recommended to increase coverage throughout the landfill footprint. However, based on the field observations outlined above, the existing GCCS on the SWP 221 landfill appears sufficient at collecting LFG and no expansion is recommended at this time.



Appendix A

Wellfield Monitoring Data

APPENDIX A
PERMIT 221 WELLFIELD TUNING EVENT - JANUARY 16, 2023
BRISTOL LANDFILL - BRISTOL, VIRGINIA

| ID | Date/Time | CH4 | CO2 | O2 | Balance | Init. Static Press. | Sys. Press. | Temp. |
|----------|-----------------|------|------|------|---------|---------------------|-------------|-------|
| | | % | % | % | % | in. H2O | in. H2O | DegF |
| BRTLGW01 | 1/16/2023 12:37 | 37 | 24.7 | 7.5 | 30.8 | -25.45 | -24.3 | 56.1 |
| BRTLGW02 | 1/16/2023 12:50 | 26.1 | 16.9 | 11.9 | 45.1 | -25.46 | -23.83 | 65.4 |
| BRTLGW03 | 1/16/2023 13:58 | 18.3 | 12.2 | 14.9 | 54.6 | -3.28 | -24.52 | 55.9 |
| BRTLGW04 | 1/16/2023 13:20 | 46.8 | 33.6 | 4.2 | 15.4 | -14.96 | -24.51 | 55.1 |
| BRTLGW05 | 1/16/2023 13:24 | 50.8 | 35.6 | 3.3 | 10.3 | -24.54 | -24.48 | 60.5 |
| BRTLGW06 | 1/16/2023 13:38 | 43.7 | 25.9 | 6.5 | 23.9 | -21.99 | -24.54 | 59.2 |
| BRTLGW07 | 1/16/2023 11:31 | 56.4 | 38.3 | 0.6 | 4.7 | -13.92 | -24.53 | 62.4 |
| BRTLGW08 | 1/16/2023 11:40 | 23 | 15.2 | 13.1 | 48.7 | -1.24 | -24.6 | 60.6 |
| BRTLGW09 | 1/16/2023 11:56 | 51.7 | 35.4 | 2.3 | 10.6 | -24.33 | -24.05 | 60.3 |
| BRTLGW10 | 1/16/2023 12:13 | 38.8 | 29.7 | 6 | 25.5 | -24.79 | -24.12 | 63.3 |
| BRTLGW11 | 1/16/2023 12:21 | 17.8 | 12.2 | 14.7 | 55.3 | -25.28 | -24.33 | 68.1 |
| BRTLGW12 | 1/16/2023 12:28 | 22.1 | 15.2 | 13.3 | 49.4 | -24.75 | -24.82 | 58.7 |
| BRTLGW13 | 1/16/2023 13:49 | 59.9 | 39.7 | 0.3 | 0.1 | -24.54 | -24.48 | 54.4 |
| BRTLGW14 | 1/16/2023 13:45 | 26 | 14.9 | 13.4 | 45.7 | -20.11 | -24.52 | 48.8 |
| BRTLGW15 | 1/16/2023 13:53 | 51.7 | 34.8 | 3.1 | 10.4 | -24.56 | -24.56 | 55 |

Appendix B Down-well Camera Event Log

**APPENDIX B
 PERMIT 221 WELL SOUNDING/CAMERA EVENT - JANUARY 24&25, 2023
 BRISTOL LANDFILL - BRISTOL, VIRGINIA**

| Wellhead | Distance to Water (.ft) | Distance to Bottom (.ft) | Distance to obstruction (.ft) | Percent open casing | Pump (Y/N) | Notes: |
|----------|-------------------------|--------------------------|-------------------------------|---------------------|------------|--|
| GW-1 | 16.33 | N/A | 19.5 | 84% | Y | Obstruction preventing total depth measurment believed to be pump lines. Clear |
| GW-2 | 18.8 | N/A | 30.85 | 61% | Y | Obstruction preventing total depth measurment known to be pump rope. Clear |
| GW-3 | Dry | 31.58 | N/A | 100% | N | No Water, Well Unobstructed |
| GW-4 | 25.95 | N/A | 27.4 | 95% | Y | Obstruction preventing total depth measurment believed to be well casing |
| GW-5 | 18.95 | 33.68 | N/A | 56% | N | Well Unobstructed, Corrosion noted on well casing, Silt in water |
| GW-6 | 20.76 | 28.18 | N/A | 74% | Y | Well Unobstructed, Clear Water |
| GW-7 | 41 | 45.4 | N/A | 90% | N | Well Unobstructed, Clear water |
| GW-8 | 17.7 | 19.75 | N/A | 90% | Y | Silt in water, Well unobstructed |
| GW-9 | N/A | N/A | 15.65 | -- | Y | Thick black buildup around pump lines prevented camera ingress. Personnel |
| GW-10 | 19.9 | 29.3 | N/A | 68% | N | Well Unobstructed, Clear water |
| GW-11 | 13.65 | 29.5 | N/A | 46% | N | Well Unobstructed, Clear water |
| GW-12 | 15.55 | 27.15 | N/A | 57% | Y | Well Unobstructed, Clear water |
| GW-13 | 26.25 | 28.3 | N/A | 93% | N | Well unobstructed, clear water, black muddy substance found on bottom 4 feet of camera |
| GW-14 | 23.43 | 29 | N/A | 81% | N | Well Unobstructed, Clear water |
| GW-15 | 28.7 | 36.15 | N/A | 79% | N | Well Unobstructed, Clear water |

Appendix C Voluntary SEM Data

SCS ENGINEERS

SURFACE EMISSIONS MONITORING RESULTS PERMIT 221 - TARGET ZONES - JANUARY 26, 2023 BRISTOL LANDFILL - BRISTOL, VIRGINIA

| Date | Time | ID # | Methane | | Compliance | Comments |
|---------|-------|------|---------------|-----|------------|----------|
| | | | Concentration | | | |
| 1/26/23 | 10:24 | 1 | 1.6 | PPM | OK | |
| 1/26/23 | 10:25 | 2 | 1.7 | PPM | OK | GW-6 |
| 1/26/23 | 10:27 | 3 | 1.2 | PPM | OK | |
| 1/26/23 | 10:27 | 4 | 1.1 | PPM | OK | |
| 1/26/23 | 10:28 | 5 | 82.4 | PPM | OK | GW-7 |
| 1/26/23 | 10:29 | 6 | 1.2 | PPM | OK | |
| 1/26/23 | 10:29 | 7 | 1.3 | PPM | OK | GW-8 |
| 1/26/23 | 10:30 | 8 | 1.2 | PPM | OK | |
| 1/26/23 | 10:30 | 9 | 1.7 | PPM | OK | |
| 1/26/23 | 10:31 | 10 | 2 | PPM | OK | GW-9 |
| 1/26/23 | 10:31 | 11 | 1.7 | PPM | OK | |
| 1/26/23 | 10:32 | 12 | 1.3 | PPM | OK | |
| 1/26/23 | 10:34 | 13 | 1.4 | PPM | OK | GW-10 |
| 1/26/23 | 10:35 | 14 | 1.3 | PPM | OK | |
| 1/26/23 | 10:36 | 15 | 1.8 | PPM | OK | |
| 1/26/23 | 10:36 | 16 | 1.4 | PPM | OK | |
| 1/26/23 | 10:37 | 17 | 1.5 | PPM | OK | |
| 1/26/23 | 10:37 | 18 | 1.7 | PPM | OK | |
| 1/26/23 | 10:38 | 19 | 1.5 | PPM | OK | |
| 1/26/23 | 10:38 | 20 | 2.3 | PPM | OK | GW-11 |
| 1/26/23 | 10:39 | 21 | 2.6 | PPM | OK | GW-12 |
| 1/26/23 | 10:39 | 22 | 1.7 | PPM | OK | |
| 1/26/23 | 10:40 | 23 | 2.1 | PPM | OK | GW-1 |
| 1/26/23 | 10:40 | 24 | 2.5 | PPM | OK | |
| 1/26/23 | 10:41 | 25 | 2.1 | PPM | OK | |
| 1/26/23 | 10:41 | 26 | 1.7 | PPM | OK | |
| 1/26/23 | 10:41 | 27 | 1.7 | PPM | OK | |
| 1/26/23 | 10:42 | 28 | 1.4 | PPM | OK | GW-2 |
| 1/26/23 | 10:42 | 29 | 1.4 | PPM | OK | |
| 1/26/23 | 10:43 | 30 | 1.5 | PPM | OK | |
| 1/26/23 | 10:43 | 31 | 1.6 | PPM | OK | |
| 1/26/23 | 10:44 | 32 | 1.5 | PPM | OK | GW-3 |
| 1/26/23 | 10:44 | 33 | 1.9 | PPM | OK | |
| 1/26/23 | 10:45 | 34 | 1.5 | PPM | OK | |
| 1/26/23 | 10:45 | 35 | 3.1 | PPM | OK | |
| 1/26/23 | 10:46 | 36 | 2.8 | PPM | OK | GW-4 |
| 1/26/23 | 10:46 | 37 | 3.1 | PPM | OK | |
| 1/26/23 | 10:47 | 38 | 2 | PPM | OK | |
| 1/26/23 | 10:47 | 39 | 1.9 | PPM | OK | |
| 1/26/23 | 10:47 | 40 | 1.4 | PPM | OK | GW-13 |
| 1/26/23 | 10:49 | 41 | 2.2 | PPM | OK | |
| 1/26/23 | 10:49 | 42 | 1.2 | PPM | OK | |
| 1/26/23 | 10:49 | 43 | 1.2 | PPM | OK | |
| 1/26/23 | 10:50 | 44 | 1.1 | PPM | OK | |
| 1/26/23 | 10:50 | 45 | 1.1 | PPM | OK | |
| 1/26/23 | 10:51 | 46 | 421 | PPM | OK | GW-15 |
| 1/26/23 | 10:52 | 47 | 1.1 | PPM | OK | |
| 1/26/23 | 10:53 | 48 | 1.1 | PPM | OK | |
| 1/26/23 | 10:53 | 49 | 1.2 | PPM | OK | |
| 1/26/23 | 10:54 | 50 | 2.2 | PPM | OK | GW-14 |
| 1/26/23 | 10:56 | 51 | 1.4 | PPM | OK | |
| 1/26/23 | 10:56 | 52 | 1.3 | PPM | OK | |
| 1/26/23 | 10:58 | 53 | 1.2 | PPM | OK | GW-5 |
| 1/26/23 | 11:02 | 54 | 1.2 | PPM | OK | |

**SURFACE EMISSIONS MONITORING RESULTS
 PERMIT 221 - TARGET ZONES - JANUARY 26, 2023
 BRISTOL LANDFILL - BRISTOL, VIRGINIA**

| Date | Time | ID # | Methane Concentration | Compliance | Comments |
|------|------|------|--------------------------|------------|----------|
|------|------|------|--------------------------|------------|----------|

| | |
|---------------------------------|----|
| Number of locations sampled: | 54 |
| Number of exceedance locations: | 0 |

NOTES:

Weather Conditions: Partly Cloudy, 33°F Wind: NW 14 MPH

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

| | | | |
|---------|------|------|-----------|
| 1/26/23 | 7:50 | ZERO | 0.0 PPM |
| 1/26/23 | 7:57 | SPAN | 503.0 PPM |

Background Reading:

| | | | |
|---------|------|----------|---------|
| 1/26/23 | 8:00 | Downwind | 4.2 PPM |
| 1/26/23 | 8:02 | Upwind | 2.0 PPM |

Appendix D Zone of Influence Maps

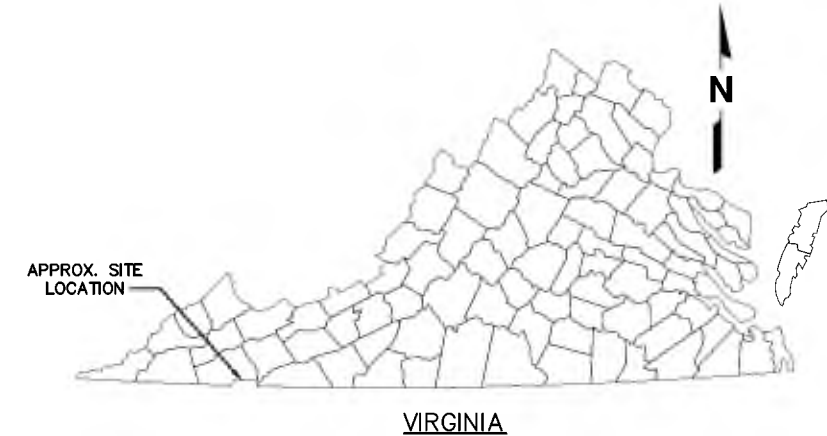
Appendix E
Proposed Conceptual LFG Expansion Plan

Appendix C

Final Closure System Permit Modification Design Plans

BRISTOL, VIRGINIA INTEGRATED SOLID WASTE MANAGEMENT FACILITY SOLID WASTE PERMIT #498

CLOSURE DESIGN PLANS BRISTOL, VIRGINIA



| INDEX OF DRAWINGS | |
|-------------------|----------------------------|
| SHEET | SHEET TITLE |
| 1 | COVER SHEET |
| 2 | GENERAL NOTES AND LEGEND |
| 3 | OVERALL SITE MAP |
| 4 | EXISTING CONDITIONS |
| 5 | INTERMEDIATE COVER GRADE |
| 6 | FINAL CLOSURE GRADE |
| 7 | CROSS SECTIONS 1 |
| 8 | CROSS SECTIONS 2 |
| 9 | CROSS SECTIONS 3 |
| 10 | SITE MONITORING PLAN |
| 11 | EXISTING DRAINAGE PLAN |
| 12 | STORMWATER MANAGEMENT PLAN |
| 13 | STORMWATER CALCULATIONS |
| 14 | DETAILS 1 |
| 15 | DETAILS 2 |
| 16 | DETAILS 3 |

PREPARED FOR:

CITY OF BRISTOL, VIRGINIA
300 LEE STREET
BRISTOL, VIRGINIA 24201

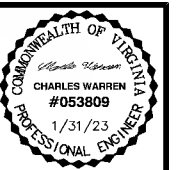
INTEGRATED SOLID WASTE MANAGEMENT
FACILITY
2655 VALLEY DRIVE
BRISTOL, VIRGINIA 24201

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. 02218208.17

JANUARY 31, 2023



| NO. | REVISION | DATE |
|-----|----------|------|
| | | |
| | | |
| | | |
| | | |
| | | |

| | |
|---------------|--|
| SHEET TITLE | COVER SHEET |
| PROJECT TITLE | SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS |

| | |
|--------|--|
| 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 TURNPIKE, SUITE 305 MIDLOTHIAN, VIRGINIA 23113-7313 PH: (804) 378-7440 FAX: (703) 471-6676 | D/A R/W BY: _____ TRW/SHA APP BY: _____ C/JW C/JW TRW |
|--|---|

| | |
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| DATE: | 1/31/23 |
| SCALE: | AS SHOWN |
| DRAWING NO. | 1 |

\\mid-rs01\Project\02218208.05\Drawings\SWP498.LF - Permit Mod Drawings



| NO. | REVISION | DATE |
|-----|----------|------|
| | | |
| | | |
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| | | |
| | | |

| | |
|---------------|--|
| SHEET TITLE | GENERAL NOTES AND LEGEND |
| PROJECT TITLE | SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS |

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 TURNPIKE - MIDLOTHIAN, VA 23113
 PH: (804) 378-7460 FAX: (804) 378-7453

PROJ. NO. 02218208 05
 DWG. NO. TRW
 CHK. BY: TRW
 DATE: 1/31/23
 APPR. BY: C.J.W.

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

- LEGEND:**
- 1850 — EXISTING CONTOUR, MAJOR (10')
 - - - - EXISTING CONTOUR, MINOR (2')
 - 1850 — 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
 - 6" — 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 PIPE
 - EXISTING GRAVEL ROAD
 - RIP RAP/ ROCKS
 - FLEXAMAT DOWNCHUTE
 - > — DIVERSION BERM
 - SF — SILT FENCE
 - CELL BOUNDARY
 - EDGE OF LINER
 - LANDFILL GAS VENT
 - LFG — LANDFILL GAS PIPE
 - P-2 — PIEZOMETER
 - MW-11 — MONITORING WELL
 - LOD — LIMITS OF DISTURBANCE
 - S — SOIL TYPE BOUNDARY
 - DRAINAGE AREA
 - STREAM OR WATERLINE
 - CENTERLINE
 - TS — TEMPORARY SEEDING
 - PS — PERMANENT SEEDING
 - CP — CULVERT INLET PROTECTION
 - OP — OUTLET PROTECTION
 - SF — SILT FENCE
 - CE — CONSTRUCTION ENTRANCE
 - MU — MULCHING
 - B/M — BLANKETS AND MATTING
 - — RUNOFF FLOW DIRECTION
 - LFG HEADER 6"Ø

- LEGEND:**
- TP-3 — 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-11 — EXISTING GROUNDWATER MONITORING WELL
 - — — — EXISTING MANHOLE
 - GW-## — PROPOSED LFG COLLECTION WELLHEAD
 - PROPERTY LINE
 - FACILITY BOUNDARY
 - WASTE MANAGEMENT UNIT BOUNDARY
 - APPROXIMATE LOCATION FOR OF SIDEWALL
 - EXISTING ROAD OUTLINE
 - EXISTING LFG HORIZONTAL COLLECTOR
 - PROPOSED LFG HORIZONTAL COLLECTOR
 - EXISTING LFG COLLECTION PIPING
 - PROPOSED LFG COLLECTION PIPING
 - PROPOSED 8" LFG COLLECTION PIPING
 - PROPOSED 12" LFG COLLECTION PIPING
 - PROPOSED 16" LFG COLLECTION PIPING
 - PROPOSED 18" LFG COLLECTION PIPING
 - PROPOSED 24" LFG COLLECTION PIPING
 - PROPOSED 28" LFG COLLECTION PIPING
 - PROPOSED 36" LFG COLLECTION PIPING
 - PROPOSED 2" AIR LINE
 - PROPOSED 4" FORCE MAIN

GENERAL NOTES:

1. OWNER/DEVELOPER: CITY OF BRISTOL, VIRGINIA
2. CONSULTING ENGINEER: SCS ENGINEERS, 15521 MIDLOTHIAN TURNPIKE #305, MIDLOTHIAN, VA 23113
3. 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.
4. BOUNDARY INFORMATION TAKEN FROM OTHERS.
5. THESE DRAWINGS ARE NOT SUITABLE FOR CONSTRUCTION.
6. HORIZONTAL DATA IS BASED ON US STATE PLANE NAD 1983 VIRGINIA SOUTH ZONE. VERTICAL DATA BASED ON NAVD 88.
7. GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
8. EXISTING LFG HEADER WAS OBTAINED FROM SCS CONSTRUCTION DRAWINGS, LAST UPDATED JULY 6, 2022.
9. THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
10. THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.
11. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.

\\mid-fs01\Project\02218208 05\Drawings\SWP-498 LF - Permit Mod Drawings



| NO. | REVISION | DATE |
|-----|----------|------|
| | | |
| | | |
| | | |
| | | |

SHEET TITLE: **OVERALL SITE MAP**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 1525 MIDLOTHIAN IMPR. - MIDLOTHIAN, VA 23113
 PH: (804) 378-7460 FAX: (804) 378-7453

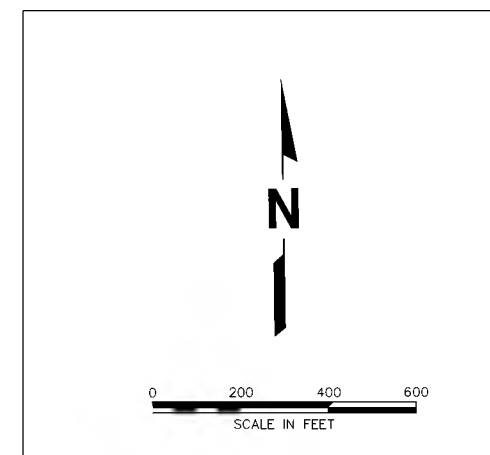
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 CHECKED BY: C.J.W.
 DATE: 02/21/2025
 SCALE: AS SHOWN

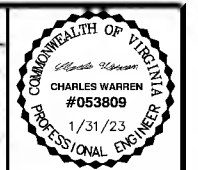
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 DATE: 1/31/23
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\\mid-rs01\Project\02218208.05\Drawings\SWP498.LF - Permit Mod Drawings

| BRISTOL VIRGINIA SOLID WASTE FACILITY CONTROL MONUMENTS 9-10-2020 | | | | |
|---|--------------|---------------|-----------|--|
| BENCHMARK | NORTHING | EASTING | ELEVATION | DESCRIPTION |
| BM-1 | 3398930.8510 | 10412541.7390 | 1945.9200 | BOLT IN CONCRETE MONUMENT |
| BM-2 | 3398427.2980 | 10411954.6380 | 1880.3510 | BOLT IN CONCRETE MONUMENT |
| BM-3 | 3399535.2420 | 10412031.2950 | 1864.1110 | TOP OF ANCHOR BOLT FOR ROCK PROTECTION FENCING |
| BM-4 | 3399345.9430 | 10413587.4720 | 1852.0750 | 1/2" REBAR IN CONCRETE AT FENCE CORNER |
| BENCHMARK INFORMATION PROVIDED BY THE CITY OF BRISTOL, VIRGINIA | | | | |

VIRGINIA
 TENNESSEE





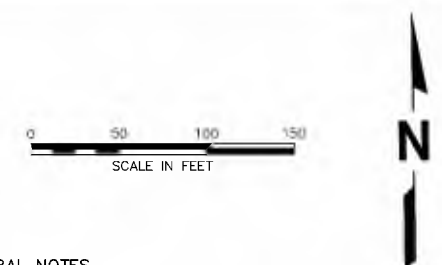
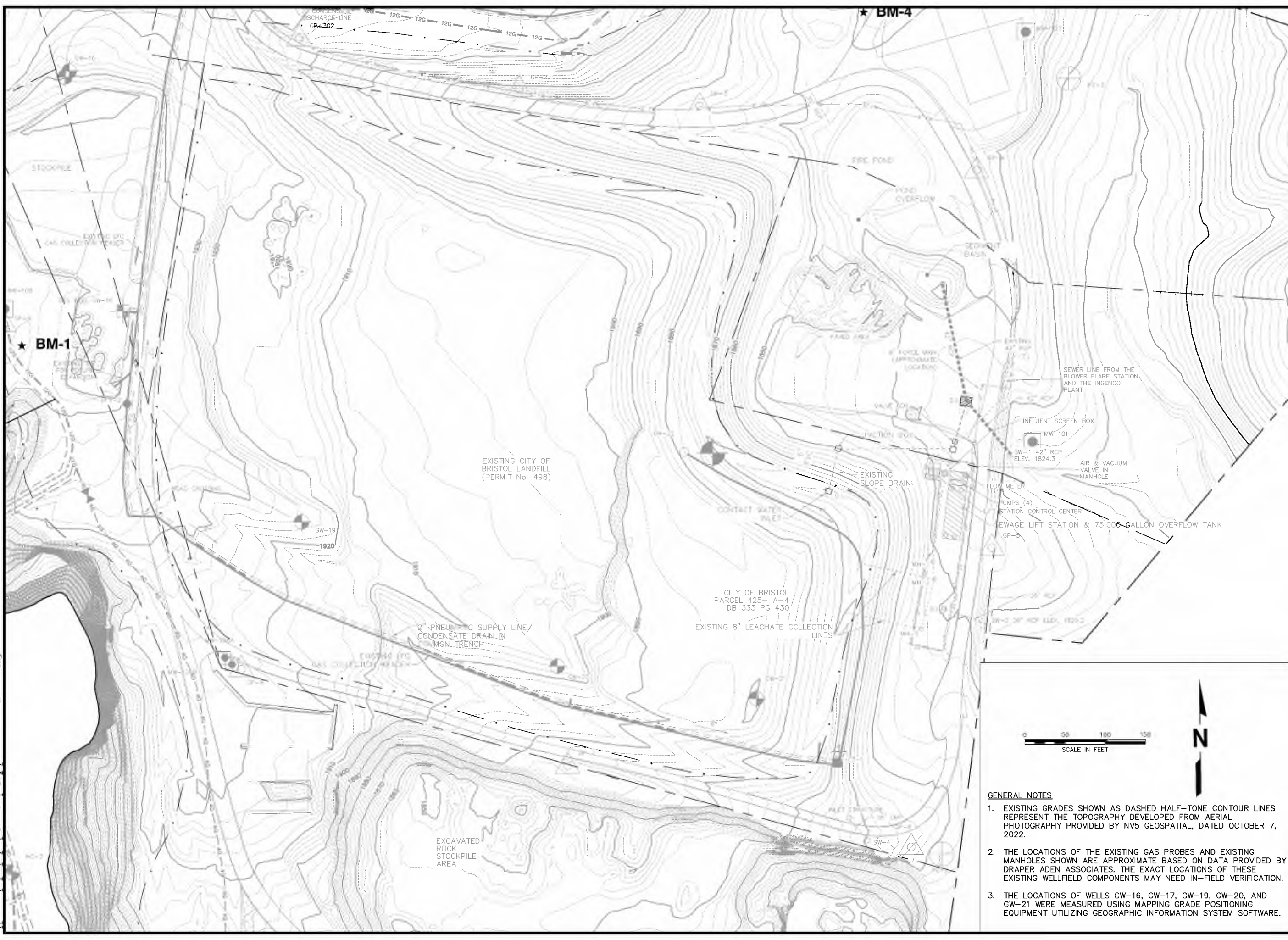
| NO. | REVISION | DATE |
|-----|----------|------|
| | | |
| | | |
| | | |

SHEET TITLE: **EXISTING CONDITIONS**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 1525 WILSON ROAD, SUITE 100
 BRISTOL, VIRGINIA, VA 24113
 PH: (804) 378-7466 FAX: (804) 378-7468

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO. **4** of 16



- GENERAL NOTES**
- EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
 - THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
 - THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.

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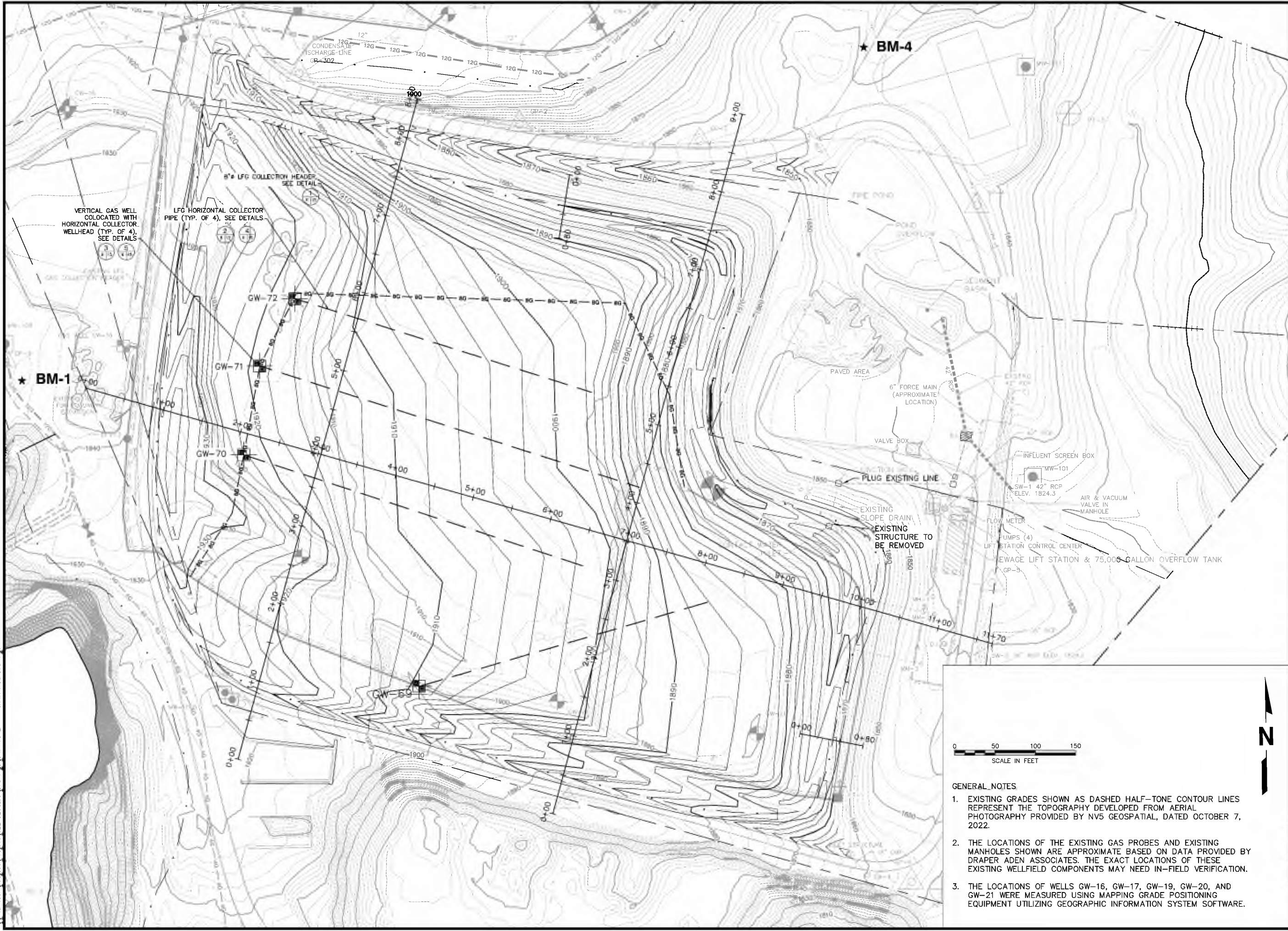
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SHEET TITLE: **INTERMEDIATE COVER GRADE**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 10500 WOODBRIDGE AVENUE, SUITE 200
 FALLS CHURCH, VA 22041
 PH: (800) 378-7460 FAX: (800) 378-7463

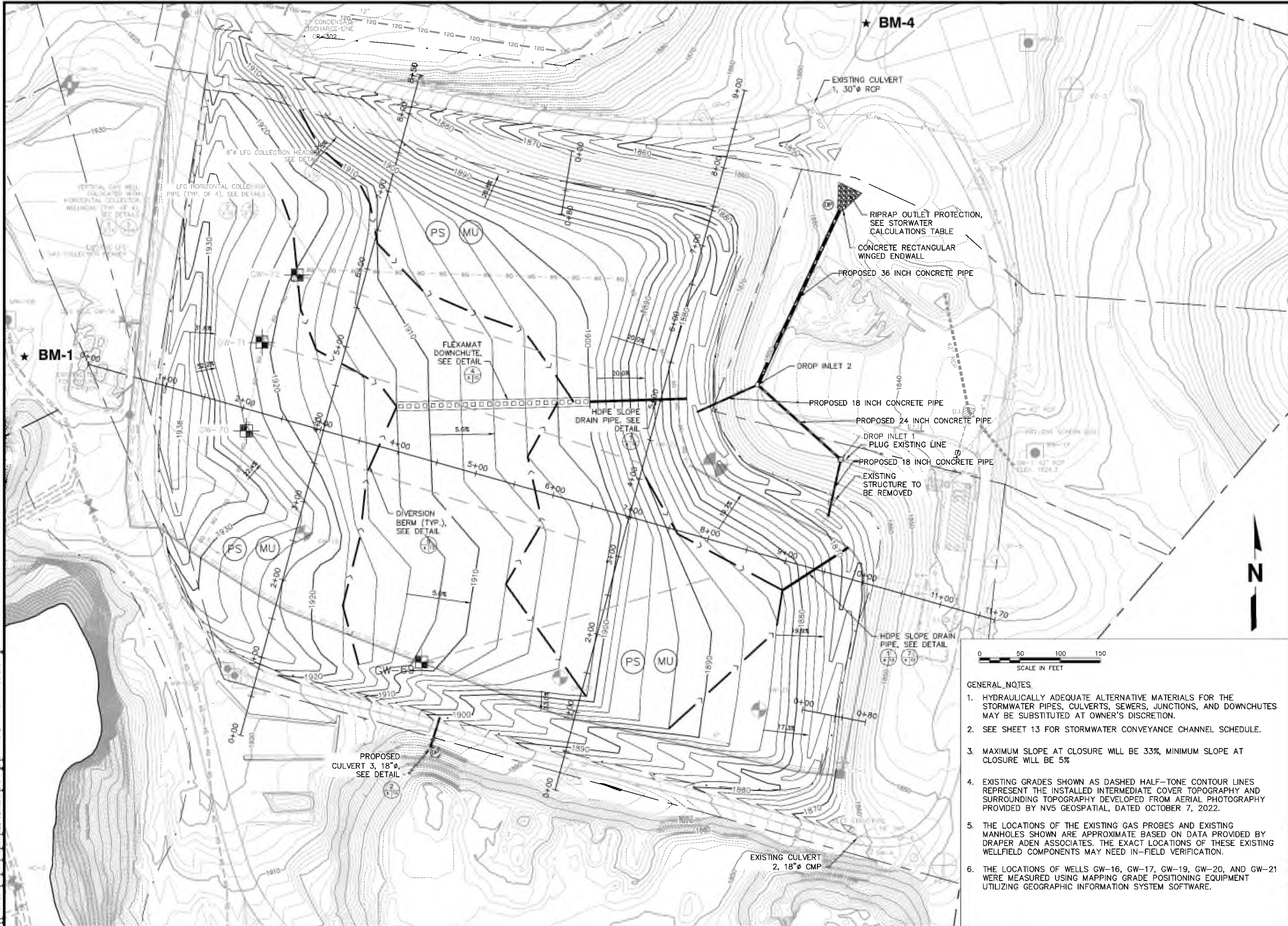
CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.



GENERAL NOTES

- EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
- THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
- THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.

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| NO | REVISION | DATE |
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SHEET TITLE: **FINAL CLOSURE GRADE**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

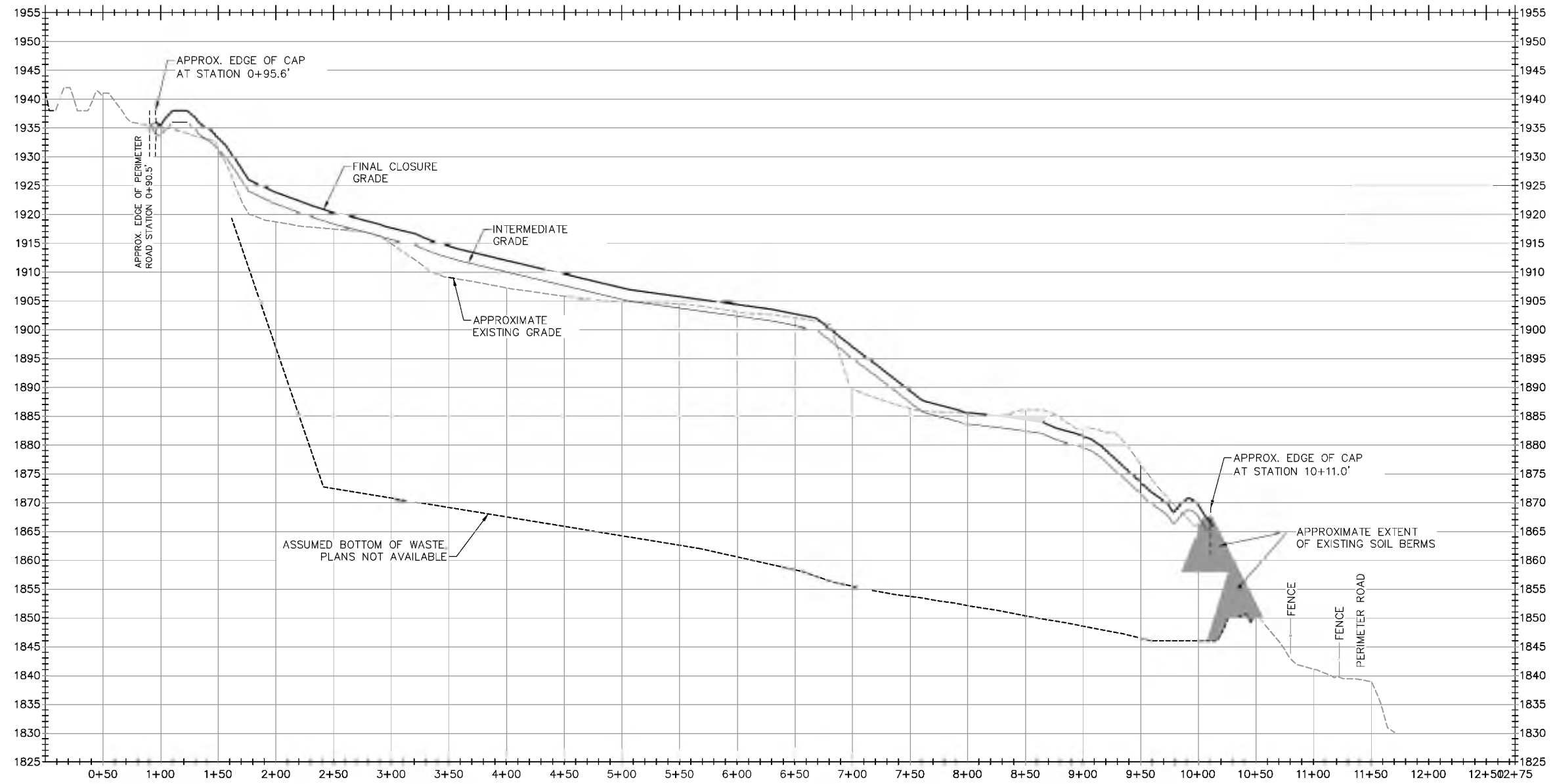
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
 2655 VALLEY DRIVE
 BRISTOL, VA 24201

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 1500 W. WILSON AVENUE, SUITE 200
 BRISTOL, VA 24201
 PH: (804) 378-7460 FAX: (804) 378-7463

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

- GENERAL NOTES
- HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
 - SEE SHEET 13 FOR STORMWATER CONVEYANCE CHANNEL SCHEDULE.
 - MAXIMUM SLOPE AT CLOSURE WILL BE 33%, MINIMUM SLOPE AT CLOSURE WILL BE 5%
 - EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE INSTALLED INTERMEDIATE COVER TOPOGRAPHY AND SURROUNDING TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
 - THE LOCATIONS OF THE EXISTING GAS PROBES AND EXISTING MANHOLES SHOWN ARE APPROXIMATE BASED ON DATA PROVIDED BY DRAPER ADEN ASSOCIATES. THE EXACT LOCATIONS OF THESE EXISTING WELLFIELD COMPONENTS MAY NEED IN-FIELD VERIFICATION.
 - THE LOCATIONS OF WELLS GW-16, GW-17, GW-19, GW-20, AND GW-21 WERE MEASURED USING MAPPING GRADE POSITIONING EQUIPMENT UTILIZING GEOGRAPHIC INFORMATION SYSTEM SOFTWARE.

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SECTION 1
 H: 1" = 50'
 V: 1" = 10'

GENERAL NOTES

- EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
- THE ASSUMED BOTTOM OF WASTE PROFILE IS BASED UPON DRAWINGS PREPARED BY DRAPER ADEN ASSOCIATES. THE ORIGINAL PLANS ARE NOT AVAILABLE.
- THE WRITTEN SCALES INDICATED UNDERNEATH THE PROFILE VIEW TITLES WILL VARY DEPENDING UPON PLOT SIZE. DRAWINGS ARE INTENDED TO BE PLOTTED ON 24" X 36" SHEETS.

| NO. | REVISION | DATE |
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SHEET TITLE: **CROSS SECTIONS 1**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

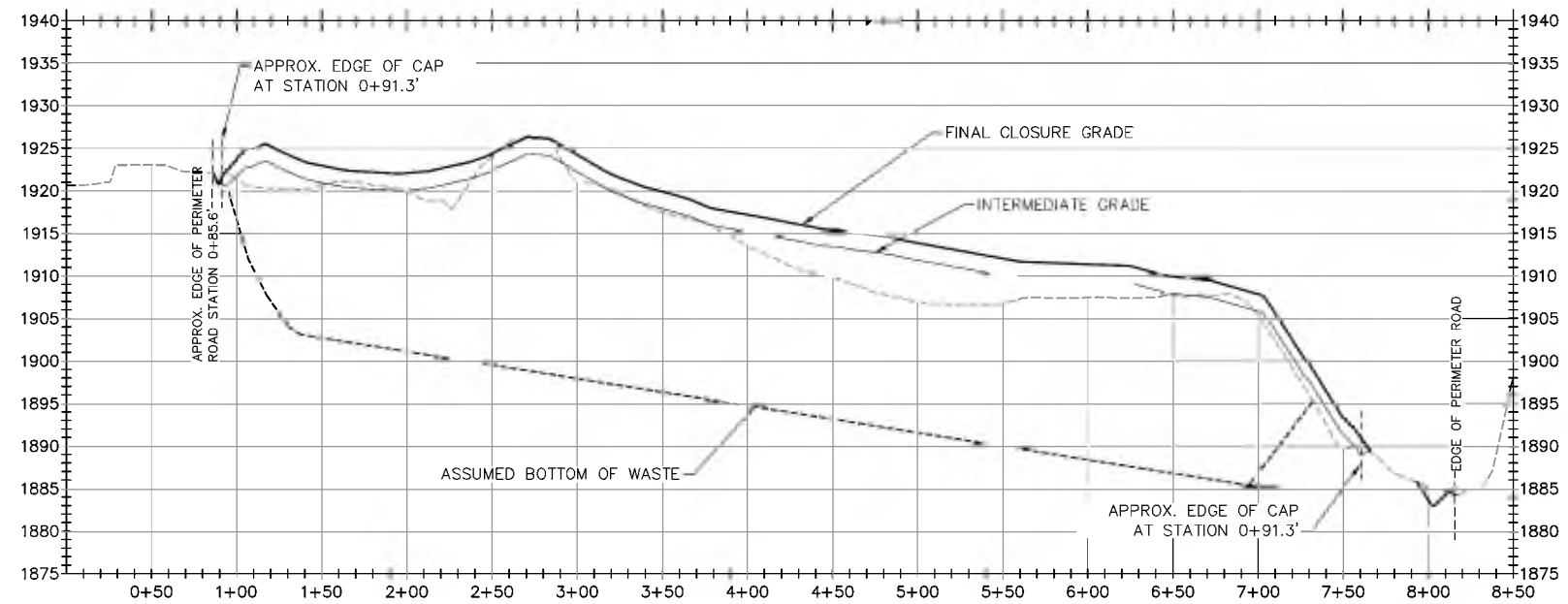
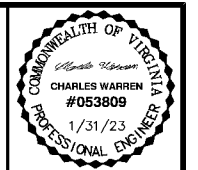
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
 2655 VALLEY DRIVE
 BRISTOL, VA 24201

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS, INC.
 6525 WILSON ROAD, SUITE 100
 BRISTOL, VA 24201
 PH: (804) 376-7466 FAX: (804) 376-7468

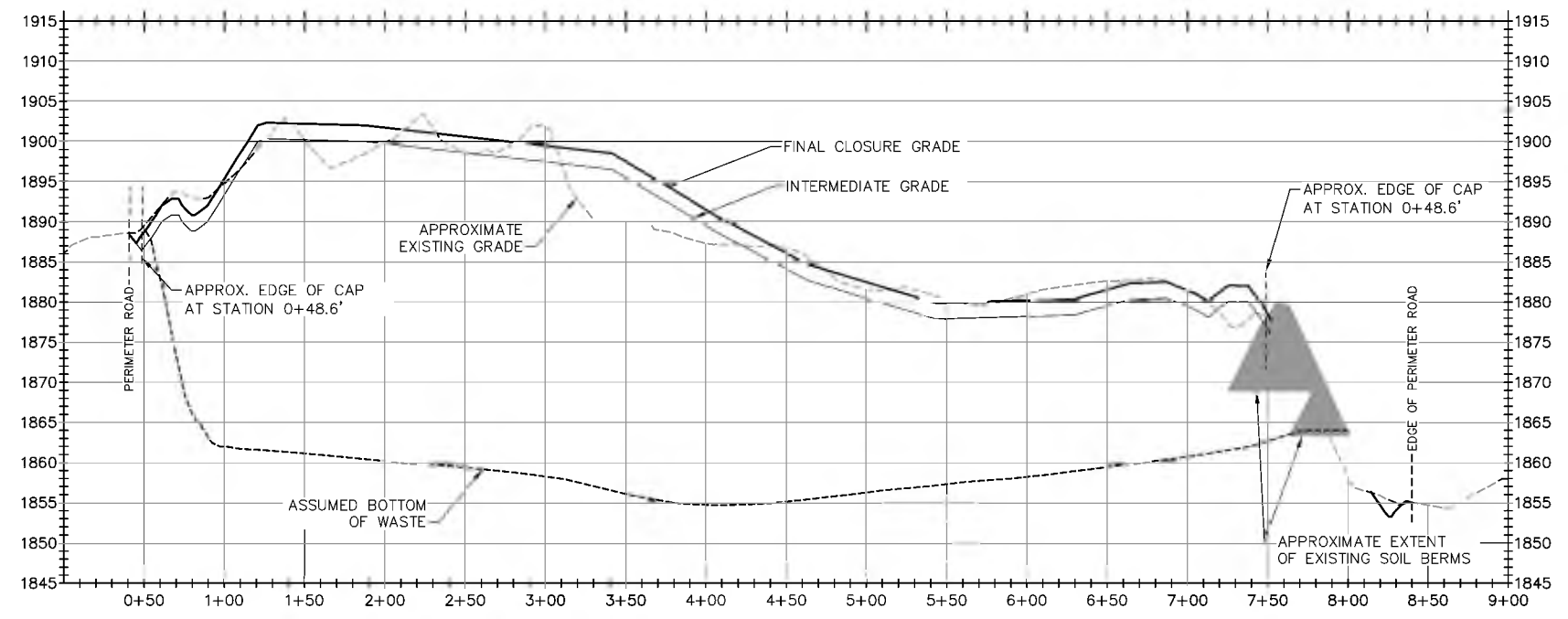
PROJ. NO: 02218208.05
 DWG. BY: TRW
 CHK. BY: TRW
 DATE: 1/31/23
 D/A R/W BY: C.J.W.
 APP. BY: C.J.W.

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

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SECTION 2
 H: 1" = 50'
 V: 1" = 10'



SECTION 3
 H: 1" = 50'
 V: 1" = 10'

GENERAL NOTES

- EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
- THE ASSUMED BOTTOM OF WASTE PROFILE IS BASED UPON DRAWINGS PREPARED BY DRAPER ADEN ASSOCIATES. THE ORIGINAL PLANS ARE NOT AVAILABLE.
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| NO. | REVISION | DATE |
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SHEET TITLE: **CROSS SECTIONS 2**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

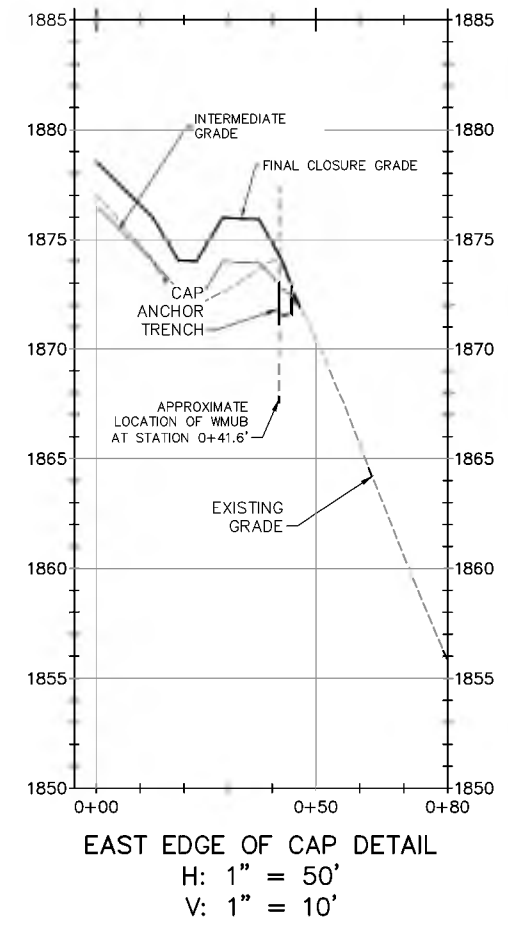
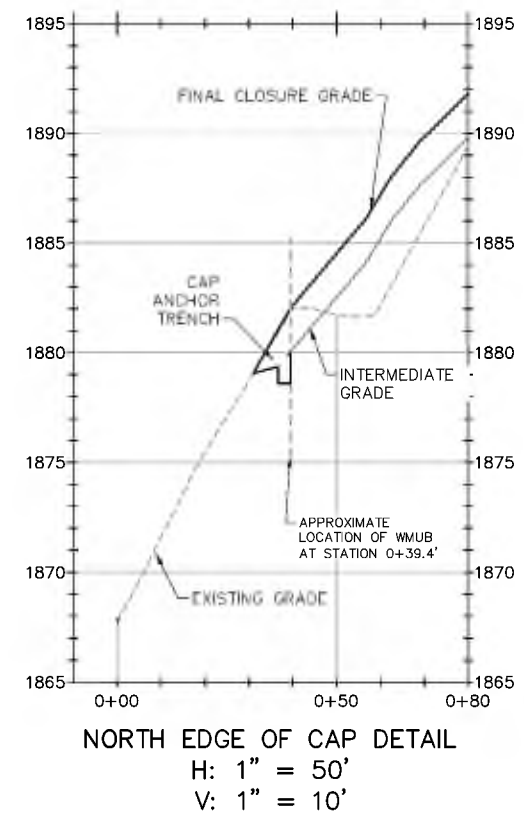
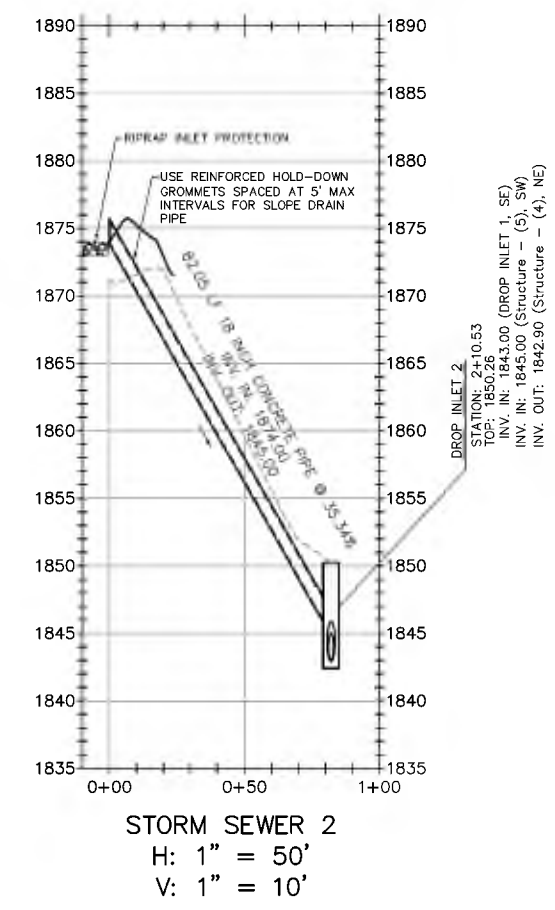
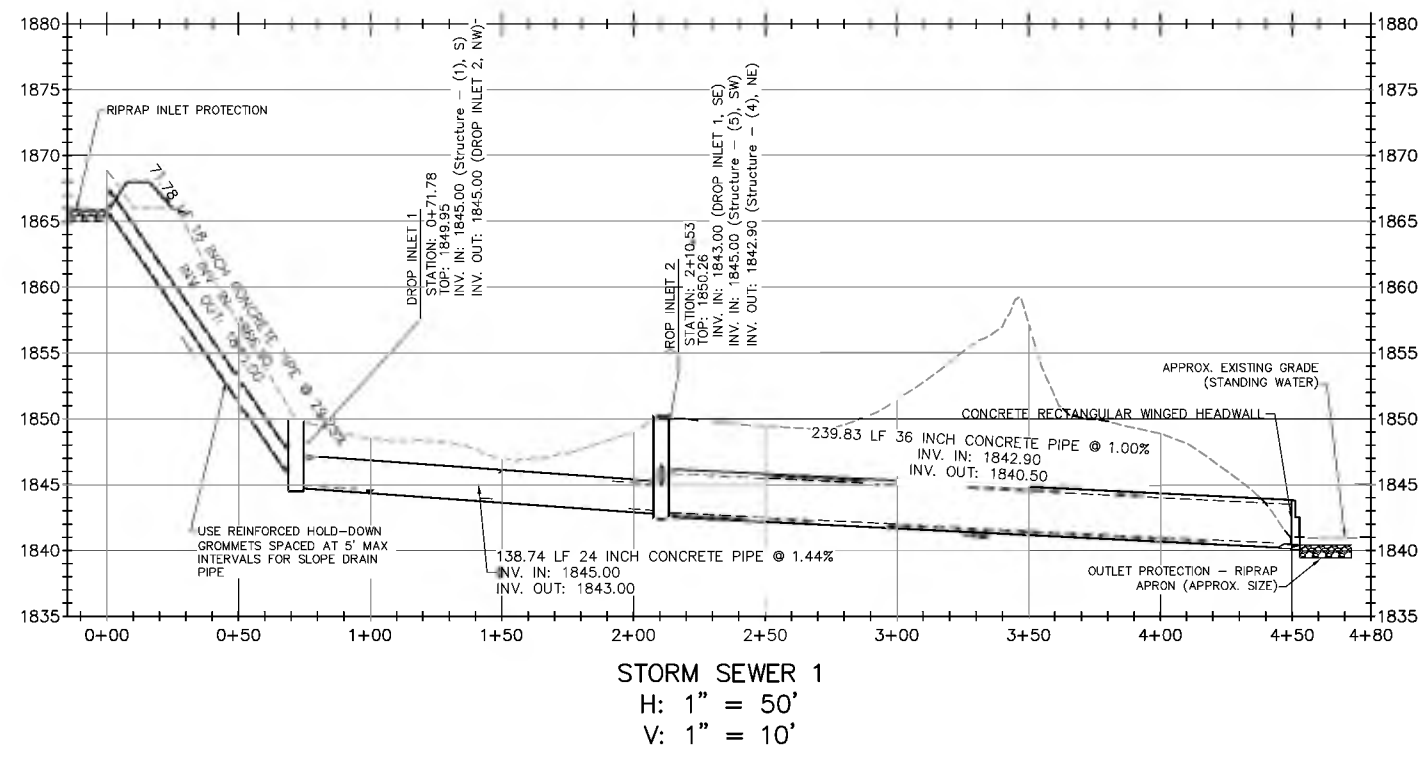
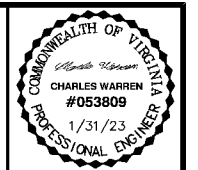
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
 2655 VALLEY DRIVE
 BRISTOL, VA 24201

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
 6525 WILSON ROAD, SUITE 100, BRISTOL, VA 24213
 PH: (804) 376-7466 FAX: (804) 376-7468

PROJ. NO: 02218208.05
 DWG. BY: TRW/SHA
 CHK. BY: TRW
 DATE: 1/31/23
 APP. BY: C.J.W.
 C.J.W.

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

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GENERAL NOTES

1. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
2. EXISTING GRADES SHOWN AS DASHED HALF-TONE CONTOUR LINES REPRESENT THE TOPOGRAPHY DEVELOPED FROM AERIAL PHOTOGRAPHY PROVIDED BY NV5 GEOSPATIAL, DATED OCTOBER 7, 2022.
3. THE ASSUMED BOTTOM OF WASTE PROFILE IS BASED UPON DRAWINGS PREPARED BY DRAPER ADEN ASSOCIATES. THE ORIGINAL PLANS ARE NOT AVAILABLE.
4. THE WRITTEN SCALE INDICATED UNDERNEATH THE PROFILE VIEW TITLES WILL VARY DEPENDING UPON PLOT SIZE. DRAWINGS ARE INTENDED TO BE PLOTTED ON 24" X 36" SHEETS

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SHEET TITLE: **CROSS SECTIONS 3**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

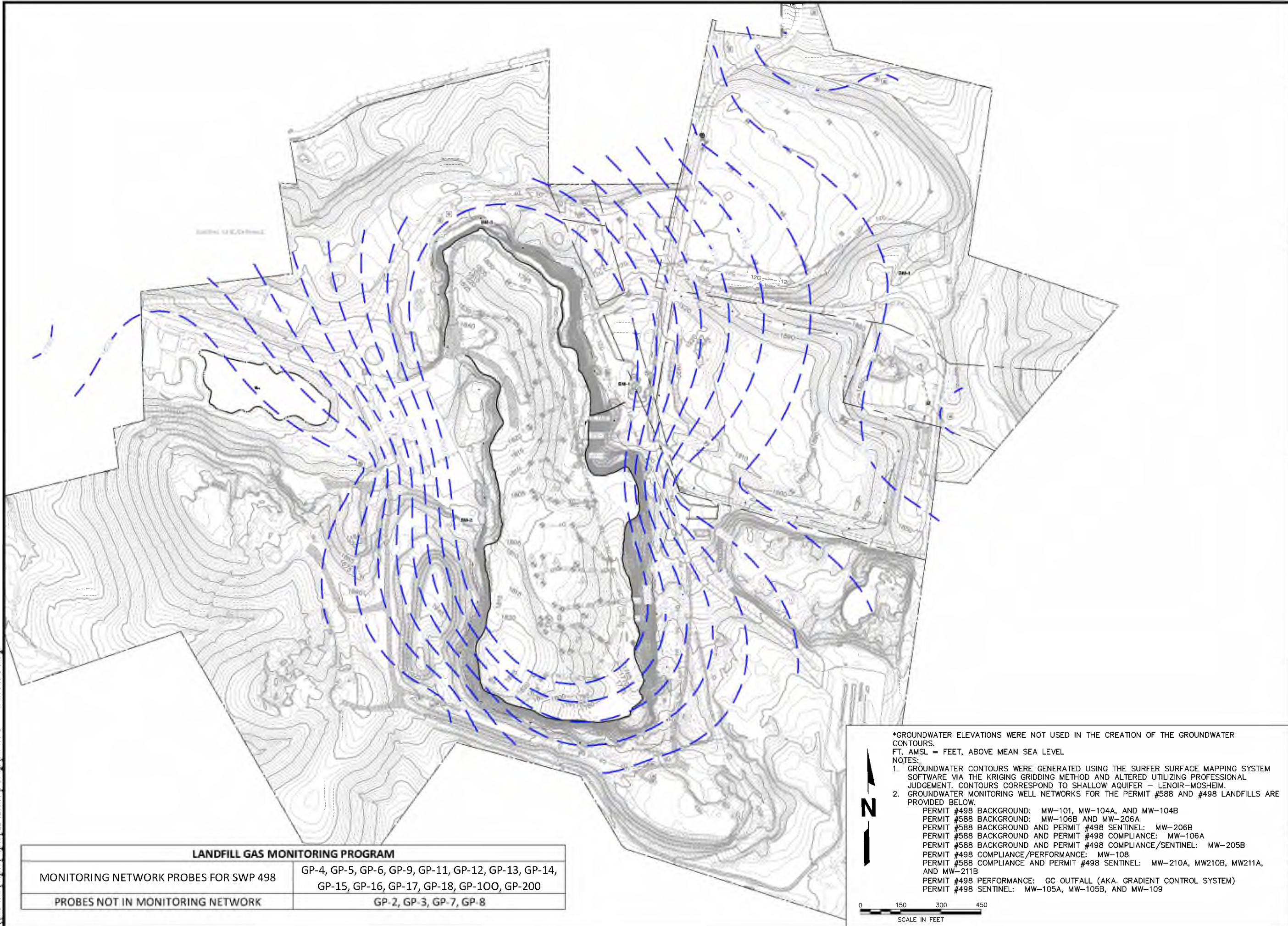
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
 2655 VALLEY DRIVE
 BRISTOL, VA 24201

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
 6525 WILSON ROAD, SUITE 100, BRISTOL, VA 24215
 PH: (804) 376-7466 FAX: (804) 376-7468

PROJ. NO: 02218208.05
 DWG. BY: TRW
 CHK. BY: TRW
 DATE: 1/31/23
 APP. BY: C.J.W.

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

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SHEET TITLE: **SITE MONITORING PLAN**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

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

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
 1525 MIDLOTHIAN TPK - MIDLOTHIAN, VA 23113
 Ph: (804) 378-7460 Fax: (804) 378-7463

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

| LANDFILL GAS MONITORING PROGRAM | |
|---------------------------------------|--|
| MONITORING NETWORK PROBES FOR SWP 498 | GP-4, GP-5, GP-6, GP-9, GP-11, GP-12, GP-13, GP-14, GP-15, GP-16, GP-17, GP-18, GP-100, GP-200 |
| PROBES NOT IN MONITORING NETWORK | GP-2, GP-3, GP-7, GP-8 |

*GROUNDWATER ELEVATIONS WERE NOT USED IN THE CREATION OF THE GROUNDWATER CONTOURS.
 FT, AMSL = FEET, ABOVE MEAN SEA LEVEL

NOTES:

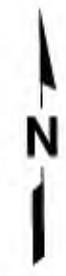
- GROUNDWATER CONTOURS WERE GENERATED USING THE SURFER SURFACE MAPPING SYSTEM SOFTWARE VIA THE KRIGING GRIDING METHOD AND ALTERED UTILIZING PROFESSIONAL JUDGEMENT. CONTOURS CORRESPOND TO SHALLOW AQUIFER - LENOIR-MOSHEIM.
- GROUNDWATER MONITORING WELL NETWORKS FOR THE PERMIT #588 AND #498 LANDFILLS ARE PROVIDED BELOW.

PERMIT #498 BACKGROUND: MW-101, MW-104A, AND MW-104B
 PERMIT #588 BACKGROUND: MW-106B AND MW-206A
 PERMIT #588 BACKGROUND AND PERMIT #498 SENTINEL: MW-206B
 PERMIT #588 BACKGROUND AND PERMIT #498 COMPLIANCE: MW-106A
 PERMIT #588 BACKGROUND AND PERMIT #498 COMPLIANCE/SENTINEL: MW-205B
 PERMIT #498 COMPLIANCE/PERFORMANCE: MW-108
 PERMIT #588 COMPLIANCE AND PERMIT #498 SENTINEL: MW-210A, MW210B, MW211A, AND MW-211B
 PERMIT #498 PERFORMANCE: GC OUTFALL (AKA. GRADIENT CONTROL SYSTEM)
 PERMIT #498 SENTINEL: MW-105A, MW-105B, AND MW-109

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 SCALE IN FEET

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| NO. | REVISION | DATE |
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| SHEET TITLE | EXISTING DRAINAGE PLAN |
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| PROJECT TITLE | SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS |

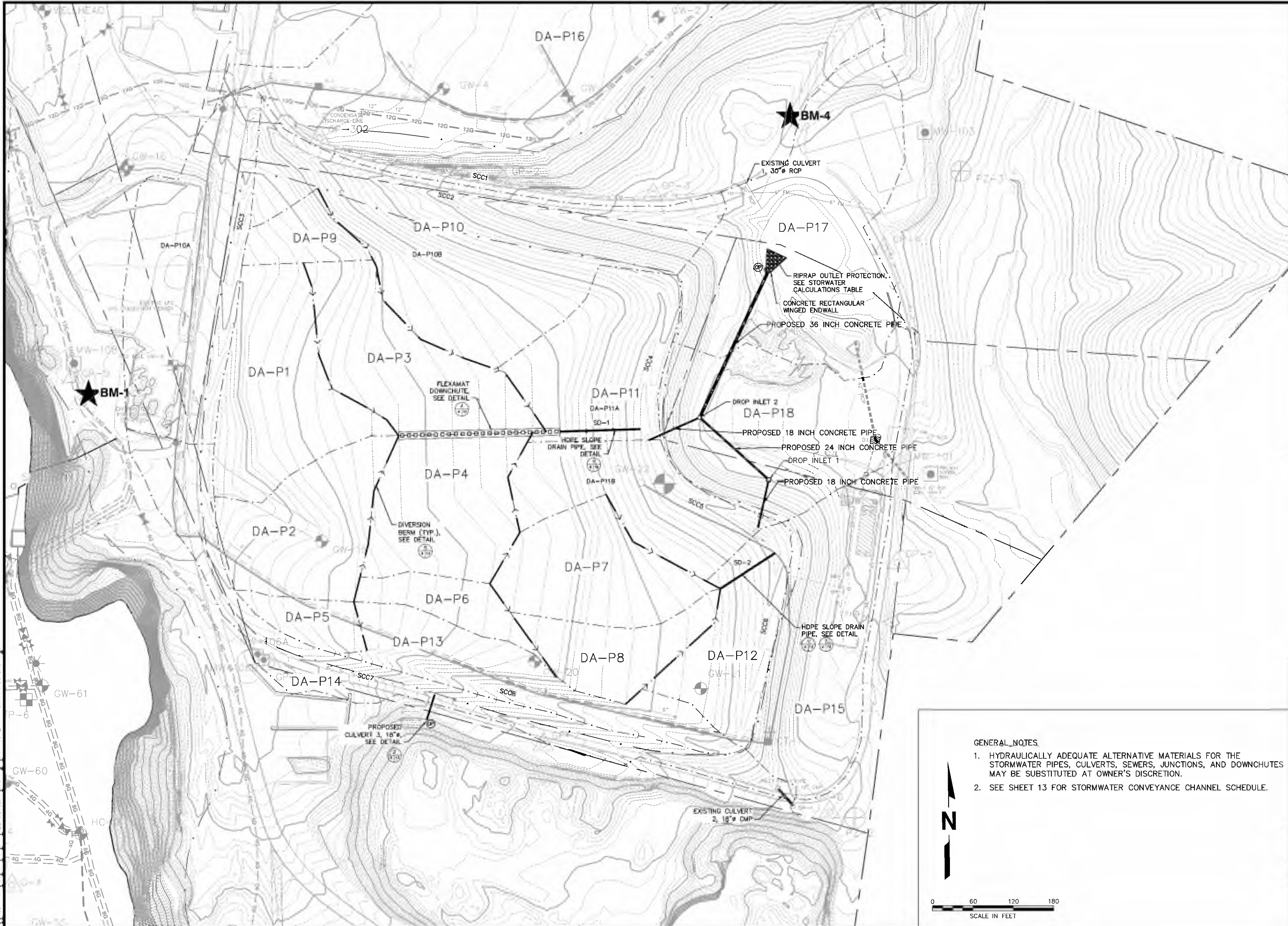
CLIENT
CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY
2655 VALLEY DRIVE
BRISTOL, VA 24201

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
1525 W. WASHINGTON AVENUE, SUITE 200
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| | | | |
|--------------|--------------|--------------|--------------|
| DATE PLOTTED | DATE PRINTED | DATE PLOTTED | DATE PRINTED |
| 1/31/23 | 1/31/23 | 1/31/23 | 1/31/23 |

TRW C.W. C.W. C.W.

CADD FILE: 02218208.05
DATE: 1/31/23
SCALE: AS SHOWN
DRAWING NO. 11 of 16



| NO | REVISION | DATE |
|----|----------|------|
| | | |
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| | | |
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SHEET TITLE
STORMWATER MANAGEMENT PLAN

PROJECT TITLE
SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

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

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
10500 WOODBRIDGE AVENUE, SUITE 201
FALLS CHURCH, VA 22044
PH: (800) 378-7466 FAX: (800) 378-7468

CADD FILE:
02218208.05

DATE:
1/31/23

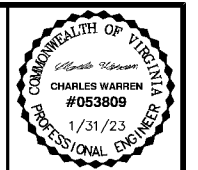
SCALE:
AS SHOWN

DRAWING NO.

GENERAL NOTES

- HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.
- SEE SHEET 13 FOR STORMWATER CONVEYANCE CHANNEL SCHEDULE.

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| Drainage Area Discharge Calculation Summary | | | | | | | | | | | | | | |
|---|-------------------|-----------|---------------|---------------------|----------|---------------------------|---------------------|----------|-------------------|---------------------|---------|---------------|------------------|-------------------|
| Drainage Area No. (Dwg. 11) | Drainage Area, AC | Curve No. | Overland Flow | | | Shallow Concentrated Flow | | | Concentrated Flow | | | Total Tc, min | 2-Year Flow, cfs | 25-Year Flow, cfs |
| | | | % Slope | Drainage Length, ft | Tc, min. | % Slope | Drainage Length, ft | Tc, min. | ΔH | Drainage Length, ft | Tc, min | | | |
| P1 | 1.21 | 94 | 10 | 100 | 8.41 | 8 | 24 | 0.09 | N/A | | 9 | 3.53 | 5.58 | |
| P2 | 0.97 | 94 | 10 | 100 | 8.41 | 7 | 160 | 0.62 | N/A | | 9 | 2.83 | 4.48 | |
| P3 | 1.07 | 94 | 5 | 100 | 11.1 | 5 | 50 | 0.23 | N/A | | 11 | 2.99 | 4.73 | |
| P4 | 1.00 | 94 | 5 | 100 | 11.1 | 5 | 172 | 0.79 | N/A | | 12 | 2.59 | 4.10 | |
| P5 | 0.24 | 94 | 10 | 100 | 8.41 | 5 | 58 | 0.27 | N/A | | 9 | 0.70 | 1.11 | |
| P6 | 0.33 | 94 | 5 | 100 | 11.1 | 5 | 110 | 0.51 | N/A | | 12 | 0.85 | 1.35 | |
| P7 | 0.90 | 94 | 5 | 100 | 11.1 | 10* | 206 | 0.71 | N/A | | 12 | 2.33 | 3.69 | |
| P8 | 0.54 | 94 | 5 | 100 | 11.1 | 7* | 184 | 0.78 | N/A | | 12 | 1.40 | 2.22 | |
| P9 | 0.29 | 94 | 5 | 100 | 11.1 | 16* | 80 | 0.28 | N/A | | 11 | 0.81 | 1.28 | |
| P10A | 1.69 | 79 | 5 | 100 | 11.1 | 5 | 125 | 0.58 | N/A | | 12 | 2.02 | 4.27 | |
| P10B | 2.54 | 87 | 5 | 100 | 11.1 | 25 | 150 | 0.31 | N/A | | 11 | 5.22 | 9.32 | |
| P11A | 1.09 | 94 | 5 | 100 | 11.1 | 12 | 120 | 0.36 | N/A | | 11 | 3.04 | 4.82 | |
| P11B | 0.96 | 94 | 7 | 100 | 9.7 | 20 | 114 | 0.26 | N/A | | 10 | 2.80 | 4.43 | |
| P12 | 0.77 | 94 | 10 | 100 | 11.1 | 20 | 54 | 0.12 | N/A | | 11 | 2.15 | 3.40 | |
| P13 | 0.93 | 94 | 5 | 100 | 11.1 | 10 | 127 | 0.41 | N/A | | 12 | 2.41 | 3.81 | |
| P14 | 1.30 | 84 | 5 | 100 | 11.1 | 10 | 200 | 0.65 | N/A | | 12 | 2.10 | 3.99 | |
| P15 | 1.46 | 79 | 10 | 100 | 8.41 | 8 | 200 | 0.73 | N/A | | 9 | 2.00 | 4.19 | |
| P16 | 6.92 | 79 | 4 | 100 | 12.14 | 10 | 600 | 1.96 | N/A | | 14 | 7.84 | 16.66 | |
| P17 | 2.31 | 79 | 10 | 100 | 8.1 | 8 | 210 | 0.77 | N/A | | 9 | 3.17 | 6.62 | |
| P18 | 1.68 | 79 | 20* | 100 | 8.28 | 8 | 250 | 0.91 | N/A | | 9 | 2.30 | 4.82 | |

Curve Number assumed as 94 within final cover area due to infiltration layer and 79 outside final cover (Group C soil)

Concentrated flow not considered, to be conservative

Manning's n value - 0.040 for riprap, 0.030 for tall grass

Riprap is VDOT Class 1

*Slope listed is a weighted average of slopes along the flow path. Actual Tc calculations utilized individual sections for paths with significant change in slope.

Stormwater Conveyance Channel Calculation Summary

| Ditch Number | Drainage Area No. (Dwg. 11) | 25-Year Flow, cfs | Ave. Slope, ft/ft | Ditch Type | Base Width, ft | Side Slopes | Ditch Depth, ft | Overtopping | | Erosion | | Lining |
|--------------|-----------------------------|-------------------|-------------------|------------|----------------|-------------|-----------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--------|
| | | | | | | | | Flow Depth D ₂₅ , ft | Velocity V ₂₅ , ft/s | Flow Depth D ₂₅ , ft | Velocity V ₂₅ , ft/s | |
| SCC-1 | Partial P16 | 6.12 | 0.09 | Trapezoid | 2 | 3:1 | 1.5 | 0.48 | 3.71 | Flexamat | | |
| SCC-2 | P9 + P10 | 14.87 | 0.09 | Trapezoid | 2 | 3:1 | 2 | 0.74 | 4.76 | Flexamat | | |
| SCC-3 | P10A | 4.27 | 0.05 | Trapezoid | 2 | 3:1 | 2 | 0.46 | 2.75 | Flexamat | | |
| SCC-4 | P1+P2+P3+P4+P11A | 23.71 | 0.03 | Trapezoid | 4 | 3:1 | 2 | 0.97 | 3.54 | Flexamat | | |
| SCC-5 | P11B | 4.43 | 0.03 | Trapezoid | 4 | 3:1 | 2 | 0.4 | 2.13 | Flexamat | | |
| SCC-6 | P5 + P12 + P13 | 8.33 | 0.03 | Trapezoid | 4 | 3:1 | 2 | 0.56 | 2.62 | Flexamat | | |
| SCC-7 | P14 | 3.99 | 0.08 | Vee | 0 | 3:1 | 1.5 | 0.63 | 3.35 | Flexamat | | |
| SCC-8 | P5 + P13 | 4.92 | 0.07 | Trapezoid | 4 | 3:1 | 2 | 0.33 | 2.99 | Flexamat | | |
| SCC-9 | Partial P13 | 2.00 | 0.07 | VEE | 0 | 3:1 | 1.5 | 0.4 | 3.5 | Flexamat | | |
| FD-1* | P5 + P13 | 18.89 | 0.05 | Trapezoid | 2 | 3:1 | 1.5 | 0.95 | 4.1 | Flexamat | | |

*Flexamat downchute

HDPE Slope Drain Pipe Calculation Summary

| Slope Drain No. | Drainage Areas | 25-Year Flow, cfs | Ave. Slope, ft/ft | Pipe Dia., in | Flow Depth, in. | Flow Velocity, ft/s | Full Flow Capacity, cfs |
|-----------------|----------------|-------------------|-------------------|---------------|-----------------|---------------------|-------------------------|
| SD-1 | P1, P2, P3, P4 | 18.89 | 0.2 | 18 | 7.6 | 26.62 | 50.87 |
| SD-2 | P7, P8 | 5.91 | 0.2 | 18 | 4.2 | 18.78 | 50.87 |

Manning's n value - 0.025 for corrugated plastic pipe

Storm Sewer Pipe Capacities

| Pipe ID | 25-Year Flow, cfs | Slope, ft/ft | Pipe Dia., in | 25yr Flow Depth, ft | 25yr Flow Velocity, ft/s | Full Flow Capacity, cfs |
|-----------------|-------------------|--------------|---------------|---------------------|--------------------------|-------------------------|
| 36" Outlet Pipe | 61.26 | 0.01 | 36 | 2.1 | 11.4 | 77 |
| 24" Sewer | 18.66 | 0.014 | 24 | 1.2 | 9.7 | 31 |
| 18" Pipe to DI2 | 47.03 | 0.35 | 18 | 0.9 | 40.8 | 72 |

Manning's n value - 0.025 for corrugated plastic pipe

Culvert Calculations Summary

| Culvert Description | Pipe Diameter ft | 25-Yr Pipe Flow cfs | Length, ft | Inv. In, ft | Inv. Out | Inlet Control, 25-yr Flow | | | Outlet Control | | | | Open Channel Assumption | | | | | | | |
|---------------------|------------------|---------------------|------------|-------------|----------|---------------------------|------|---------|----------------|--------|------------|-----|-------------------------|-----|---------|-----------------|----------------------|---------------|-------------------|--------------------|
| | | | | | | HW/D | HWin | Elhi | TW,ft | Dc, ft | (Dc + D)/2 | ho | ke | H | Elho | Control HW Elev | 25-Yr Flow Depth, ft | Road Elev. Ft | Pipe Capacity cfs | Pipe Velocity ft/s |
| Culvert 1 | 2.5 | 16.66 | 40 | 1847 | 1846 | 0.81 | 2.02 | 1849.02 | 1 | 1.4 | 1.7 | 1.7 | 0.2 | 0.6 | 1848.3 | 1849.2 | 0.83 | 1850 | 70.25 | 11.65 |
| Culvert 2 | 1.5 | 2.55 | 32 | 1860 | 1859 | 0.55 | 0.83 | 1860.83 | 0.5 | 0.6 | 1.1 | 1.1 | 0.2 | 0.4 | 1860.45 | 1860.83 | 0.36 | 1861 | 20.13 | 11.39 |
| Culvert 3 | 1.5 | 1.56 | 32 | 1897.5 | 1896.5 | 0.42 | 0.62 | 1898.12 | 0.4 | 0.7 | 1.1 | 1.1 | 0.2 | 0.4 | 1898 | 1898.12 | 0.29 | 1899 | 20.13 | 11.39 |

All pipe is assumed Class IV RCP

ho is larger of TW or (Dc+D)/2

Outlet Protection Summary

| Structure ID | Pipe Diameter ft | 25 Year Peak Flow, cfs | L _w , ft | Initial Width, ft | End Width, ft | d ₅₀ , min., ft |
|--------------|------------------|------------------------|---------------------|-------------------|---------------|----------------------------|
| Culvert 1 | 2.5 | 16.66 | 30 | 7.5 | 32.5 | 0.9 |
| Culvert 2 | 1.5 | 2.55 | 10 | 4.5 | 5.5 | 0.9 |
| Culvert 3 | 1.5 | 1.56 | 10 | 4.5 | 5.5 | 0.9 |

L_w and widths from VESCH Plate 3.18-4

Use VDOT Class IA riprap. Discharge channels will be lined with flexamat, so additional OP is not needed

| NO. | REVISION | DATE |
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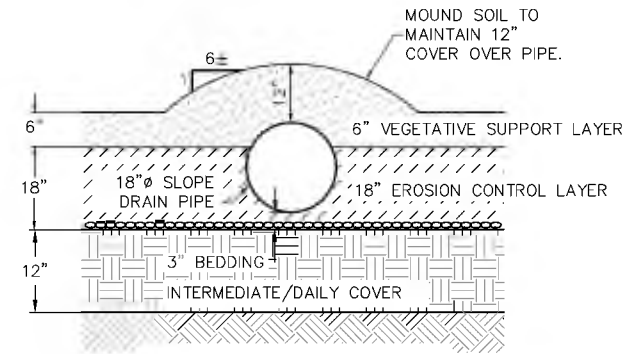
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|---------------|--|
| SHEET TITLE | STORMWATER CALCULATIONS |
| PROJECT TITLE | SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS |

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

| | | |
|---|---|---|
| SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 10520 WILSON ROAD, SUITE 100 PH: (804) 376-7466 FAX: (804) 376-7468 | DRAWN BY: TRW CHECKED BY: TRW DATE: 02/21/2025 05 | DISTRICT: TRW APP'D BY: TRW SCALE: AS SHOWN |
|---|---|---|

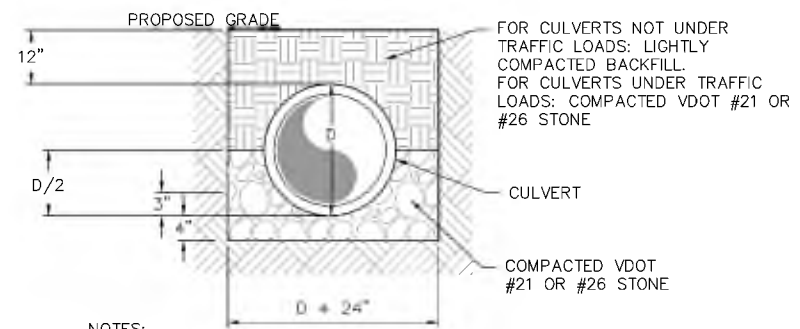
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| CADD FILE: | 02218208.05 |
| DATE: | 1/31/23 |
| SCALE: | AS SHOWN |
| DRAWING NO. | |

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PERMANENT SLOPE DRAIN SECTION A
N.T.S.

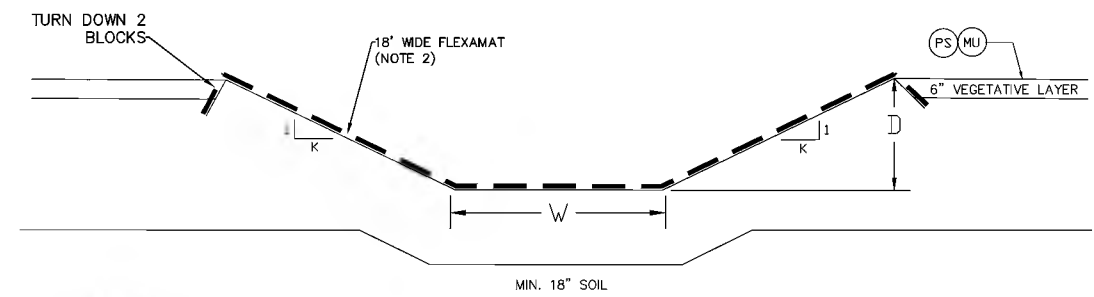
1
6 13



- NOTES:
1. DETAIL DOES NOT APPLY TO UNDERDRAIN PIPING.
 2. SHOULD GROUNDEASTE OR SATURATED SOILS BE EXPECTED, BEDDING SHALL BE VDOT #57 STONE IN LIEU OF VDOT #21 OR #26 STONE.

CULVERT BEDDING AND BACKFILL
N.T.S.

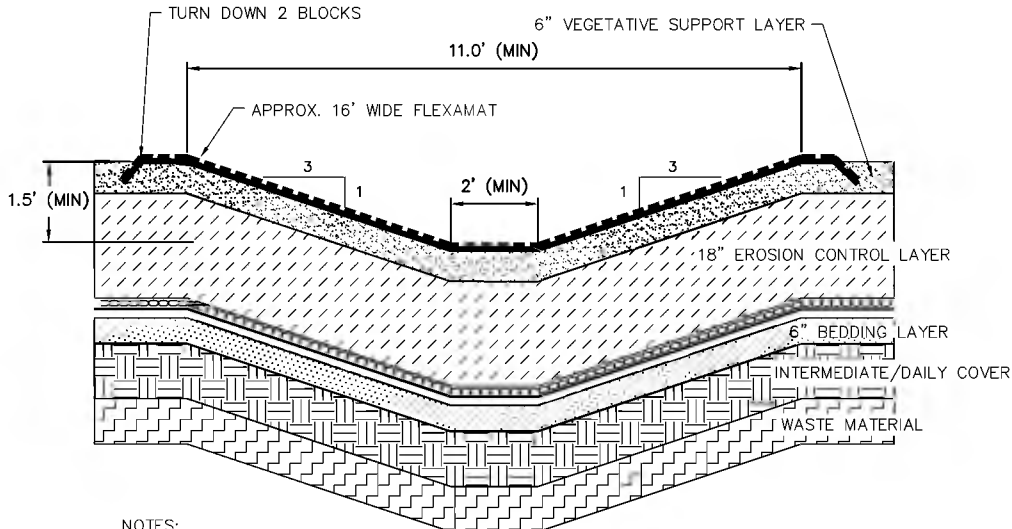
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- NOTE:
1. FOR FLEXAMAT LINED STORMWATER CONVEYANCE CHANNELS (SCC), CHANNEL DIMENSIONS SHALL BE PER THE FINAL GRADING PLAN AND SCC SCHEDULE ON THE STORMWATER CALCULATIONS SHEET.
 2. FLEXAMAT STANDARD WITH 8' AND 10' REQUIRED IF 18' WIDTH NOT AVAILABLE PER MANUFACTURER.

STORMWATER CONVEYANCE CHANNEL FLEXAMAT INSTALLATION DETAIL
N.T.S.

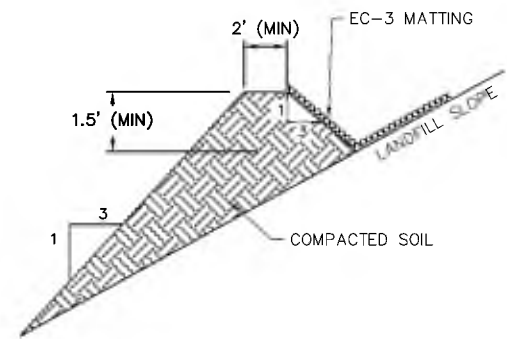
3
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- NOTES:
1. WHERE DIVERSION BERMS ENTER INTO FLEXAMAT DOWN CHUTE, EXTEND FLEXAMAT 8 FEET INTO DIVERSION BERM TO CREATE TRANSITION.
 2. CHANNEL DIMENSIONS SHOWN FOR DOWN CHUTE ONLY. FOR FLEXAMAT LINED STORMWATER CONVEYANCE CHANNELS (SCC), SEE CHANNEL SCHEDULE AND FINAL GRADING PLAN.

FINAL COVER FLEXAMAT DOWN CHUTE INSTALLATION DETAIL
N.T.S.

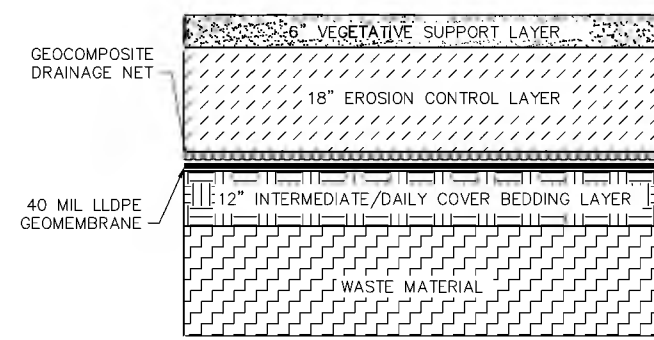
4
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- NOTES:
1. FLOW SLOPE OF THE DIVERSION TO BE MAX. 5% AND MIN. 2%.
 2. SEE FINAL COVER DOWNCHUTE DETAIL FOR CONNECTION OF DIVERSION BERMS.
 3. VESCH - STD 3.12.

DIVERSION BERM DETAIL
N.T.S.

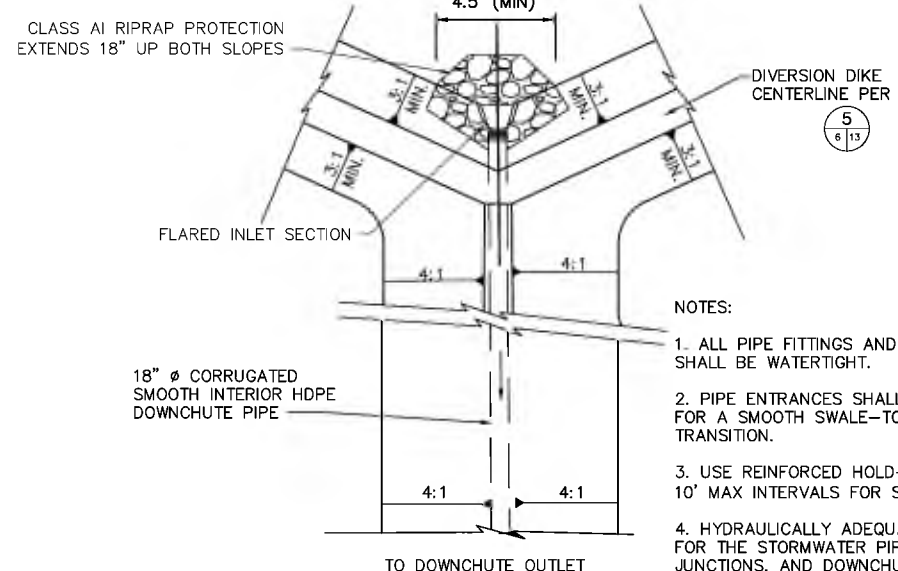
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6 13



- NOTES:
1. THE TOP 6" OF INTERMEDIATE/DAILY COVER WILL FUNCTION AS A BEDDING LAYER AND IS TO BE SMOOTH AND FREE OF STICKS, ROCKS LARGER THAN 3/8 INCH, OR OTHER IREGULARITIES WHICH COULD PUNCTURE THE SYNTHETIC CAP.
 2. THE SYNTHETIC CAP SHALL BE PLACED AS PER MANUFACTURER'S RECOMMENDATIONS. SEE CLOSURE SPECIFICATIONS FOR ALLOWABLE MATERIALS, INSTALLATION AND QUALITY CONTROL MEASURES.
 3. EROSION CONTROL LAYER SHALL BE PLACED IMMEDIATELY AFTER THE GEOCOMPOSITE. THE GEOCOMPOSITE MAY NOT BE EXPOSED TO SUNLIGHT FOR MORE THAN THE TIME LIMITED IN THE PROJECT SPECIFICATIONS.
 4. THE VEGETATIVE COVER SHALL BE PLACED AND SEEDING IMMEDIATELY AFTER INSTALLATION OF THE EROSION CONTROL LAYER. A TEMPORARY SEEDING MIXTURE MAY BE USED TO PROTECT THE AREA FROM EROSION. ONCE THE CLOSURE IS COMPLETED, FINAL SEEDING WILL OCCUR.

TYPICAL LLDPE CAP DETAIL
N.T.S.

6
6 13



- NOTES:
1. ALL PIPE FITTINGS AND CONNECTIONS SHALL BE WATERTIGHT.
 2. PIPE ENTRANCES SHALL BE GRADED FOR A SMOOTH SWALE-TO-FLANGE TRANSITION.
 3. USE REINFORCED HOLD-DOWN GROMMETS SPACED AT 10' MAX INTERVALS FOR SLOPE DRAIN PIPE.
 4. HYDRAULICALLY ADEQUATE ALTERNATIVE MATERIALS FOR THE STORMWATER PIPES, CULVERTS, SEWERS, JUNCTIONS, AND DOWNCHUTES MAY BE SUBSTITUTED AT OWNER'S DISCRETION.

HDPE DOWNCHUTE UPPER INLET, WITH DIVERSION BERMS
N.T.S.

7
6 13

COMMONWEALTH OF VIRGINIA
Professional Engineer
Charles Warren
#053809
1/31/23

| | |
|----------|--|
| DATE | |
| REVISION | |
| NO. | |

SHEET TITLE: DETAILS 1
PROJECT TITLE: SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS

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

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
10520 MIDCOTWAY, BRISTOL, VA 22113
PH: (804) 376-7466 FAX: (804) 376-7468

PROJ. NO: 02218208-05
DATE: 1/31/23
SCALE: AS SHOWN
DRAWING NO. 14 of 16

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PS LIME AND FERTILIZER APPLICATION RATES
 IF POSSIBLE, DETERMINE BY SOILS TEST. WHERE NOT POSSIBLE TO OBTAIN A SOILS TEST, THE FOLLOWING SOIL AMENDMENTS WILL APPLY:

LIME

COASTAL PLAIN: 2 TONS/ACRE PULVERIZED AGRICULTURAL GRADE LIMESTONE (90 LBS./1000 FT²)

PIEDMONT AND APPALACHIAN REGION: 2 TONS/ACRE PULVERIZED AGRICULTURAL GRADE LIMESTONE (90 LBS./1000 FT.)

NOTE: AN AGRICULTURAL GRADE OF LIMESTONE SHOULD ALWAYS BE USED.

FERTILIZER

MIXED GRASSES AND LEGUMES: 1000 LBS./ACRE 10-20-10 OR EQUIVALENT NUTRIENTS (23 LBS./1000 FT.).

LEGUME STANDS ONLY: 1000 LBS./ACRE 5-20-10 (23 LBS./1000 FT.) IS PREFERRED; HOWEVER, 1000 LBS./ACRE OF 10-20-10 OR EQUIVALENT MAY BE USED.

GRASS STANDS ONLY: 1000 LBS./ACRE 10-20-10 OR EQUIVALENT NUTRIENTS, (23 LBS./1000 FT.).

OTHER FERTILIZER FORMATIONS, INCLUDING SLOW-RELEASE SOURCES OF NITROGEN (PREFERRED FROM A WATER QUALITY STANDPOINT), MAY BE USED PROVIDED THEY CAN SUPPLY THE SAME AMOUNTS AND PROPORTIONS OF PLANT NUTRIENTS.

INCORPORATION - LIME AND FERTILIZER SHALL BE INCORPORATED INTO THE TOP 4-6 INCHES OF SOIL FROM A WATER QUALITY STANDPOINT, MAY BE USED PROVIDED THEY CAN SUPPLY THE SAME AMOUNTS AND PROPORTIONS OF PLANT NUTRIENTS.

| ORGANIC MULCH MATERIALS AND APPLICATION RATES | | | |
|---|---|------------------|---|
| MULCHES: | RATES: | | NOTES: |
| | PER ACRE | PER 1000 SQ. FT. | |
| STRAW OR HAY | 1 1/2 - 2 TONS (MINIMUM 2 TONS OF WINTER COVER) | 70 - 90 LBS. | FREE FROM WEEDS AND COARSE MATTER. MUST BE ANCHORED, SPREAD |

PERMANENT SEEDING PS

VESCH STD & SPEC 3.32

**TABLE 3.32-C
 SITE SPECIFIC SEEDING MIXTURES
 FOR APPALACHIAN/MOUNTAIN AREA**

| MINIMUM CARE LAWN | TOTAL LBS. PER ACRE |
|---------------------------------------|---------------------|
| -COMMERCIAL OR RESIDENTIAL | 200-250 LBS. |
| -KENTUCKY 31 OR TURF-TYPE TALL FESCUE | 90-100% |
| -IMPROVED PERENNIAL RYEGRASS * | 0-10% |
| -KENTUCKY BLUEGRASS | 0-10% |

HIGH-MAINTENANCE LAWN

MINIMUM OF THREE (3) UP TO FIVE (5) VARIETIES OF BLUEGRASS FROM APPROVED LIST FOR USE IN VIRGINIA

125 LBS.

GENERAL SLOPE (3:1 OR LESS)

| | |
|--------------------------|----------------|
| - KENTUCKY 31 FESCUE | 128 LBS. |
| - RED TOP GRASS | 2 LBS. |
| - SEASONAL NURSE CROP ** | <u>20 LBS.</u> |
| | 150 LBS. |

LOW-MAINTENANCE SLOPE (STEEPER THAN 3:1)

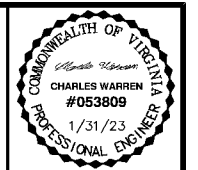
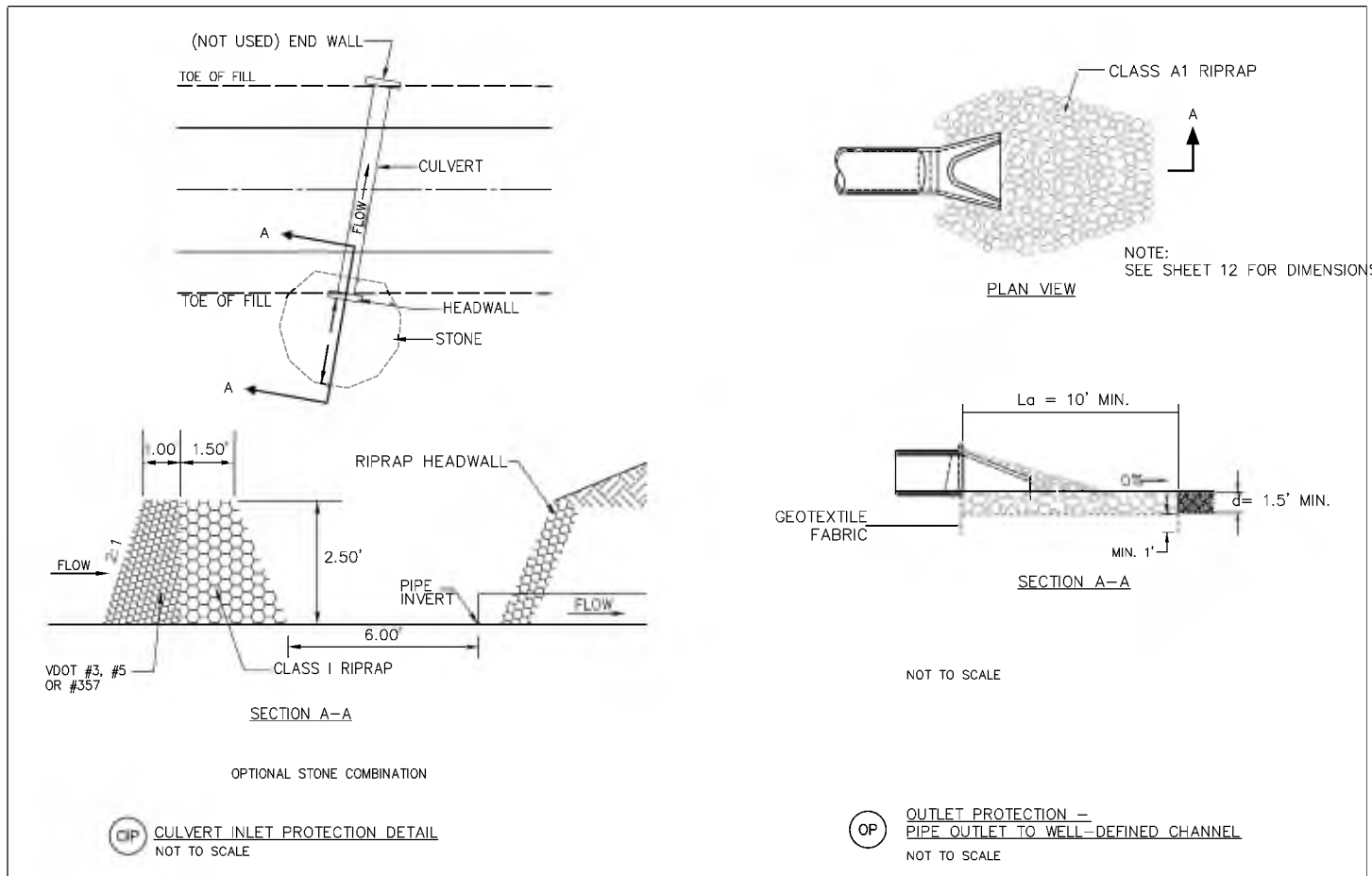
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|--------------------------|----------------|
| - KENTUCKY 31 FESCUE | 108 LBS. |
| - RED TOP GRASS | 2 LBS. |
| - SEASONAL NURSE CROP ** | 20 LBS. |
| - CROWN VETCH *** | <u>20 LBS.</u> |
| | 150 LBS. |

* PERENNIAL RYEGRASS WILL GERMINATE FASTER AND AT LOWER SOIL TEMPERATURES THAN FESCUE, THEREBY PROVIDING COVER AND EROSION RESISTANCE FOR SEEDBED.

** USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:
 MARCH, APRIL THROUGH MAY 15TH ANNUAL RYE
 MAY 16TH THROUGH AUGUST 15TH FOXTAIL MILLET
 AUGUST 16TH THROUGH SEPTEMBER, OCTOBER ANNUAL RYE
 NOVEMBER THROUGH FEBRUARY WINTER RYE

*** IF FLATPEA IS USED, INCREASE TO 30 LBS./ACRE. ALL LEGUME SEED MUST BE PROPERLY INOCULATED. WEEPING LOVEGRASS MAY ALSO BE INCLUDED IN ANY SLOPE OR LOW-MAINTENANCE MIXTURE DURING WARMER SEEDING PERIODS; ADD 10-20 LBS./ACRE IN MIXES.

III - 302



| DATE | REVISION | NO. |
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SHEET TITLE: **DETAILS 2**
 PROJECT TITLE: **SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS**

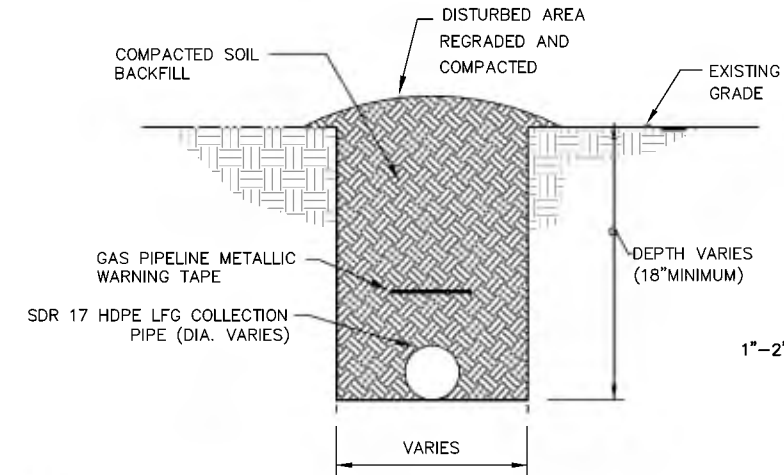
CLIENT: **CITY OF BRISTOL INTEGRATED SOLID WASTE MANAGEMENT FACILITY**
 2655 VALLEY DRIVE
 BRISTOL, VA 24201

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
 6525 WOODBURN AVENUE, SUITE 100, BRISTOL, VA 24215
 PH: (804) 370-7460 FAX: (804) 370-7468

PROJ. NO: 02218208-05
 DATE: 1/31/23
 DRAWN BY: TRW
 CHECKED BY: TRW
 DATE: 1/31/23
 DESIGNED BY: TRW
 APPROVED BY: C.J.W.

CADD FILE: 02218208.05
 DATE: 1/31/23
 SCALE: AS SHOWN
 DRAWING NO.

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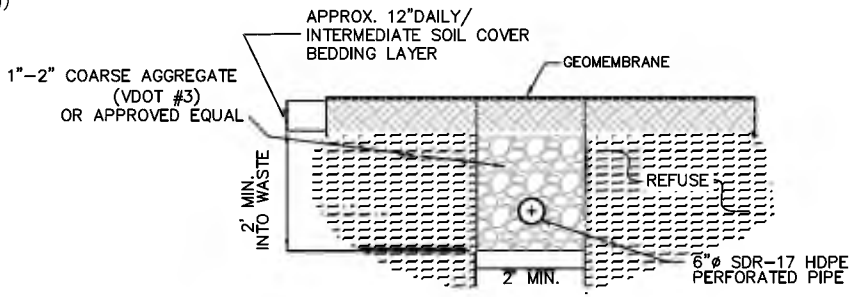


1 LFG COLLECTION PIPE TRENCH DETAIL

5,6 15 NOT TO SCALE

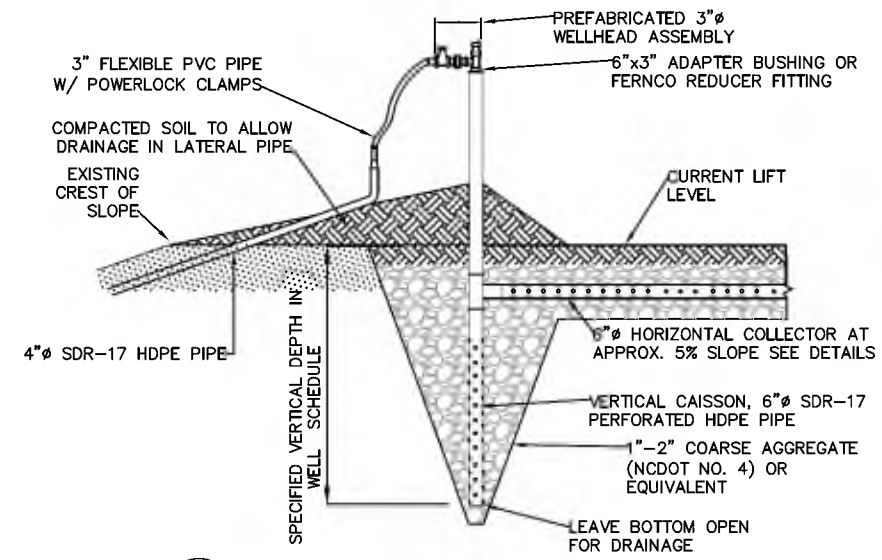
NOTES:

1. PNEUMATIC SUPPLY, FORCEMAIN, AND SPARE CONDUIT PIPING TO BE OMITTED FOR LFG COLLECTION PIPE WITHIN WASTE FOOTPRINT.



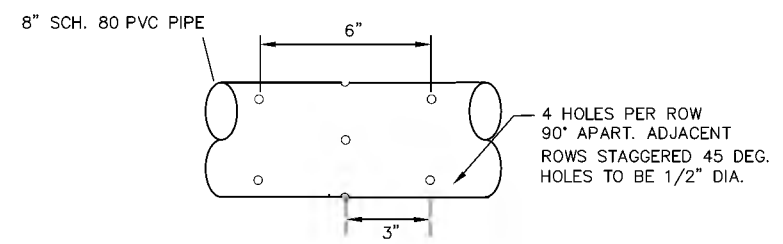
2 HORIZONTAL COLLECTOR SECTION

5,6 15 NOT TO SCALE



3 HORIZONTAL COLLECTOR WITH PIT DETAIL

5,6 15 NOT TO SCALE



4 PERFORATED PIPE DETAIL

5,6 15 NOT TO SCALE

| Well ID | Northing | Easting | Surface Elevation (MSL) | Top of Liner System Elevation (MSL) | Total Boring Depth (ft) | Solid Wall Length (ft) | Slotted Length (ft) |
|---------|------------|-------------|-------------------------|-------------------------------------|-------------------------|------------------------|---------------------|
| GW-69 | 3398552.73 | 10413034.88 | 1931 | 1911 | 10 | 0 | 9 |
| GW-70 | 3398839.81 | 10412817.39 | 1921 | 1901 | 10 | 0 | 9 |
| GW-71 | 3398950 | 10412836.87 | 1919 | 1899 | 10 | 0 | 9 |
| GW-72 | 3399033.65 | 10412880.61 | 1918 | 1898 | 10 | 0 | 9 |

NOTES:

1. CONTRACTOR SHALL SURVEY PROPOSED WELL LOCATIONS FOR ACTUAL GROUND ELEVATIONS BEFORE CONSTRUCTION.
2. CONTRACTOR SHALL SUBMIT SURVEY INFORMATION, INCLUDING NORTHING AND EASTING AND ACTUAL SURFACE ELEVATIONS, TO OWNER AND ENGINEER FOR POTENTIAL ADJUSTMENTS TO WELL BORING DEPTHS. FOLLOWING REVIEW OF ADJUSTED WELL SCHEDULE, CONTRACTOR SHALL OBTAIN WRITTEN AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.

5 LANDFILL GAS EXTRACTION WELL SCHEDULE

5,6 15

| DATE | REVISION | NO. |
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|---------------|---|
| SHEET TITLE | DETAILS 3 |
| PROJECT TITLE | SWP #498 FINAL CLOSURE SYSTEM PERMIT MODIFICATION DESIGN PLANS |

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

| | |
|--|--|
| SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC. 6525 WILSON ROAD, SUITE 100 PH: (804) 376-7460 FAX: (804) 376-7463 | DWG. BY: TRW CHK. BY: C.J.W. DATE: 02/21/2023 05 D/A R/W BY: TRW APP. BY: C.J.W. |
|--|--|

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| CADD FILE: | 02218208.05 |
| DATE: | 1/31/23 |
| SCALE: | AS SHOWN |
| DRAWING NO. | |

Midlothian, VA

PROJECT: City Bristol, LF Engineering, ISWMF, VA 02218208.05 DATE: 2/10/2023

SUBJECT: January Monthly Compliance Reports SWP #588, SWP #498, & SWP #221 TRANSMITTAL ID: 00009

PURPOSE: For Record VIA: Info Exchange

FROM

| NAME | COMPANY | EMAIL | PHONE |
|----------------------------------|---------------|--------------------------|-----------------|
| Charles Warren Midlothian, VA | SCS Engineers | CWarren@scsengineers.com | +1-804-486-1903 |

TO

| NAME | COMPANY | EMAIL | PHONE |
|---|--|-----------------------------------|-------|
| Jonathan Chapman 355-A Deadmore Street Abingdon VA 24210 United States | Virginia Department of Environmental Quality | Jonathan.chapman@deq.virginia.gov | |

REMARKS: Jonathan,
In accordance with Item 8.iii of Appendix A and Item 8 of Appendix B of the Consent Decree between the City and VDEQ, SCS is submitting the Monthly Compliance Reports for the Solid Waste Permits #588, #498, and #221 on behalf of the City of Bristol, Virginia. The reports can be downloaded using the links below. Please note that the data from monthly gas monitoring of leachate collection components (Item 1.i of Appendix A), sampling and analysis of dual extraction wells (Item 4.ii of Appendix A), and topographic survey (Item 5.ii of Appendix A) are contained within the Solid Waste Permit #588 report. Let us know if you have questions about the contents of these reports.
Regards,
Charles

DESCRIPTION OF CONTENTS

| QTY | DATED | TITLE | NOTES |
|-----|-----------|--|-------|
| 1 | 2/10/2023 | January Compliance Report - SWP 221.pdf | |
| 1 | 2/10/2023 | January Compliance Report - SWP 498.pdf | |
| 1 | 2/10/2023 | January 2023 Compliance Report - SWP 588.pdf | |

Transmittal

DATE: 2/10/2023
TRANSMITTAL ID: 00009

COPIES:

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| Charles Warren | (SCS Engineers) |
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| Erin Malone | (Environmental Protection Agency) |
| Erin Willard | (Environmental Protection Agency) |
| Jacob Chandler | (Bristol, VA, City of) |
| Jeffery Hurst | (Virginia Department of Environmental Quality) |
| Joey Lamie | (City of Bristol) |
| Jonathan Hayes | (Bristol, VA, City of) |
| Michael Martin | (Bristol, VA, City of) |
| Randall Eads | (City of Bristol) |
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| Jennifer Robb | (SCS Engineers) |
| Brandon King | (SCS Engineers) |
| Lindsey Hall | (SCS Engineers) |
| Samuel Burgess | (SCS Engineers) |