Fountain Avenue Landfill
Brooklyn, New York
NYSDEC Site No. 224003

Annual Post Closure Operation, Maintenance and Monitoring Report
January 2019 through December 2019

March 2020
(Revised September 2020)

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Section 1 – Introduction

This Post-Closure Annual Report (Report) has been prepared by the New York City Department of Environmental Protection (DEP) to fulfill the reporting requirements contained in the Fountain Avenue Landfill (FAL) Operation and Maintenance (O&M) Manual, the FAL Monitoring Plan, and 6NYCRR Parts 360 and 363. This Report contains current background information and documents the operation, maintenance and monitoring activities performed between January 1, 2019 and December 31, 2019.

Section 2 – Site Background

The FAL is an inactive hazardous waste disposal site located on 297 acres at the southern end of Fountain Avenue in Brooklyn, New York. It is bounded on the northwest by the Belt Parkway, on the southeast by Jamaica Bay, on the southwest by Hendrix Creek and on the east by Old Mill Creek. A site location map is provided in Figure 1.

The FAL was opened in 1961, when land-filling activities shifted from the Pennsylvania Avenue Landfill (PAL) located on the other side of Hendrix Creek. Under the responsibility of the New York City Department of Sanitation (DOS), the landfill received municipal and industrial wastes between 1961 and 1985. It is reported that, between 1974 and 1980, illegal dumping of hazardous wastes occurred at the Site. Liquid wastes reportedly disposed of at the FAL included waste oils, spent plating baths, sludges, thinners and lacquers. Asbestos and medical wastes were also reported to have been discarded. In addition, contaminated waste oils were sprayed on site access roads for dust control.

The FAL was added to the New York State Registry of Inactive Hazardous Waste Disposal Sites initially as a Class 3 site, requiring further surveillance. In 1983, the FAL was reclassified as a Class 2 site, which is a site that poses a significant threat to public health and the environment.

In 1974, ownership of the lands on which the FAL is situated, transferred with other parcels from the City of New York to the United States Department of the Interior, National Park Service (NPS), for the creation of the Gateway National Recreation Area, with the understanding that landfill operations at FAL could continue at the Site until the end of 1985.

On December 16, 1985 and again on April 17, 1990, NYSDEC executed Orders on Consent with DOS to close and remediate the Site. On May 15, 1992, DEP entered into an Order on Consent (Index 2-24-003) with the New York State Department of Environmental Conservation (NYSDEC) for the remediation of the FAL. In response, the DEP initiated a Remedial Investigation/Feasibility Study (RI/FS) in March 1993 to assess the nature and extent of contamination. The Remedial Investigation Report was released in May 1994, and the Feasibility Study Report was released in September 1994. The RI/FS revealed that certain areas and media at the Site required remediation. A summary of the findings follows:

- Soil – Surface soils exhibited semi-volatile organic compounds (SVOCs) and metal levels that exceeded soil cleanup guidelines.

- Groundwater – Levels of volatile organic compounds (VOCs), SVOCs, metals and polychlorinated biphenyls (PCBs) exceeding the drinking water standards were confined to groundwater samples collected from the leachate mound (Fill Aquifer). As a result, the Upper Glacial Aquifer does not require remediation.
- Surface Water – the primary landfill-related exceedances of surface water standards were for chlorobenzene which was present in low concentrations in the leachate mound and in high concentrations in surface water at the drainage outlet into Old Mill Creek.
- Sediment – samples taken along the Hendrix Creek demonstrated levels of VOCs, SVOCs, metals, PCBs and pesticides that generally exceeded the wildlife and human bioaccumulation guideline concentrations, but were below the benthic toxicity guidelines.

As specified by the Order on Consent, Interim Remedial Measures (IRMs) were implemented. An interim cover was placed to prevent casual contact with exposed waste and rip-rap was installed for shoreline protection.

The goals for the remediation program were set to eliminate or minimize the threats to the public health and the environment, by addressing the contamination of surface soils and waste disposal areas; by protecting surface waters through eradication of run-off and erosion from contaminated substrates and the migration of leachate into surrounding waters; by minimizing the impact of contaminated groundwater; by reducing soil and sediment contamination levels and removing the possibility of human or animal contact; and, by controlling and containing landfill gas emissions.

Subsequently, in 1995, the NYSDEC published the Record of Decision (ROD) for the FAL, which mandated that the selected remedy for the site consist of "landfill capping with active gas collection and long term environmental monitoring." In accordance with the ROD, in October 2000, the DEP awarded Construction Contract No. LF-FAL-G4 for the remediation of the FAL. The main elements of the selected remedy included regrading of the top of the landfill to ensure proper drainage and minimize erosion, a landfill cap meeting the requirements of 6NYCRR Part 360 regulations, and landfill gas control with an active collection system consisting of extraction wells screened in the waste and connected via blowers to an enclosed flare. Construction of the final cover, stormwater management, landfill gas management, environmental monitoring and ancillary systems was completed in July 2009.

Once construction of the landfill remedial systems was completed, responsibility for their O&M was transferred from the DEP Bureau of Engineering Design and Construction (BEDC) to the DEP Bureau of Wastewater Treatment (BWT) and the operations, maintenance and monitoring contractor. The landfill cover, stormwater and ancillary systems were transferred to BWT on March 1, 2009. The landfill gas management system was transferred to BWT on August 1, 2009.

The ROD called for a pre-approved Post-Closure Monitoring, Sampling and Analysis Plan (Monitoring Plan, the Plan), to commence within one month of DEP's receipt of NYSDEC's written acceptance of the Final Engineering Report (FER). The Plan requires monitoring water-level elevations and groundwater quality in twelve monitoring wells, and monitoring for the presence of methane in seven gas monitoring wells located beyond the perimeter of the cap. The

Plan was approved in March 2009. Subsequently, NYSDEC approved the following modifications to the groundwater monitoring portion of the Plan in a letter of May 9, 2011 to the DEP:

- Monitoring can be performed independently of the tide cycle.
- The low-flow purging and sampling method can be used to collect the samples.
- Sampling can be performed annually in rotating calendar quarters instead of quarterly.
- During the first five-year review period, monitoring should be performed for all Plan parameters.
- Based on the results from the first five annual monitoring rounds, the NYSDEC may allow non-detected parameters to be excluded from subsequent annual monitoring rounds, except as indicated below.
- Monitoring for all Plan parameters will be performed once every five years, coinciding with the last year of each five-year review period.

Additionally, per Part 360, the groundwater samples are to be analyzed by a State-certified environmental laboratory and validated by an independent data validation company.

The FER was submitted to NYSDEC for review on September 7, 2011, and was accepted by the NYSDEC on January 31, 2012. The formal post-closure monitoring period officially began on February 1, 2012. The first official round of quarterly gas monitoring was performed in February 2012, within one month of the start of the post-closure period. With the concurrence of the NYSDEC, the first round of annual groundwater monitoring was performed during the 2nd Quarter of 2012 to coincide with the annual groundwater monitoring round at the PAL so that both sites are on the same monitoring schedule. Annual groundwater monitoring has been performed in rotating calendar quarters (i.e., once every five quarters) thereafter, similar to the PAL.

In July 2012, the NYSDEC changed the classification of the FAL site from a Class 2 to a Class 4 site on the Registry of Inactive Hazardous Waste Disposal Sites since it was properly remediated and requires site management.

The Gateway National Recreation Area in which the former PAL and FAL are situated was established by the NPS, Site Owner, in order to "preserve and protect for the use and enjoyment of present and future generations an area possessing outstanding natural and recreational features". In 2017, NPS proposed, and DEP and the New York State Office of Parks, Recreation and Historic Preservation (NYS Parks) agreed, that it would be to the mutual advantage of the Federal, State and City governments, and to the benefit of the public, to develop the concept of a park and restoration plan for this area.

Pursuant to said proposal, NYS Parks entered into a General Agreement with NPS, allowing the State to invest State funds for the design, construction, operation and maintenance of a NYS Park at the former PAL and FAL. NPS, NYS Parks, and DEP subsequently entered into a Cooperative Management Agreement to effectuate the development of Phase 1 of this State Park (Park), to be named in honor of Shirley Chisholm. In accordance with the requirements of the sites' Environmental Notice, in December 2017, NYS Parks received approval from NYSDEC and the New York State Department of Health to change the Site's land use from a closed landfill to a closed landfill with NYSDEC-approved passive recreational uses.

On August 24, 2018, an agreement between the DEP and the NYS Parks was executed in order to delineate the responsibilities of the two agencies in relation to NYS Parks' efforts for the development of the PAL and FAL into the Shirley Chisholm State Park (Park). NYS Parks is in the process of making capital improvements to the sites to create the Park and is responsible for the maintenance of those improvements as well as the maintenance of portions of the capping and closure systems. All work performed by NYS Parks will be done in accordance with the sites' RODs, Consent Orders, Environmental Notices and O&M Plans. Part of the FAL portion of the Park was opened to the public on August 27, 2019. The Park entrance was opened to pedestrians on October 7, 2019, and the pier opened on November 5, 2019.

Section 3 – Annual Summary

This Report covers the period from January 1 through December 31, 2019. It summarizes the operation, maintenance and monitoring activities at the Site during this period.

3.1 Landfill Gas Management System

The landfill gas management system represents one of the elements of the selected remedy in the Site's ROD. The ROD required the selected remedy "to ensure full collection and control of landfill gas". This system must also meet the requirements of 6NYCRR Part 363 to limit off-site gas migration to 25% of the lower explosive limit (LEL) at the property line and in structures (i.e., 1.25% gas in air). In 2011, due to below-threshold NOx emissions, the NYSDEC downgraded the Air Title V Facility Permit for the landfill gas flare emissions to an Air Facility Registration (Certificate # 2-6105-00687/00003). The FAL was subject to the EPA's Greenhouse Gas Reporting Rule through 2016, but due to relatively low emissions the EPA determined that no further monitoring/reporting of greenhouse gas emissions was required for this site.

The system features 265 gas extraction wells (EWs), a below-grade polyethylene collection header piping network with 56 isolation valves, three 2,600-scfm centrifugal blowers, condensate collection system, an enclosed high temperature flare system, process instrumentation and controls, a programmable logic control (PLC) management system, a fire alarm system and an emergency condition alarm auto-dialer phone system. The annual FDNY inspection was conducted on December 19th and the system passed. A schematic diagram of the overall Landfill Gas Management System, with the locations of the EWs, header pipes and flare facility, is shown in Figure 2.

All 265 EWs were inspected and monitored for gas content (percent CH_4, CO_2 and O_2), temperature and vacuum pressure each month. Deficiencies such as missing signage, track cleaning or sampling port repair were corrected, when possible at the times of the inspections. Work orders are issued for all other work. The landfill gas management system continues to struggle at times due to condensate accumulation in the headers. The LFG-3 reports are included in Appendix A of the Quarterly Reports.

The main headers that convey the landfill gas slope continuously around the landfill to a low point adjacent to the blower and flare station located at the southeastern corner of the landfill. Each of the headers is connected to a condensate drain line at their low point. These drain lines and the drain lines from the three blower demisters (knock-out pots) empty into the 8,000 gallon condensate tank located within the flare station. On February 21st, 7,000 gallons of condensate was removed by a private waste hauler for proper off-site disposal. Prior to disposal, the condensate was sampled on January 11th, and the laboratory reports are included in Appendix A of the 2019 First Quarter Report. At the end of this annual reporting period, the condensate tank inventory was 4,350 gallons.

The landfill gas collection system is comprised of three closed loops, each of which is split into two headers. The system includes 56 isolation valve boxes for pressure and flow adjustments and to isolate portions of the system for repairs. As the six (two 8-inch and four 12-inch) headers come up into the blower and flare station, they each contain a manually operated butterfly valve for individual header vacuum adjustment, temperature and vacuum gauges, and monitoring ports. They then join into the 12-inch main header on the vacuum side of the blower station. This main header contains an electric modulating butterfly valve which automatically adjusts the valve position to control the landfill vacuum or flow according to PLC programming. This is followed by an electro-pneumatic butterfly valve which, actuated by compressed nitrogen, automatically closes in the event of any system failure or shutdown.

The landfill gas then flows through three 12" plug valves into the three demisters, exits through 12" piping which is reduced to 8" before entering the blowers, exits the blowers through 8" plug valves and discharges through a single 16-inch header and flame arrestor into the enclosed flare. The system is operated with one blower in service and the remaining two on standby. Blowers are switched periodically and preventive maintenance is performed to ensure all three blowers remain in good operating condition. The flare support system includes a propane fired pilot, a purge air blower, two manual and two automatic dampers, and temperature control with three thermocouples. The flare operation is normally on automatic control using the bottom thermocouple at a target temperature of 1,600 ºF. Figure 3 exhibits the layout of the Flare and Blower Station.

Daily inspections are conducted and readings are recorded on the LFG-1 inspection logs. The monthly summary reports of the LFG-1 daily inspections can be found in Appendix A of the Quarterly Reports.

During this annual reporting period, the landfill gas flaring system processed 377,475,500 SCF of landfill gas at an average methane content of 38.6% (see table on the following page). The flare ran for 37.9% of the time at an average flow of 1,894.2 scfm. The flare operation down time totaled 5,438.59 hours or 62.1% of the twelve-month interval. A large portion of the down time was experienced due to fire alarm panel communication malfunction that required the flare to be operated on fire watch (i.e., operated only when the DEP OM&M Contractor was on-site). Down time was also experienced due to a propane system leak that was repaired, flame failures from low CH_4, thermocouple malfunction, FDNY annual inspection, and a false fire alarm. Landfill gas flow data is summarized in the table that follows.

Fountain Avenue Landfill Flare Operation - 2019			
MONTH	**CH_4** (% by Volume)	**Time in Service** (Hours)	**Flow** (SCF)
January	29.84	149.3	16,335,000
February	34.52	92.1	10,583,000
March	42.64	76.8	9,332,000
April	40.03	160.1	19,620,000
May	46.30	160.6	19,749,000
June	41.32	141.1	17,810,000
July	46.37	159.4	19,340,000
August	48.81	219.5	26,455,000
September	48.92	120.4	14,984,000
October	37.82	692.5	80,784,000
November	24.78	693.5	73,989,000
December	21.44	656.1	68,494,500
Average	**38.57**		**31,456,292**
Total		**3,321.4**	**377,475,500**

Bi-weekly (LFG-2) and quarterly (LFG-4) inspections were conducted, and copies are included in Appendix A of the Quarterly Reports. Deficiencies encountered at the flare and blower station during scheduled inspections, and still pending, include the damaged insulation at the top of the flare stack and the Condensate Tank Sentinel that needs replacement. While replacement of the level sensor is pending, the condensate inventory is monitored twice a week. A replacement fire alarm panel was installed on August 21st, and a new central station monitoring company was engaged and the panel was programmed on October 3, 2019. The system was taken off fire watch on October 4, 2019.

Equipment components exposed to the Hurricane Sandy surge that are currently operational but were not designated for replacement will continue to be monitored and assessed over time and may be replaced in the future, if necessary.

3.2 Final Cover System

The landfill final cover system prevents stormwater infiltration into the landfill and landfill gas migration into the atmosphere. The ROD stipulated the construction of a 6NYCRR Part 360 landfill cap. The landfill final cover system is comprised of layers, from top to bottom, as follows:

- Vegetative topsoil layer with a minimum thickness of 6 inches.
- 12-inch thick barrier protection layer.
- Geocomposite drainage layer as follows.
    - A cushion geotextile in the Type 1 Cover System (areas with <5% slopes); or

- A double-sided Geocomposite in the Type 2 Cover System (areas with >5% slopes).

- Linear Low Density Polyethylene (LLDPE) geomembrane material.
  - Smooth 40-mil thick LLDPE geomembrane in the Type 1 Cover System (areas with <5% slopes); or
  - Textured 40-mil thick LLDPE geomembrane in the Type 2 Cover System (areas with >5% slopes).

- 6-inch-thick Type II cover soil layer was placed over the re-graded waste material.

The O&M Manual requires the final cover system be inspected on a monthly basis and immediately after each major rainfall event equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). The surface of the landfill was divided into 16 inspection zones. All 16 inspection zones are shown in Figure 4, which is utilized to identify the system components. This figure is also utilized to identify the components of the stormwater and ancillary systems. A record of the final cover system inspection is summarized on a Monthly Checklist Form FCS-1, with deficiencies noted on the Deficiency and Problems Form (DP-1). The monthly inspection reports can be found in Appendix B of the Quarterly Reports. The final cover system is inspected for surface cracking, vegetative growth, vector penetration, settlement, erosion, slope stability, seepage, and vandalism. The inspection is performed by walking up and down the side slopes and across each zone several times. Work orders are issued for deficiencies noted during monthly inspections that cannot be addressed at the time. Deficiencies, including those pending from the previous reporting period, are some areas of erosion identified on the DP-1 Form that continue to be monitored and remain to be filled and seeded, and ponding in Inspection Zones G, H and M.

Under the Agreement executed on August 24, 2018 between the DEP and NYS Parks, NYS Parks is responsible for the maintenance/repair of the following elements of the Final Cover System:

- Surface restoration and replanting of the grass cover and topsoil layer of the final cover system; and
- Landscaping, both existing and any landscaping installed by NYS Parks. At a minimum, NYS Parks shall perform all landscaping work, including maintenance and repair of existing vegetation/landscaping including those in the existing planting islands, required in the O&M Manual.

3.3 Stormwater Management System

The stormwater management system is an integral part of the capping and closure system required under the 6 NYCRR Part 360 regulations to protect the landfill final cover system. The system was designed to collect, transport and discharge stormwater to the surface waters surrounding the FAL in order to prevent stormwater ponding and erosion damage to the final cover system.

This system consists of several components (as shown on Figure 4) which require monitoring, inspection, and periodic maintenance. The system has been divided into three subsystems (SWM-1, SWM-2 and SWM-3) for ease of inspection and reporting. These subsystems include:

- SWM-1: Stormwater drainage swales, wetlands and revetment area
- SWM-2: Outlets, culverts, and rip-rap inlet and outlet protection, and
- SWM-3: Down chute pipes, manholes, pipe trenches and energy dissipation structures.

The O&M Manual requires that stormwater management systems SWM-1, SWM-2 and SWM-3 be inspected on a monthly basis and immediately after each major rainfall event equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). A record of the inspection is summarized on Monthly Checklist Forms SWM-1, SWM-2, SWM-3 and DP-1 in accordance with the requirements of the O&M Manual. A Deficiency and Problems Form DP-1 is completed to summarize the items marked not satisfactory (NS) in the stormwater system checklist forms.

Deficiencies identified during the period covered by this Annual Report do not necessarily affect the overall performance of this system. Inspection of the stormwater management system during monthly inspections indicate that it is working adequately. Work orders are issued when necessary to perform repair work as identified on the DP-1 Forms. The DP-1 Form also identifies other locations where sediment and standing water have been observed and provides corrective actions for each location. Where necessary, investigations are being performed, repair details are being developed and repairs will be addressed. The monthly inspection reports and DP-1 Forms can be found in Appendix B of the Quarterly Reports.

Under the Agreement executed on August 24, 2018 between the DEP and NYS Parks, NYS Parks is responsible for the maintenance/repair of the following elements of the Stormwater Management System:

- Clearing of overgrown vegetation, sediment and debris, including trash, from stormwater swales;
- Clearing of visible sediment, debris, including trash, and vegetative growth from outlets and culverts, culvert inlet/outlet rip-rap protection and energy dissipaters; and
- Removal of trash and debris from rip-rap in revetment areas.

3.4 Ancillary Systems

The ancillary systems are those support systems at the FAL that are used for site access and security. The ancillary systems include seven (7) access roads (A through G), along with fences, gates, and locks, as shown in Figure 4. The roadways are integral in providing access to perform required inspection, monitoring and maintenance activities. In addition, since the selected remedy resulted in leaving waste on-site, the security fences and gates provide important institutional

controls to prevent site access to unauthorized individuals. In anticipation of the site being developed into a State Park, DEP installed security cameras at the site entrance, DEP Office Trailer, and Flare Station to maintain security of DEP facilities during off-hours. The security system is monitored by DEP Central Communications personnel.

The O&M Manual requires that the ancillary systems be inspected on a monthly basis. A record of the inspection is summarized on Monthly Checklist Forms ANS-1 and DP-1 (for ANS-1) in accordance with the requirements of the O&M Manual. The instructions for the checklists further require inspections immediately after each major rainfall event equal to or exceeding the 2-year 24-hour precipitation event (3.5 inches in 24 hours). These are incorporated into the monthly inspections found in Appendix B of the Quarterly Reports.

Safety inspections are performed monthly. Damaged and missing "Confined Space" and/or "Hazard" signs are replaced right away.

Under the Agreement executed on August 24, 2018 between the DEP and NYS Parks, the NYS Parks is responsible for the maintenance/repair of the following elements of the Ancillary Systems:

- Maintain the surface condition of all gravel paths and the perimeter stone and paved roads necessary for operation of the Park. Such maintenance shall not include repairs required because of subsurface settlement or other subsurface conditions;
- Maintain and, when necessary, repair or replace Site perimeter fencing including gates and locks to prevent unauthorized access to the Site when the Park is closed; and
- Install and maintain signage except that DEP shall maintain and, when necessary, repair or replace, signage relating to Landfill Infrastructure and City Property security and/or safety.

3.5 Post-Closure Environmental Monitoring

As noted previously in Section 2, the Plan for the FAL went into effect on February 1, 2012 following acceptance of the FER by the NYSDEC, and now incorporates modifications approved by the NYSDEC in 2011. The Plan addresses the performance evaluation of the effectiveness of the cap and/or landfill gas collection system in controlling leachate and landfill gas migration. The Plan entails quarterly monitoring of soil gas quality in seven perimeter gas monitoring wells and annual monitoring in rotating calendar quarters (i.e., once every five quarters) of the groundwater elevation and quality at twelve wells (HF wells), all of which are located around the perimeter of the landfill outside the limits of the cap, as shown on Figure 5. Additionally, the landfill surface is monitored semi-annually for potential landfill gas emissions, although this is not a regulatory requirement at this Site.

3.5.1 Gas Monitoring Program

Perimeter soil gas readings were taken at the seven perimeter gas monitoring wells during quarterly monitoring rounds and after extended flare outages to confirm the absence of off-site gas migration. Figure 5 shows the locations of the perimeter gas wells, while the gas monitoring results are summarized in Table 1. Monitoring at these perimeter gas monitoring wells is performed in accordance with 6NYCRR Part 363 (effective November 4, 2017) to ensure that subsurface methane gas is less than 25% of the LEL at the property line (i.e., 1.25% gas in air). Monitoring data is included in Appendix C of the 2019 Quarterly Reports.

During these monitoring events, perimeter soil gas monitoring methane readings were between 0.0% and 1.2% by volume at monitoring well GMW-1, between 0.0% and 1.5% at GMW-2, between 0.0% and 10.8% at GMW-3, between 0.0% and 1.4% at GMW-4, between 0.3% and 10.7% at GWM-5, between 0.0% and 8.8% at GMW-6, and between 29.6% and 68.2% at GMW-7. When methane readings were above 1.25%, bar-hole readings were taken in the subsurface soil in the vicinity of the well, detecting 0.0% methane by volume. While methane levels at GMW-7 are consistently above 1.25%, this well is not located near the property line and historically methane levels at this well have been attributed to the gas monitoring well being screened in the naturally-occurring tidal marsh deposits present at depth at certain locations, not due to landfill gas migration. The perimeter gas monitoring results, including the bar-hole results, confirm that landfill gas is being controlled by the LFG Management System.

On June 10th and October 8th, landfill surface gas readings were taken, with no gas detections observed throughout the cover surface or in the area around the perimeter gas monitoring wells. Although the O&M Manual does not require surface emission monitoring since the landfill does not meet the applicability requirements of 6NYCRR Part 208, the DEP has included this task in the OM&M Contract. The levels encountered during these monitoring events are well below the 6NYCRR Part 208.4 requirement that landfill gas collection systems be operated so that methane concentrations are less than 500 ppm above the background at the landfill surface. Figure 6 shows the sampling locations and monitoring results are included in Appendix C of the 2019 Quarterly Reports.

The perimeter gas monitoring and the surface gas monitoring performed to date indicate that the landfill gas being generated by the FAL is being contained by the collection and treatment system, and off-site methane migration is being prevented. It is expected that landfill gas concentrations will continue to decrease over time as the landfill ages.

3.5.2 Groundwater Monitoring Program

In the NYSDEC letter of May 9, 2011 to the DEP, the NYSDEC approved the DEP's request to reduce the frequency of groundwater monitoring from quarterly monitoring to once every five quarters. Annual post-closure groundwater monitoring at the FAL began during the second quarter of 2012 and is performed on the same schedule as the PAL groundwater monitoring program for data coordination purposes. Accordingly, prior annual groundwater monitoring rounds were performed during the third quarter of 2013, the fourth quarter of 2014, the first quarter of 2016, the second quarter of 2017, the third quarter of 2018, and during the fourth quarter of 2019. In

accordance with the rotating calendar quarter schedule, no groundwater monitoring was required in 2015 and none will be required in 2020. Following the first five-year review, in 2017, NYSDEC approved DEP's request to reduce the frequency of monitoring for pesticides and PCBs to once during each five-year review period. In order to remain consistent with the PAL monitoring schedule, monitoring for pesticides and PCBs for the second five-year review period was completed during the second quarter of 2017. Monitoring of pesticides and PCBs for the third five-year review period will be performed during the third quarter of 2023.

The fourth quarter 2019 groundwater-monitoring round served as the monitoring round for the period covered by this Report. The next groundwater-monitoring round will be performed during the first quarter of 2021.

In addition, the NYSDEC in their letter of June 14, 2019 to the DEP requested that during the next scheduled post-closure groundwater monitoring event at FAL samples be taken for 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS). The NYSDEC made this request as part of their State-wide evaluation of remediation sites to better understand the existence of these emerging contaminants in drinking water supplies throughout the State. While this monitoring was performed during the fourth quarter of 2019 to coincide with the post-closure monitoring program, the results for this one time monitoring event are summarized in a separate report.

The FAL groundwater monitoring wells are designated by aquifer and depth as follows:

- U – fill aquifer (i.e., the saturated zone above the tidal marsh deposit (TMD))
- S – shallow zone of underlying upper glacial aquifer (UGA), 10-20 feet below the TMD
- D – deep zone of UGA, 45-55 feet below the TMD

The 2019 annual groundwater monitoring round was performed on November 4th, 6th and 7th. It entailed measuring the depth-to-water in 9 of the 12 monitoring wells, and collecting samples from 10 of the wells. Since the water-level in Well HF-102U was only 0.20 feet from the bottom of the well, samples could not be collected and the well is considered dry for this monitoring event. Well HF-104U was not sampled because it has a constriction above the water table, and is also believed to be dry. Water-level data could not be collected from Wells HF-102S and HF-104D because their casings have restrictions that do not accommodate the meter probe. These are not significant data gaps because, since groundwater elevations in the wells are tidally-influenced, the water-level data are not used to prepare groundwater-flow maps. As indicated by their "U" designations, Wells HF-102U and HF-104U are screened in the fill aquifer. The fact that they were not sampled is not a significant data gap because, since the fill aquifer is unsaturated at these locations, there was no potential for contaminant migration via the groundwater pathway from the fill aquifer at these well locations.

Per the Plan, the groundwater samples were collected with dedicated tubing and a peristaltic pump via the low-flow purging and sampling procedure, and were analyzed for VOCs, SVOCs, leachate indicator parameters and inorganic parameters. The QA/QC-related samples required by the Plan were also collected and analyzed. The laboratory results for one of the samples were validated by

an independent data validator. The field data, Laboratory Final Report and Data Usability Summary Report are provided in Appendix D of the 2019 Fourth Quarter Report.

Review of the field sampling logs indicates that apart from the lack of drawdown data for Wells HF-102S, HF-104S, and the more than 0.3 feet of drawdown in Wells HF-104D and HF-602U, the samples were collected in accordance with low-flow protocols. These minor deviations did not significantly impact the quality of the results for these wells because Wells HF-102S, HF-104S and HF-104D are screened below the water table, and the purge rate of Well HF-602U was very low. Therefore, there was no potential for cascading of water inside the wells during purging.

The VOC, SVOC, leachate indicator parameter and inorganic parameter results are summarized and compared to the Part 703 Class GA standards and NYSDEC TOGS 1.1.1 guidance values in Tables 2 through 5, respectively. Note that Tables 2 and 3 only list the VOCs and SVOCs that were detected in at least one groundwater sample in 2019. Most of the target VOCs and SVOCs were not detected in any of the groundwater samples.

It should also be noted that due to the FAL's seaside location, the groundwater beneath it is naturally saline and therefore non-potable. However, the results were compared to the Class GA standards and guidance values because there are no standards or guidance values for saline groundwater. Accordingly, for this site, exceedances of the Class GA standards or guidance values do not necessarily indicate a significant concern with respect to protection of public health or the environment.

Overall, the 2019 results are consistent with previous results, and continue to indicate that the FAL is not a significant source of releases of hazardous or toxic substances to groundwater. The results also continue to indicate that site-related impacts are primarily limited to the fill aquifer in the vicinity of Well HF-608U. The fill aquifer is underlain by organic, low-permeability TMD in most areas of the site. Where present, the marsh deposits act as a barrier to the vertical movement of groundwater downward into the underlying UGA.

Field Parameters – The 2019 final field parameter readings for each well were consistent with naturally saline groundwater. Specifically, they indicate that the groundwater is moderately conductive, has a slightly acidic to slightly basic pH, is low in dissolved oxygen and has low turbidity. Negative oxidation-reduction readings, indicating reducing conditions, were present in all wells except Wells HF-102D, HF-602D and HF-608D.

The water in some the wells also exhibited physical characteristics indicative of potential water-quality impacts. Specifically, the water in Well HF-608U, which is screened in the fill aquifer, was amber in color, had a petroleum sheen and odor, and exhibited effervescence. The water in Well HF-602U, which is also screened in the fill aquifer, contained black particulates and was gray in color. The water in Well HF-602S had a sulfur-like odor. These field observations are generally consistent with prior monitoring round results.

VOCs – The results of the 2019 annual groundwater monitoring round continue to indicate that the FAL is not a significant source of VOC impacts to groundwater. Specifically, although each groundwater sample was analyzed for 46 target VOCs, as shown in Table 2, only two

VOCs were actually detected. Acetone was detected in three wells at low concentrations. The only other VOC detection was chlorobenzene at 15.0 ug/L in Well HF-608U. This detection exceeded the 5-ug/L Class GA standard for chlorobenzene, but is consistent with prior results for this well. Most of the VOC detections occurred in fill aquifer wells.

SVOCs – The results of the 2019 annual groundwater-monitoring round continue to indicate that the FAL is also not a significant source of SVOC impacts to groundwater. Specifically, although each groundwater sample was analyzed for 63 target SVOCs, as shown in Table 3, only 11 were actually detected. Moreover, each was detected only once, in one of four wells (HF-602U, HF-602S, HF-608U and HF-608S). Most of the detections were low, estimated concentrations. The other six wells were non-detectable for SVOCs. Exceedances of the Class GA standards and guidance values were limited to cresol in Well HF-602U and indeno (1,2,3-cd) pyrene in Well HF-608S

Leachate Indicators – The 2019 leachate indicator parameter results are consistent with the FAL being an old, closed and capped municipal landfill that is underlain by saline groundwater. Specifically, as shown in Table 4, except for cyanide and nitrate, these parameters were detected in nearly every well. Cyanide typically does not occur at significant concentrations in saline groundwater, and nitrate is metabolized by bacteria in the groundwater. These two parameters were only detected sporadically at low concentrations.

Moreover, the concentrations of parameters known to occur naturally in seawater, such as bromide, chloride, hardness, sulfate and total dissolved solids, tended to be highest in wells screened in the UGA where the groundwater is most saline. Other parameters, such as alkalinity, ammonia and color, appear to be site-related because their highest concentrations tended to occur in wells screened in the fill aquifer. The highest concentrations of most of the site-related leachate indicator parameters occurred in Well HF-608U, which is consistent with the VOC and SVOC results.

Class GA standards or guidance values exist for nine of the leachate indicator parameters. Except for cyanide and nitrate, which were only detected sporadically at low concentrations, each of these parameters was detected at concentrations higher than its respective Class GA standard or guidance value in a number of wells. However, it should be noted that most of these exceedances are for parameters attributed to the naturally saline groundwater. The smaller number of exceedances for site-related parameters, such as ammonia and phenols, are not a significant concern with respect to protection of public health and the environment because the groundwater is non-potable. Moreover, ammonia does occur naturally at low concentrations in seawater and is not persistent in the environment, and the Class GA standard for phenols is aesthetics-based, not health-based.

Inorganic Parameters – The 2019 inorganic parameter results continue to indicate that the FAL is not a significant source of inorganic parameter impacts to groundwater. Specifically, as shown in Table 5, most of the target analytes, including the more toxic heavy (RCRA) metals, were either not detected or were only detected sporadically and/or at low concentrations. The concentrations of the frequently-detected parameters, such as boron, magnesium, potassium and sodium, were generally higher in the wells screened in the UGA than in the wells screened

in the fill aquifer. The exception is Well HF-608U, which also contained the highest concentrations of VOCs, SVOCs and site-related leachate indicator parameters. This overall pattern indicates that these inorganic parameters are primarily associated with the naturally saline groundwater. The exceedances for these parameters are also primarily associated with the saline groundwater. Except for the exceedance for total chromium in Well HF-608U, heavy metal concentrations were lower than the Class GA standards, and most of the heavy metals were either not detected, or only detected sporadically at low, primarily estimated concentrations.

Section 4 – Conclusions and Recommendations

Based on the results of the post-closure activities performed during this reporting period, the FAL engineering controls and associated institutional controls are in place, performing properly and remain effective. The FAL remedy continues to be protective of public health and the environment and is compliant with the FAL ROD. The activities associated with the O&M Manual and the Post-Closure Monitoring Plan (as approved by the NYSDEC) continue to be implemented.

Routine system maintenance and repair of each of the remediation systems should continue, in compliance with the requirements of the FAL O&M Manual. In general, it has previously been recommended that components exposed to the Hurricane Sandy surge that are currently operational, but were not designated for replacement, continue to be monitored and assessed over time and may be replaced in the future, if necessary.

During the Third Quarter of 2018, the DEP and NYS Parks entered into an agreement in support of NYS Parks' efforts to develop the PAL and FAL into the Park. Under this agreement, NYS Parks is making capital improvements to the sites to create the Park and will be responsible for the maintenance of those improvements, as well as the maintenance of portions of the Final Cover System, Stormwater Management System and Ancillary System identified under Section 3 of this Report. All work performed by NYS Parks will be done in accordance with the sites' RODs, Consent Orders, Environmental Notices and O&M Manuals. DEP will continue to be responsible for the inspection and reporting of the condition of all components of these systems. The DEP and NYS Parks will work together to coordinate these efforts.

Specific conclusions and recommendations for this reporting period for each of the remedial systems are identified in the following paragraphs.

4.1 Landfill Gas Management System

The landfill gas management system is operational and is preventing off-site gas migration. The operational equipment components that were impacted by the Hurricane Sandy surge that are currently operational but not designated for replacement should continue to be monitored and assessed over time, and may be replaced in the future, if necessary. In addition, the recommended corrective actions when listed in Form DP-1, Landfill Gas System, Descriptions of Deficiencies and Problems, in Appendix A of the Quarterly Reports should be implemented.

4.2 Final Cover System

Overall the landfill final cover system is in good condition and protecting the landfill cap beneath it as intended. Conditions found are typical of those encountered during the landfill post-closure period, with only a few deficiencies noted. It is recommended that routine maintenance continue to be performed to control problem areas. This would include filling ruts caused by erosion, reseeding areas where necessary, and maintaining landfill surface slope to promote stormwater runoff. Mowing should be conducted as needed to control invasive species and to provide access for inspections and maintenance. The recommended corrective actions listed in Form DP-1, FCS-1, Descriptions of Deficiencies and Problems, in Appendix B of the Quarterly Reports, should be implemented.

4.3 Stormwater Management System

The stormwater management system continues to convey stormwater runoff to its outfall locations. Conditions found are typical of those encountered during the landfill post-closure period, with a few deficiencies noted. In general, it is recommended that silt and vegetation in drainage swales continue to be periodically removed and sediment be removed from other portions of the drainage system. Areas of the stormwater management system affected by Hurricane Sandy that were restored to their existing condition prior to the storm event under Contract No 1400-FLP should continue to be maintained. Specifically, the recommended corrective actions listed in Form DP-1 (SWM-1, SWM-2 SWM-3), Descriptions of Deficiencies and Problems, in Appendix B of the Quarterly Reports, should be implemented.

4.4 Ancillary Systems

The roads of the ancillary system continue to provide access throughout the site while the fencing and gates continue to allow for controlled site access. The shoreline embankment and the shoulder of Road A damaged by Hurricane Sandy that were restored under Contract No. 1400-FLP should continue to be maintained. Other conditions found are typical of those encountered during the landfill post-closure period, with a few deficiencies noted. In general, it is recommended that routine maintenance continue to be performed to control problem areas from expanding and worsening. This would include filling ruts and potholes in roads and repairing site fencing and gates when necessary. Specifically, the recommended corrective actions listed in Form DP-1, ANS-1, Descriptions of Deficiencies and Problems, in Appendix B of the Quarterly Reports, should be implemented.

4.5 Post-Closure Environmental Monitoring

Based on the results of the post-closure environmental monitoring performed to date, the FAL remedy continues to be protective of public health and the environment and is compliant with the FAL ROD.

The results of the post-closure landfill-gas monitoring performed during this annual reporting period, showed that methane level measurements met the 6NYCRR Part 363 requirements in the vicinity of the property line, indicating that the landfill gas being generated by the FAL is being

contained by the collection and treatment system, and off-site methane migration is being prevented. It is expected that landfill gas concentrations will continue to decrease over time as the landfill ages.

Overall, the results of the 2019 annual groundwater monitoring round are consistent with previous results, and continue to indicate that the FAL is not a significant source of releases of hazardous or toxic substances to groundwater.

Recommendations for this reporting period are to continue to perform the environmental monitoring in accordance with the modified Plan (2011). Specifically, as noted in Section 2, with the concurrence of the NYSDEC, groundwater monitoring is to be performed in rotating calendar quarters (i.e., once every five quarters) and the reduction in the frequency of monitoring for pesticides and PCBs to once every five years. Accordingly, the next groundwater monitoring round will be performed during the first quarter of 2021, and the samples will be analyzed for VOCs, SVOCs, leachate indicator parameters and inorganic parameters. Perimeter gas monitoring will continue to be performed quarterly.

Figures

Figure 1: Fountain Avenue Landfill Site Map

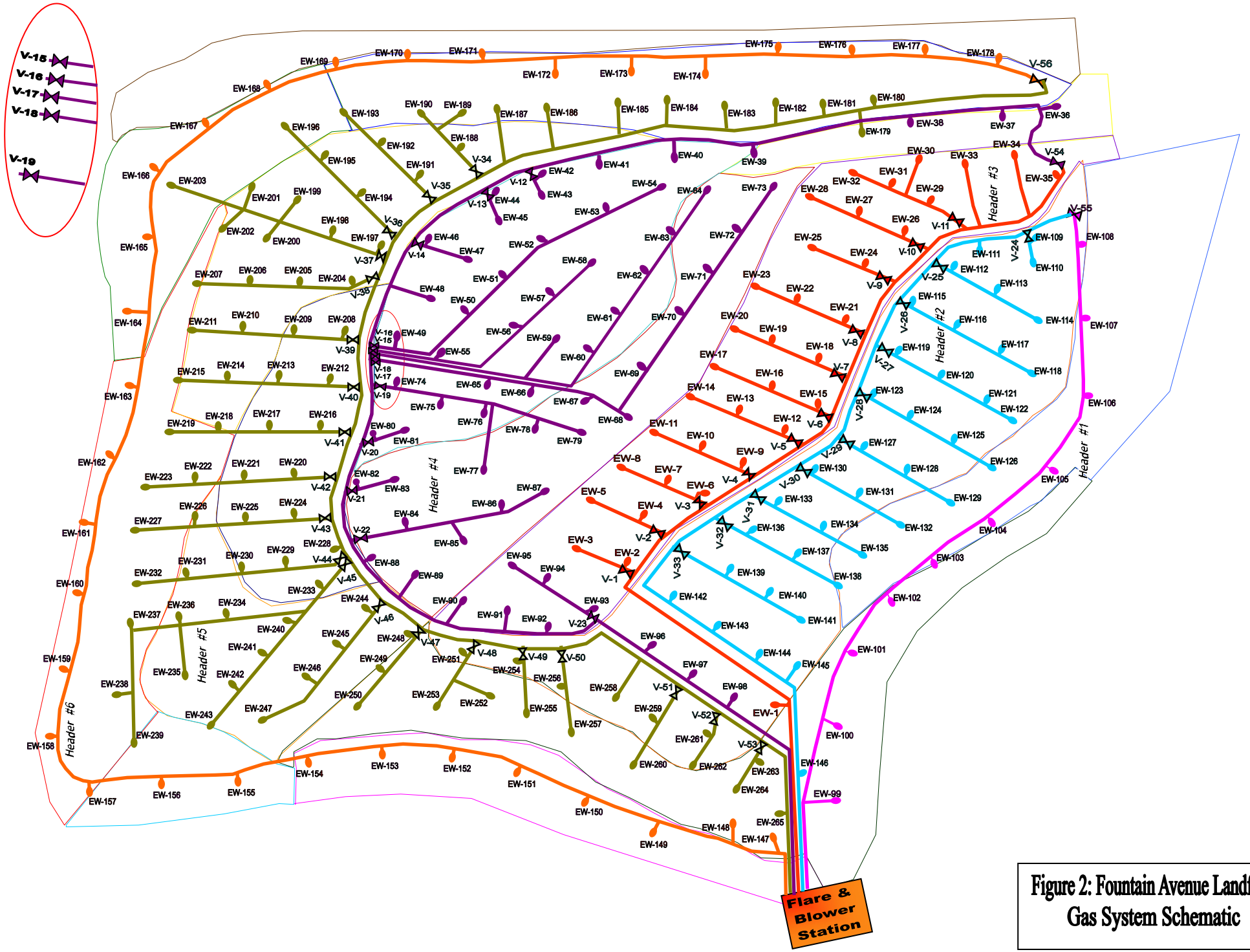
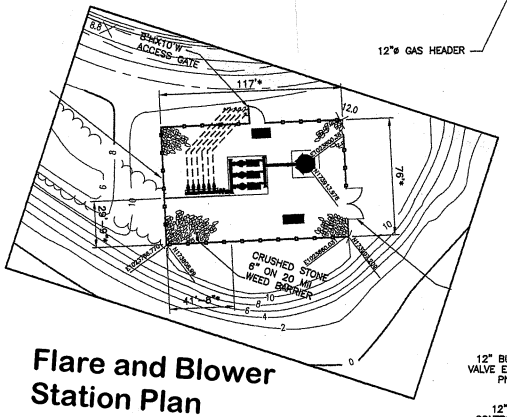
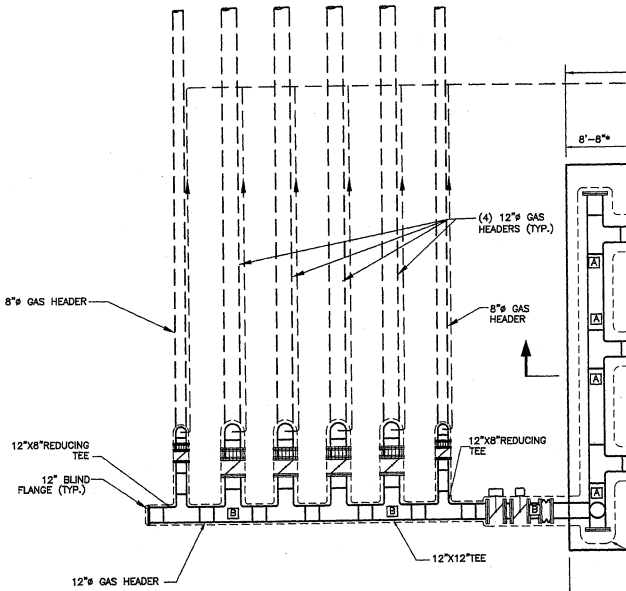


Figure 2: Fountain Avenue Landfill Gas System Schematic

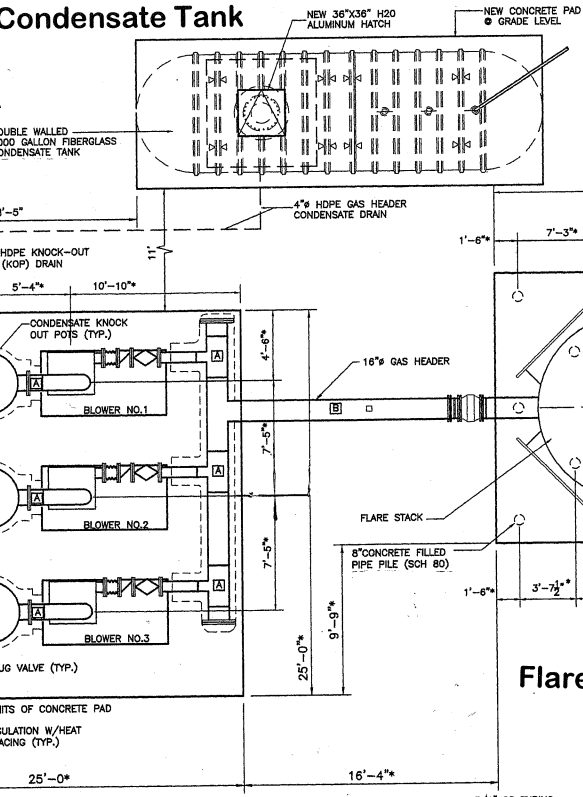
Figure 3: Fountain Avenue Landfill Flare and Blower Station

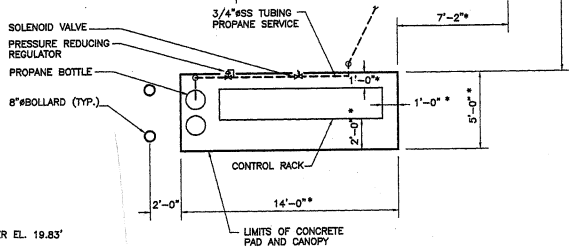


Flare and Blower Station Plan



LFG Headers





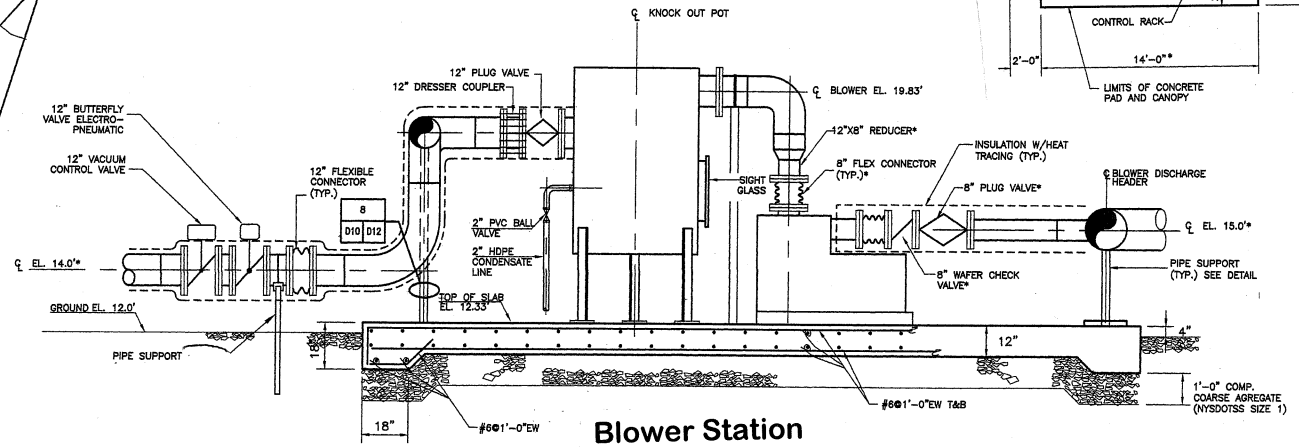


Figure 4: Fountain Avenue Landfill Stormwater Management, Final Cover Zones and Roads

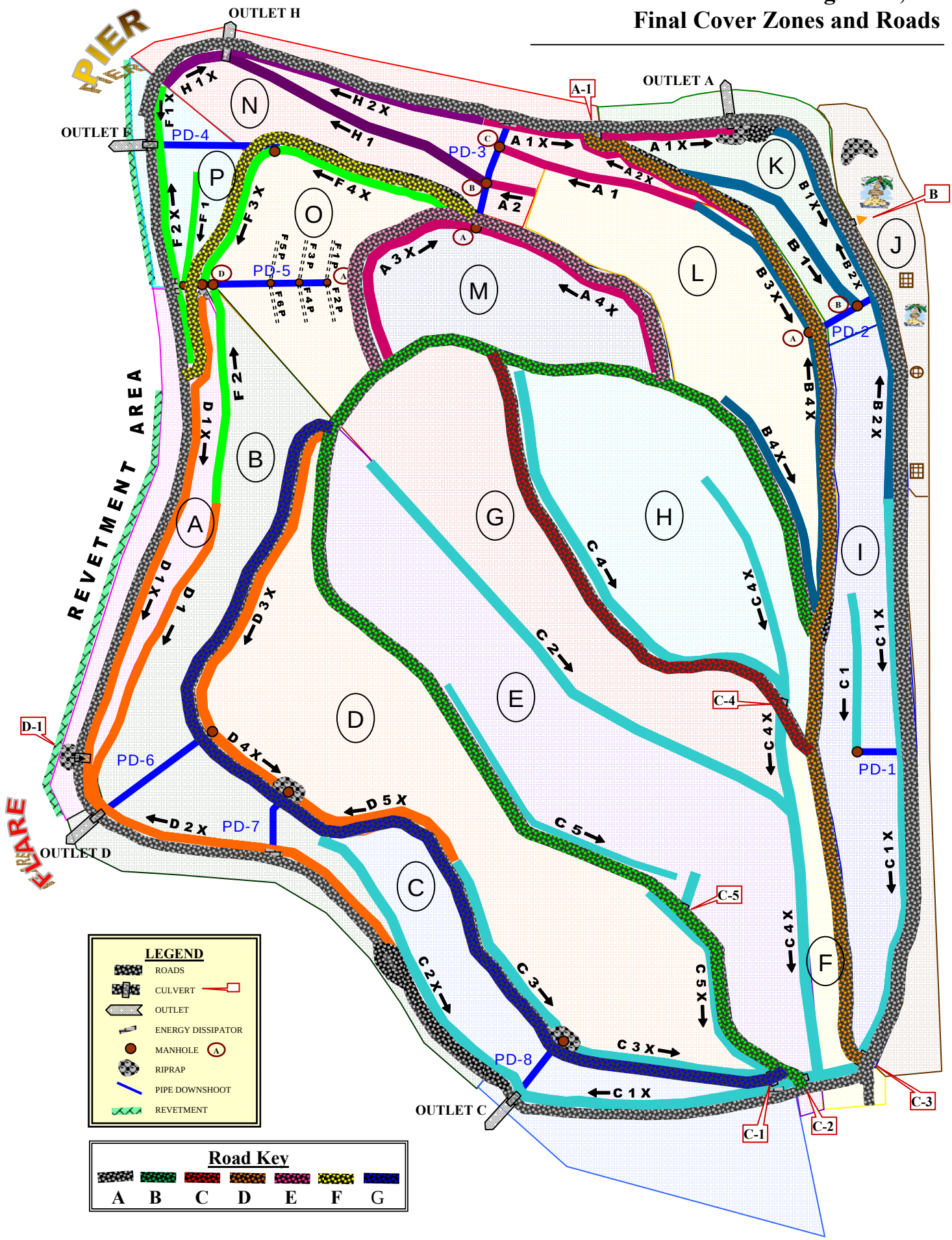
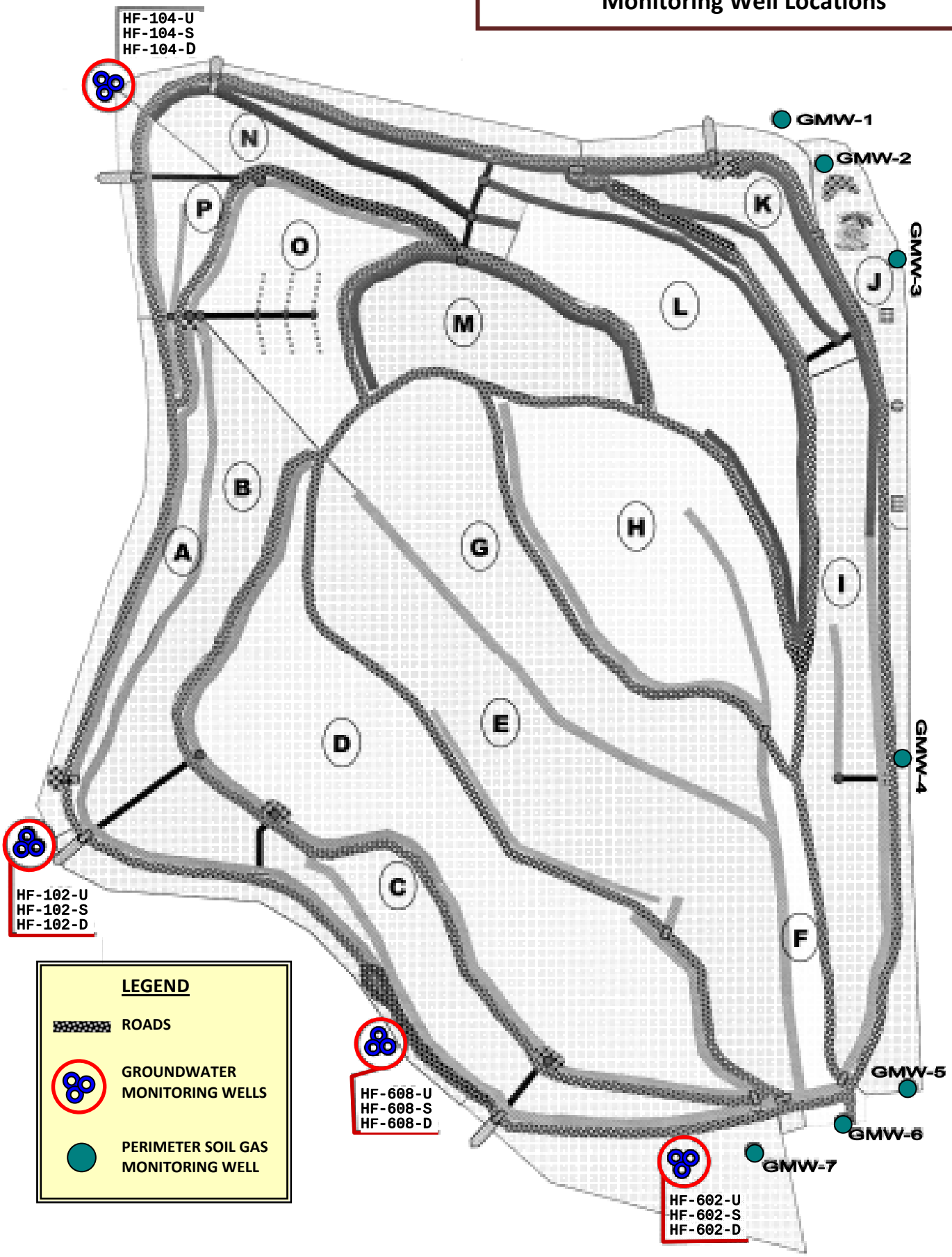


Figure 5: Fountain Avenue Landfill Groundwater and Perimeter Gas Monitoring Well Locations



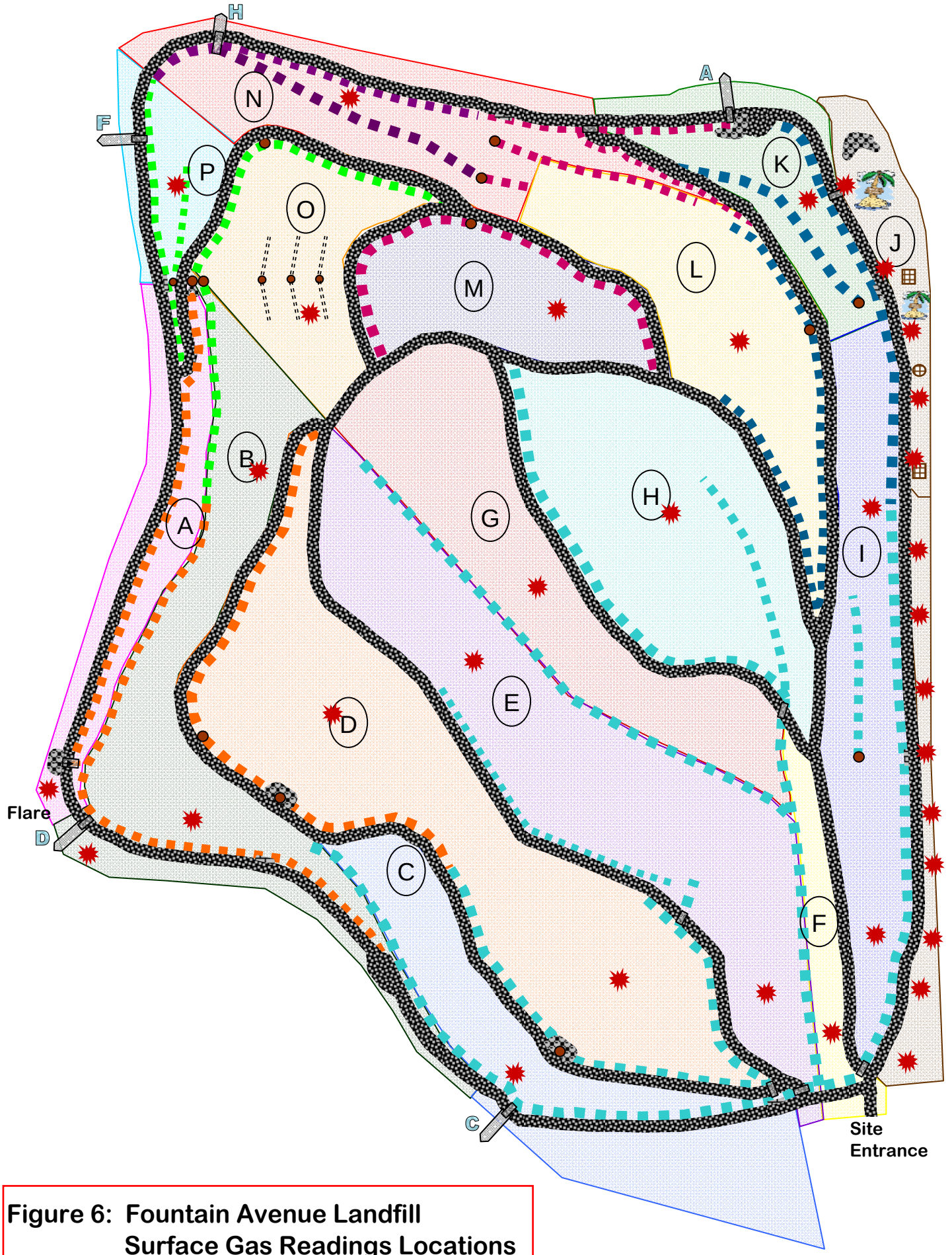


Figure 6: Fountain Avenue Landfill
Surface Gas Readings Locations

Tables

Table 1
Summary of Perimeter Gas Monitoring Well Results
Fountain Avenue Landfill, Brooklyn, NY

		7-Jan	14-Jan	22-Jan	4-Feb	25-Feb	28-Feb	5-Mar	8-Mar	11-Mar	14-Mar	29-May	10-Jun	17-Jun	24-Jun	1-Jul	8-Jul	15-Jul	22-Jul	29-Jul	5-Aug	12-Aug	20-Aug	26-Aug	3-Sep	9-Sep	16-Sep	23-Sep	30-Sep	7-Oct	10-Oct	2-Dec	23-Dec
METHANE (% BY Volume)	GMW-1	0.3	0.6	1.2	1.0	1.1	0.8	1.0	0.9	0.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	GMW-2	0.5	0.8	1.4	1.3	1.5	1.2	1.3	1.2	1.2	0.9	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	GMW-3	0.4	0.7	1.3	1.4	1.3	1.3	1.4	1.3	1.3	1.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	10.8	10.4	7.9	7.3	7.6	5.1	4.6	4.3	4.6	3.7	4.6	3.1	0.0	2.3	2.8
	GMW-4	0.4	0.7	1.3	1.3	1.4	1.2	1.3	1.4	1.2	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	GMW-5	0.3	0.6	1.2	1.2	1.3	1.2	1.2	1.4	1.1	0.8	0.8	4.6	3.1	2.2	2.6	5.1	5.9	8.6	10.7	8.1	6.4	1.2	4.3	7.1	4.3	4.4	3.9	5.5	5.0	*	4.1	4.2
	GMW-6	3.0	3.3	3.9	3.6	3.5	3.2	3.5	3.5	3.5	3.2	0.3	0.5	0.9	0.4	0.0	0.2	3.3	8.8	0.4	2.6	4.3	8.3	3.1	0.3	6.4	6.6	6.9	7.1	5.5	2.3	5.2	6.8
	GMW-7	46.2	46.5	47.1	46.3	46.7	46.4	45.2	46.2	46.2	45.9	42.6	42.4	29.6	38.3	40.2	68.2	47.1	56.2	50.4	46.5	45.8	43.8	46.7	52.4	51.4	47.2	46.5	42.3	45.3	47.3	44.3	43.5
CARBON DIOXIDE (% BY Volume)	GMW-1	2.8	4.2	6.5	6.8	6.9	6.5	6.5	6.5	6.3	6.4	1.6	2.4	2.2	1.9	1.8	2.1	1.9	2.7	2.5	6.1	0.2	2.4	2.3	2.2	1.8	1.5	2.5	2.3	2.5	2.7	2.6	2.7
	GMW-2	2.2	3.6	5.9	5.9	6.2	5.7	6.2	5.6	5.4	5.5	0.5	0.5	0.2	0.7	0.5	0.7	1.3	0.3	1.2	1.2	1.2	0.8	0.6	0.5	0.7	0.6	1.3	1.1	0.9	0.7	0.8	0.9
	GMW-3	1.5	2.9	5.2	5.6	5.7	5.5	5.5	5.3	5.1	5.2	0.1	0.1	0.1	0.2	0.3	0.2	3.0	4.3	4.3	4.4	4.4	4.6	0.6	0.3	0.5	0.7	0.9	0.8	0.5	0.4	1.1	1.3
	GMW-4	1.6	3.0	5.3	5.5	5.6	5.3	5.3	5.2	5.0	5.1	0.1	0.3	0.3	0.1	0.2	0.3	0.2	2.8	0.6	0.4	0.2	0.4	0.5	0.6	0.1	0.2	0.3	1.7	1.1	0.5	1.0	1.2
	GMW-5	1.6	3.0	5.3	4.3	4.2	4.4	4.6	4.0	3.8	3.9	1.3	1.9	1.9	0.9	1.9	3.1	5.9	4.8	5.0	6.7	7.4	2.3	2.5	1.9	7.2	7.5	7.0	8.2	7.6	*	8.4	6.3
	GMW-6	3.7	5.1	7.4	7.9	7.8	7.6	7.4	7.6	7.4	7.5	0.3	0.6	0.9	0.2	0.4	0.2	2.1	2.5	0.3	2.1	2.3	3.8	2.2	0.8	4.0	4.3	4.6	4.9	3.2	0.9	3.6	3.6
	GMW-7	10.6	12.0	14.3	15.2	15.1	15.0	15.0	14.9	14.7	14.8	6.4	6.6	6.8	9.1	10.2	8.1	8.0	8.1	7.9	8.8	9.2	9.1	8.1	6.7	9.2	9.0	9.7	9.8	8.7	6.8	9.3	8.3
OXYGEN (% BY Volume)	GMW-1	17.7	16.7	17.2	17.5	17.3	17.6	17.2	17.2	17.2	17.1	18.3	17.9	18.1	15.4	16.4	16.8	17.2	22.6	20.6	11.2	20.2	17.7	17.9	18.1	16.3	16.6	16.8	16.6	17.4	18.5	17.6	17.2
	GMW-2	20.2	19.2	18.1	17.9	17.4	18.1	17.5	17.6	17.6	17.5	20.4	20.4	20.1	20.6	18.6	19.2	19.0	12.8	19.8	20.8	20.5	22.4	21.4	21.1	20.4	19.7	19.3	19.2	19.6	20.2	19.5	18.4
	GMW-3	20.2	19.2	18.3	18.3	18.0	18.3	18.2	18.0	18.0	17.9	19.6	20.9	20.8	21.1	21.2	20.7	17.6	16.3	15.8	18.2	18.1	15.1	16.5	14.1	15.2	15.0	15.6	15.6	16.5	21.7	16.3	15.8
	GMW-4	20.3	19.3	17.6	16.7	16.5	16.5	16.5	16.4	16.4	16.3	20.6	20.4	20.2	20.6	20.5	20.9	19.5	24.9	19.2	21.7	22.3	20.4	20.9	21.8	17.9	17.6	17.4	17.2	18.3	20.4	18.2	17.7
	GMW-5	19.8	18.8	17.8	17.8	17.3	17.9	17.2	17.5	17.5	17.4	15.8	14.1	13.8	17.6	17.8	11.9	2.7	6.2	5.2	1.9	0.6	2.2	17.2	16.1	0.0	0.0	0.2	0.0	0.0	*	0.0	0.0
	GMW-6	17.9	16.9	16.9	16.4	16.3	16.5	16.4	16.1	16.1	16.0	20.3	19.4	18.4	20.4	19.8	20.4	16.8	16.7	21.7	19.2	19.6	18.8	17.4	19.3	18.0	17.8	18.4	17.2	18.8	20.1	17.6	18.1
	GMW-7	1.0	1.0	2.0	2.0	2.1	2.2	2.6	1.7	1.7	1.6	0.2	0.1	1.9	0.7	0.5	0.4	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

BARHOLE READINGS

		Date	7-Jan	14-Jan	22-Jan	4-Feb	25-Feb	28-Feb	5-Mar	8-Mar	11-Mar	14-Mar	29-May	10-Jun	17-Jun	24-Jun	1-Jul	8-Jul	15-Jul	22-Jul	29-Jul	5-Aug	12-Aug	20-Aug	26-Aug	3-Sep	9-Sep	16-Sep	23-Sep	30-Sep	7-Oct	10-Oct	2-Dec	23-Dec
METHANE (% BY Volume)	GMW-2	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
	GMW-3	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
	GMW-4	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
	GMW-5	5 ft North				0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
		5 ft South				0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
	GMW-6	5 ft North				0.0	0.0	0.0	0.0	0.0	0.0	0.0								0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		5 ft South				0.0	0.0	0.0	0.0	0.0	0.0	0.0								0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	GMW-7	5 ft North	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		5 ft South	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CARBON DIOXIDE (% BY Volume)	GMW-2	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
	GMW-3	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0							0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
	GMW-4	5 ft East				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
		5 ft West				0.0	0.0	0.0	0.0	0.0	0.0	0.0																					
	GMW-5	5 ft North				0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
		5 ft South				0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
	GMW-6	5 ft North				0.0	0.0	0.0	0.0	0.0	0.0	0.0								0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		5 ft South				0.0	0.0	0.0	0.0	0.0	0.0	0.0								0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	GMW-7	5 ft North	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		5 ft South	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OXYGEN (% BY Volume)	GMW-2	5 ft East				20.6	20.6	20.6	20.6	20.6	20.6	20.6																					
		5 ft West				20.7	20.7	20.7	20.7	20.7	20.7	20.7																					
	GMW-3	5 ft East				20.6	20.6	20.6	20.6	20.6	20.6	20.6							20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8		20.8	20.8
		5 ft West				20.7	20.7	20.7	20.7	20.7	20.7	20.7							20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8		20.8	20.8
	GMW-4	5 ft East				20.6	20.6	20.6	20.6	20.6	20.6	20.6																					
		5 ft West				20.8	20.8	20.8	20.8	20.8	20.8	20.8																					
	GMW-5	5 ft North				20.8	20.8	20.8	20.8	20.8	20.8	20.8		20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8		20.8	20.8
		5 ft South				20.7	20.7	20.7	20.7	20.7	20.7	20.7		20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6		20.6	20.6
	GMW-6	5 ft North				20.8	20.8	20.8	20.8	20.8	20.8	20.8							20.8	20.8		20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
		5 ft South				20.8	20.8	20.8	20.8	20.8	20.8	20.8							20.6	20.6		20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
	GMW-7	5 ft North	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
		5 ft South	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6	20.6

* October 10, GMW-05 was covered with dirt at time of reading due to construction asctivities.

Table 2

Summary of Target Volatile Organic Compounds (VOCs) Detected in Groundwater Samples

Fountain Avenue Landfill, Brooklyn, NY

VOCs Detected In Ground-Water Samples	Class GA Standard	Well Number and Result, in ug/L										
		HF-102S	HF-102D	HF-104S	HF-104D	HF-602U	HF-602S	602S Dup.	HF-602D	HF-608U	HF-608S	HF-608D
Acetone	50[GV]	<5.0	<5.0	8.5	<5.0	22.6	<5.0	<5.0	<5.0	14.8	<5.0	<5.0
Chlorobenzene	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**15.0**	<5.0	<5.0

Footnotes: ug/L = Micrograms per Liter.
J = Estimated concentration.
Class GA standards are from 6NYCRR Part 703.
GV = Guidance value from NYSDEC TOGS 1.1.1 (No Class GA standard for this parameter).
Bold font indicates exceedance of Class GA standard or TOGS 1.1.1 guidance value.
Wells HF-102U and HF-104U could not be sampled because they were dry and/or constricted.

Table 3

Summary of Target Semi-Volatile Organic Compounds (SVOCs) Detected in Groundwater Samples

Fountain Avenue Landfill, Brooklyn, NY

SVOCs Detected In Ground-Water Samples	Class GA Standard	Well Number and Result, in ug/L										
		HF-102S	HF-102D	HF-104S	HF-104D	HF-602U	HF-602S	602S Dup.	HF-602D	HF-608U	HF-608S	HF-608D
Benzo (g,h,i) perylene	No Std.	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.71 J	<1.0
Bis (2-ethylhexyl) phthalate	5	<1.0	<1.0	<1.0	<1.0	<1.0	2.0	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloroaniline	5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.67 J	<1.0	<1.0
Cresol (m&p)	2 GV*	<1.0	<1.0	<1.0	<1.0	**3.1**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz (a,h) anthracene	No Std.	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.61 J	<1.0
1,4-Dichlorobenzene	3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.52 J	<1.0	<1.0
Di-n-butyl phthalate	50	<1.0	<1.0	<1.0	<1.0	<1.0	0.50 J	<1.0	<1.0	<1.0	<1.0	<1.0
Di-n-octyl phthalate	50 GV	<1.0	<1.0	<1.0	<1.0	<1.0	0.53 J	<1.0	<1.0	<1.0	<1.0	<1.0
Indeno (1,2,3-cd) pyrene	0.002 GV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**0.59 J**	<1.0
Naphthalene	10 GV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.7	<1.0	<1.0
N-Nitrosodiphenylamine	50 GV	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.76 J	<1.0	<1.0

Footnotes:
ug/L = Micrograms per Liter.
J = Estimated concentration.
Class GA Standards are from 6NYCRR Part 703.
GV = Guidance value from NYSDEC TOGS 1.1.1 (No Class GA Standard for this parameter).
NA = Not Available (No Class GA standard or TOGS 1.1.1 guidance value for this parameter).
Bold font indicates exceedance of Class GA standard or guidance value.
1,4-dichlorobenzene was analyzed for as both a VOC and SVOC, but was not detected as a VOC.
* Guidance value for total phenols.
Wells HF-102U and HF-104U could not be sampled because they were dry and/or constricted.

Table 4

Summary of Leachate Indicator Parameters Detected in Groundwater Samples

Fountain Avenue Landfill, Brooklyn, NY

Leachate Indicator Parameter	Class GA Standard	Well Number and Result, in mg/L*										
		HF-102S	HF-102D	HF-104S	HF-104D	HF-602U	HF-602S	602S Dup.	HF-602D	HF-608U	HF-608S	HF-608D
Alkalinity	NA	979	0.97 J	1,770	359	453	954	1,930	435	2,540	1020	311
Bromide	2[GV]	**44.4**	**14.0**	**6.3**	0.10 J	0.092 J	**8.7**	**9.6**	**35.0**	**8.7**	**24.2**	**45.3**
Chloride	250	**10,900**	**3,650**	**670**	40.8	33.4	**1,480**	**1,300**	**8,840**	**708**	**6,020**	**12,400**
Sulfate	250	**676**	**418**	<5.0	42.1	41.9	**414**	**369**	**1,330**	82.0	**936**	**1,840**
BOD	NA	1.0 J	23.4	2.7 J	1.0 J	17.5	2.1 J	2.2 J	1.0 J	14.1 J	1.0 J	1.0 J
COD	NA	899	162	308	19.0	107	91.0	86.6	369	810	223	673
Color (Color Units)	15	**150**	5.0	**75.0**	**60.0**	**50.0**	**30.0**	**30.0**	**20.0**	**1,250**	**75.0**	**25.0**
Cyanide	0.2	0.0036 J	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.006 J	<0.010	<0.010
Hardness	NA	3,400	1,500	700	300	460	600	800	3,000	200	1,100	3,700
Ammonia	2	**25.5**	0.71	**220**	0.062 J	**2.4**	**25.0**	**23.9**	0.26	**397**	**2.4**	0.14
Nitrate	10	0.027 J	0.041 J	<0.050	<0.050	<0.050	<0.050	<0.050	0.54	0.022 J	0.022 J	0.77
Phenols	0.001	**0.0026 J**	<0.005	**0.0029 J**	**0.0052**	**0.0029 J**	<0.005	<0.005	**0.0034 J**	**0.0050 J**	**0.0064**	**0.0040 J**
TDS	500**	**17,400**	**5,220**	**2,230**	498	**586**	**3,070**	**3,080**	**13,800**	**3,020**	**10,400**	**18,100**
TKN	NA	23.3	0.55	228	0.76	2.4	25.5	23.7	4.3	404	9.6	<0.10
TOC	NA	14.1	<1.0	46.3	3.5	29.5	15.5	15.8	4.8	185	16.5	3.8

Footnotes:

mg/L = Milligrams per Liter.
J = Estimated concentration.
Class GA standards are from 6NYCRR Part 703.
GV = Guidance value from NYSDEC TOGS 1.1.1 (No Class GA Standard for this parameter).
NA = Not Available (No Class GA standard or TOGS 1.1.1 guidance value for this parameter).
Bold font indicates exceedance of Class GA standard or TOGS 1.1.1 guidance value.
* = Except for Color, which is in Color Units.
** = Standard is the more stringent Federal SMCL (The Class GA TDS standard is <1,000 mg/L).
Wells HF-102U and HF-104U could not be sampled because they were dry and/or constricted.
TOC results should be considered approximate due to a laboratory error and subsequent reanalysis out of holding time.

Table 5

Summary of Metals Detected in Groundwater Samples
Fountain Avenue Landfill, Brooklyn, NY

Metals	Class GA Standard	Well Number and Result, in ug/L										
		HF-102S	HF-102D	HF-104S	HF-104D	HF-602U	HF-602S	602S Dup.	HF-602D	HF-608U	HF-608S	HF-608D
Aluminum	NA	<200	<200	<200	<200	<200	<200	<200	<200	377	<200	<200
Antimony	3	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0	<60.0
Arsenic*	10**	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Barium*	1,000	177 J	129 J	690	81.8 J	300	6.7 J	7.1 J	50.1 J	357	34.0 J	49.9 J
Beryllium	3[GV]	0.18 J	0.28 J	0.081 J	<5.0	<5.0	0.18 J	0.16 J	0.14 J	<5.0	0.30 J	0.17 J
Boron	1,000	**3,470**	138	**2,200**	89.0	46.8 J	**1,800**	**1,920**	**2,100**	**6,670**	**3,210**	**2,840**
Cadmium*	5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Calcium	NA	242,000	308,000	221,000	123,000	173,000	65,000	68,900	227,000	56,500	111,000	252,000
Chromium, Total*	50	2.1 J	<10.0	6.6 J	<10.0	<10.0	5.2 J	5.8 J	<10.0	**147**	<10.0	<10.0
Cobalt	NA	<50.0	2.4 J	3.4 J	<50.0	<50.0	<50.0	<50.0	<50.0	18.8 J	<50.0	<50.0
Copper	200	14.6 J	110	11.8 J	6.1 J	24.5 J	9.8 J	9.3 J	11.0 J	9.4 J	17.4 J	13.8 J
Iron	300	**13,200**	**244,000**	**1,850**	**2,540**	**1,360**	53.0 J	54.9 J	143	**4,050**	**2,870**	46.2 J
Iron and Manganese	500	**13,649**	**249,400**	**1997**	**2,595**	**2171**	61.7 J	64.1 J	178	**4,135**	**3,231**	46.2 J
Lead*	25	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Magnesium	35,000[GV]	**689,000**	**172,000**	**50,600**	17,400	20,200	**166,000**	**176,000**	**642,000**	23,900	**292,000**	**772,000**
Manganese	300	**449**	**5,400**	147	54.7	**811**	8.7 J	9.2 J	34.7	84.9	**361**	**<10.0**
Mercury*	0.7	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Nickel	100	15.0 J	<40.0	20.6 J	17.8 J	15.0 J	16.6 J	16.9 J	11.1 J	47.3	17.1 J	11.8 J
Potassium	NA	284,000	60,000	132,000	7,720	2,940 J	124,000	130,000	259,000	197,000	212,000	258,000
Selenium*	10	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Silver*	50	2.5 J	4.9 J	<10.0	<10.0	<10.0	<10.0	<10.0	2.5 J	<10.0	5.7 J	2.8 J
Sodium	20,000	**5,700,000**	**1,350,000**	**566,000**	**30,300**	**18,200**	**845,000**	**890,000**	**4,620,000**	**836,000**	**3,360,000**	**5,920,000**
Thallium	0.5[GV]	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Vandium	NA	8.4 J	6.7 J	6.8 J	<50.0	<50.0	26.7 J	28.2 J	<50.0	220	7.6 J	<50.0
Zinc	2,000[GV]	<20.0	5.5 J	33.6	39.9	13.8 J	<20.0	<20.0	<20.0	9.6 J	5.4 J	<20.0

Footnotes: ug/L = Micrograms per Liter.
J = Estimated concentration.
Class GA standards are from 6NYCRR Part 703.
GV = Guidance value from NYSDEC TOGS 1.1.1 (No Class GA Standard for this parameter).
NA = Not Available (No Class GA standard or TOGS 1.1.1 guidance value for this parameter).
Bold font indicates exceedance of Class GA standard or TOGS 1.1.1 guidance value.
* = RCRA metal.
** = Standard is the more stringent Federal MCL. (The NYSDEC Class GA standard is 25 ug/L.)
Wells HF-102U and HF-104U could not be sampled because they were dry and/or constricted