Appendix F

New Extraction Wells Installation Plan

Hydrogeologic Investigation Activities During Installation of New Extraction Wells

Dewey Loeffel Landfill Superfund Site
Nassau, New York

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Dewey Loeffel Landfill Superfund Site Nassau, New York

General Electric Company/SI Group, Inc.
Albany, New York

RALPH E. MORSE, MANAGING SCIENTIST
O'Brien & Gere Engineers, Inc.

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

As stated in Section 4.2 of the Design Report/Implementation Plan (DR/IP), the objective of this appendix is to describe the additional hydrogeologic investigation activities that are proposed to be performed during implementation of the DR/IP to expand the amount of data already available regarding the bedrock groundwater system at the Dewey Loeffel Landfill Superfund Site (the Site). More specifically, hydrogeologic investigation activities are proposed to be completed at each of the five new extraction wells that will be installed. As described in Section 4.3 and Appendix G of the DR/IP, additional testing is also proposed in the five open bedrock boreholes installed by the United States Environmental Protection Agency (EPA) prior to completing those boreholes into monitoring wells.

At the location of each new extraction well, the hydrogeologic conditions in the bedrock will be characterized using a multidisciplinary approach. This multidisciplinary approach will include the use of rock coring, borehole geophysics (including vertical flow meter testing under ambient and pumping conditions), and packer testing (for both hydraulic and water quality data). In addition, bedrock samples will be collected at some of the locations for laboratory analysis of various physical parameters, and detailed hydraulic conductivity profiling will be performed at one or two locations. Following completion of the hydrogeologic investigation activities, each borehole will be converted into an extraction well per the Contract Drawings presented in Appendix C of the DR/IP.

2. HYDROGEOLOGIC INVESTIGATION ACTIVITIES

2.1. GENERAL

As discussed in the DR/IP, five new extraction wells will be installed downgradient of the landfill at the locations shown on Figure 2. New extraction wells EW-4, EW-6 and EW-7 are located closest to the landfill and are proposed to be 200 feet deep. New extraction wells EW-5 and EW-8 are located farther from the landfill (similar to existing extraction well EW-3) and are proposed to be 250 feet deep.

Supervision of the hydrogeologic investigation activities will be provided by a qualified O'Brien & Gere Engineers, Inc. (O'Brien & Gere) geologist and/or hydrogeologist who will be in attendance at all times during the drilling, testing and well installation activities to: perform health and safety monitoring; prepare geologic field logs based on drilling and bedrock core observations; properly label, package and handle rock core and groundwater samples; supervise hydraulic testing activities and well installation; and, complete daily drilling/testing field records.

2.2. BEDROCK DRILLING PROGRAM

At the location of each new extraction well, the overburden unit and the upper 10 feet of competent bedrock will be isolated using steel casing prior to further advancing the borehole into the bedrock. Each borehole will be advanced through the overburden unit and into competent bedrock utilizing rotary drilling techniques. The overburden and upper 10 feet of competent bedrock will be sealed off by grouting an 8-inch inside diameter (ID) steel casing into a 10 or 12-inch diameter rock socket prior to bedrock drilling. The steel casing will be lowered to the bottom of the borehole and the annular space between the casing and the borehole wall will be grouted to ground surface. The grout will be introduced via a tremie pipe lowered to just above the base of the borehole. As the grout is introduced into the borehole, the tremie pipe will be removed in sections so that the grout is pumped into the borehole at a level below the top of the grout seal as it is emplaced. The grout will be allowed to set for a minimum of 24 hours before further bedrock drilling is initiated. The grout material will consist of Type I Portland cement mixed with either a powdered or granular bentonite. The grout mixture will be prepared in accordance with American Society for Testing and Materials (ASTM) D5092-90, such that approximately 3 to 5 pounds of bentonite is mixed with 6½ to 7 gallons of water per 94-pound sack of cement.

Bedrock drilling at each new extraction well location will then be performed using bedrock coring techniques. Each borehole will be drilled to its total depth using a 4-inch outer diameter (OD) HQ3 diamond core bit. Following extraction of the rock core from the borehole, each section of core will be described by a qualified O'Brien & Gere geologist and recorded on a core log along with related depth, identification of visible fractures, percent recovery and rock quality designation (RQD) information. The rock core from each location will be placed in labeled core boxes for storage at the Site. Rock core will be stored on pallets at the Site at a location near the pole barn. Alternatively, the rock core may be stored at a location inside the security fence associated with the new treatment building. In addition, the existing core boxes generated during previous drilling at extraction well EW-2 will be relocated adjacent to the new core boxes.

Drilling activities will be performed by Parratt-Wolff, Inc. (Parratt-Wolff) of East Syracuse, New York along with their drilling subcontractor Cushing & Sons of Keene, New Hampshire. Clean water from the Town of Nassau's water supply well east of the site will be used for all rock coring activities. Alternatively, clean water may be obtained from a local water provider, such as Scaccia, Inc.

2.3. BOREHOLE DEVELOPMENT

Following the completion of the drilling activities, each bedrock borehole will be developed prior to performing the additional hydrogeologic investigation activities described in the following sections. The bedrock borehole will be developed to:

- Remove fine-grained materials which may have settled out during the drilling process;
- Reduce the turbidity of groundwater within the borehole; and
- Enhance the hydraulic connection between the bedrock borehole and the formation.

Well development equipment will be decontaminated prior to use in each bedrock borehole and care will be taken not to expose the equipment to contaminants during installation and use. Groundwater and solids produced during well development will be managed in accordance with Section 3 below.

Development of each bedrock borehole will be performed by Parratt-Wolff and will be accomplished by mechanical surging using a surge block device and pumping utilizing an air lift method. Development shall continue until the development fluid is relatively clear, sediment free and there is a leveling off of the specific capacity, as determined by the on-site geologist.

2.4. BOREHOLE GEOPHYSICS

Each of the five new open bedrock boreholes will be logged using a suite of downhole geophysical methods. The purpose of the geophysical logging will be to assess changes in borehole diameter, fluid characteristics, rock type and vertical flow (including direction [*i.e.*, upward or downward] and magnitude), and to help locate potential water-transmitting fractures within the open boreholes for subsequent packer testing. The suite of geophysical methods performed at each borehole will include:

- Borehole caliper (borehole diameter);
- Fluid resistivity (conductivity);
- Fluid temperature;
- Normal resistivity;
- Single point resistance;
- Spontaneous potential;
- Natural gamma radioactivity (rock type);

- Heat pulse flow meter, under ambient and pumping conditions (the latter with the pump set at the base of the well casing);
- Borehole video;
- Optical televiewer; and
- Acoustic televiewer.

Borehole geophysical logging services will be provided by Mid-Atlantic Geosciences, LLC (MAG) of Lancaster, Pennsylvania. The geophysical information obtained from each borehole will be digitally recorded. The results of the borehole geophysical logging will be summarized by MAG and presented in a report which will be included as an appendix to the summary report discussed in Section 5 below.

2.5. PACKER TESTING

Based on the data obtained from the borehole geophysical logging, packer testing will be performed for the potential water-transmitting fractures identified within each bedrock borehole. To facilitate the testing, a downhole, dual-straddle, inflatable packer system will be utilized. Up to 8 zones will be tested in each of the 200 foot deep boreholes and up to 11 zones will be tested in the 250 foot deep boreholes using a wire-line straddle packer assembly fitted with an appropriate gas-driven piston pump.

In order to assess discrete intervals, the dual packers will be separated by no more than 10 feet, with at least 3 feet of perforations above the bottom portion of packer assembly. The packers will be inflated with nitrogen to isolate the test interval. During pumping from within the packer assembly, water levels will be collected at one-minute intervals from within the test interval and also within the open borehole above the test interval using pressure transducers and associated data logger(s).

During the packer testing, a discrete groundwater sample will be collected from each tested interval that produces sufficient water for sampling. Each such groundwater sample will be collected as a grab sample after a minimum of three packer intervals of groundwater have been evacuated from the test interval. For slowly recharging intervals, the test interval will be purged to dryness for a minimum of one packer interval volume prior to groundwater sample collection. If a test interval does not recover sufficiently to collect a sample within one hour, then no sample will be collected from that interval. The collected groundwater samples will be sent via chain-of-custody to Pace Analytical Services, Inc. (Pace) for laboratory analysis of volatile organic compounds (VOCs) by EPA SW-846 Method 8260B.

Quality assurance / quality control (QA/QC) samples will be collected at a frequency of one per 20 environmental samples. QA/QC samples will include equipment blanks, blind duplicate samples, matrix spike and matrix spike duplicate (MS/MSD) samples and trip blanks. A trip blank will be included with each shipment to the laboratory, and each shipment of samples to the laboratory will occur with 24 hours of sample collection.

2.6. ANALYSIS OF BEDROCK PHYSICAL PROPERTIES

Bedrock core samples will be collected during the extraction well drilling program for laboratory analysis of various physical properties of the bedrock at the Site. A total of 20 bedrock core samples (*i.e.*, two sets of 10 samples) will be obtained for possible testing. The bedrock core samples obtained for laboratory analysis will be collected from various depth intervals at a minimum of two of the five boreholes and will be representative of each of the predominant lithologic units (*i.e.*, the shale-siltstone beds, siltstone/greywacke beds and the shale beds). Initially, eight of these bedrock core samples (*i.e.*, two sets of four samples) will be submitted for laboratory analysis with the remaining 12 samples (*i.e.*, two sets of six samples) held for possible analysis after the initial testing is completed.

One set of four bedrock core samples will be submitted to Golder Associates Ltd. (Golder) in Mississauga, Ontario to evaluate the bedrock matrix diffusion coefficient for chloride and the corresponding tortuosity factor. Specific gravity, hydraulic conductivity, rock density, total organic carbon (TOC), and total porosity analyses will

also be conducted. Based on these data, a decision will be made regarding the testing of the additional six samples.

Another set of four bedrock core samples will also be submitted to PTS Laboratories, Inc. (PTS) in Santa Fe Springs, California for physical properties testing. These bedrock samples will be analyzed by mercury injection porosimetry for total porosity and pore throat distribution by ASTM Method D4404, and for TOC by the Walkley-Black method. Based on these data, a decision will be made regarding the testing of the additional six samples.

The results of the bedrock physical properties testing will be presented as an appendix to the summary report discussed in Section 5 below.

2.7. DETAILED HYDRAULIC CONDUCTIVITY PROFILING

To obtain a detailed profile of the variability of hydraulic conductivity with depth, Flexible Liner Underground Technologies, LLC (FLUTe™) will test one or two of the new 250 foot deep bedrock boreholes using its Hydraulic Conductivity Profiler method. During this process, a blank liner is installed into the borehole while monitoring the rate of decent, or velocity, that the liner everts down the borehole. Those data are then used to prepare a detailed vertical profile of hydraulic conductivity in the borehole.

Hydraulic conductivity profiling will initially be completed at extraction well EW-8. Based on this testing, hydraulic conductivity profiling may also be completed at extraction well EW-5. Completion of the testing at the second well location is contingent on the bedrock formation having adequate transmissivity so that the everting liner reaches the bottom of the borehole in a reasonable amount of time (*i.e.*, within 12 hours of the start of the test). In addition, if the results of the borehole geophysics and/or the packer testing indicate that another borehole has greater transmissivity than EW-8 or EW-5, an alternate borehole may be tested with the concurrence of EPA.

2.8. EXTRACTION WELL INSTALLATION

Following the completion of the additional hydrogeologic investigation activities discussed above, each bedrock borehole will be converted to an extraction well in accordance with the Contract Drawings presented in Appendix C of the DR/IP. This work will be performed by Parratt-Wolff and its subcontractor, Cushing & Sons.

To facilitate the installation of the extraction well screen and riser pipe, the 4-inch diameter corehole (drilled in accordance with Section 2.2 above) will be reamed out to a nominal diameter of 8 inches using rotary drilling techniques. A stabilizer bar will be placed behind the drill bit to minimize borehole deviation during the drilling. Following the completion of the drilling activities, each bedrock borehole will be flushed of any residual drill cuttings and developed in accordance with Section 2.3 prior to installation of the well screen and riser pipe.

Each extraction well will be constructed using a length of 6-inch ID schedule 80 polyvinyl chloride (PVC) riser pipe connected to a length of 0.030-inch slot schedule 80 PVC well screen placed within the bedrock borehole. The length of well screen and the depth of screen installation are presented on Drawing M3 of the Contract Drawings presented in Appendix C of the DR/IP.

Following completion of the extraction well installation, each well will be completed with a flush mounted well vault and the mechanical equipment and electrical controls will be installed in accordance with the Contract Drawings. This work will be performed by ARCADIS U.S., Inc (ARCADIS) and its subcontractors.

2.9. SURVEYING

Each of the newly-installed extraction wells will be surveyed for horizontal and vertical control and will be incorporated into the existing Site base map. Extraction wells will be surveyed vertically to the nearest 0.01 feet at the top of the riser pipe (measuring point) and top of protective steel casing. Ground surface at each location will be surveyed to the nearest 0.1 feet. This surveying work will be performed by ARCADIS.

2.10. DECONTAMINATION PROCEDURES

Decontamination procedures will be used during the additional hydrogeologic investigation activities to ensure that potential contaminants are not introduced into the boreholes or transferred from the subsurface across the Site. A temporary decontamination pad will be constructed at a central location. The proposed location of the temporary decontamination pad is adjacent to extraction well location EW-7. Prior to drilling the first boring, the equipment used in drilling will be cleaned to remove possible contaminants from the drilling equipment. All equipment which will come into contact with subsurface soil, bedrock and/or groundwater, as well as drill tools, drill bits and rods, hoses and the back of the drill rig will undergo the initial cleaning process. While working at the Site, the drilling equipment that comes into contact with subsurface soil, bedrock and/or groundwater will be decontaminated between extraction well locations to prevent cross-contamination. All equipment which will come into contact with subsurface soil, bedrock and/or groundwater will again undergo the cleaning process prior to leaving the Site at the conclusion of the additional hydrogeologic investigation activities.

The cleaning process will involve the use of a high-pressure steam cleaner. Clean water will be used for all decontamination and drilling procedures. Clean water from the Town of Nassau's water supply well east of the site and/or a local water provider will be used for all decontamination procedures. Decontamination water will be collected and managed in accordance with the procedures presented in Section 3.3 below.

3. HANDLING OF INVESTIGATION-DERIVED MATERIALS

Investigation-derived materials (IDM) resulting from performance of the additional hydrogeologic investigation activities will require appropriate management. The IDM includes the following:

- Drill cuttings;
- Groundwater resulting from the drilling and development of the bedrock boreholes;
- Groundwater resulting from the heat pulse flow meter and packer testing performed in the bedrock coreholes;
- Decontamination fluids;
- Sediment which settles out of groundwater and decontamination fluids produced during the above; and
- Personnel protective equipment (PPE) and associated debris resulting from the execution of the various field activities.

The management of these materials is discussed below.

3.1. DRILL CUTTINGS

Drill cuttings derived from the overburden and bedrock will be placed in 55-gallon drums and transported to a central location at the landfill proper. These drums will be temporarily stored adjacent to the gravel turnaround in a manner that does not impede truck traffic. All drill cuttings will be labeled with the appropriate borehole identification(s), the dates on which the cuttings were containerized, and a description of the type of material (*i.e.*, overburden or bedrock drill cuttings).

Following the completion of the drilling and extraction well installation program, representative samples of the drummed overburden and bedrock drill cuttings from extraction well locations EW-4, EW-6 and EW-7 (*i.e.*, the three wells located closest to the landfill proper) will be submitted to Pace for laboratory analysis for VOCs by EPA SW-846 Method 8260B and PCBs by EPA SW-846 Method 8082. The final disposition of the cuttings will be determined based on the results of the laboratory analysis. After receiving the necessary approval(s), the drill cuttings will be transported for off-site disposal at a permitted facility in accordance with the Transportation and Disposal Plan conditionally approved by EPA.

3.2. GROUNDWATER

Groundwater produced during the drilling, development, vertical flow meter testing and packer testing activities will be containerized in polyethylene storage tanks and/or 55-gallon drums and transported to the landfill proper where it will be transferred to one of the two on-site frac tanks located in the pole barn. This groundwater will then be transferred into tanker trucks for off-site transport, treatment, and disposal in accordance with the Transportation and Disposal Plan conditionally approved by EPA. Alternatively, depending on timing, the groundwater may be treated on-site using the new treatment system once it has been placed into routine operation.

3.3. DECONTAMINATION FLUIDS

Decontamination fluids containing non-indigenous materials (*i.e.*, alconox solution) generated during performance of the additional hydrogeologic investigation activities will be containerized in 55-gallon drums and temporarily stored at a central location at the landfill proper. Pending approval from Clean Harbors Environmental Services, Inc. (Clean Harbors), the decontamination fluid will be transferred to one of the two on-site frac tanks located in the pole barn for subsequent off-site disposal as discussed above in Section 3.2.

3.4. SEDIMENT

Sediment is expected to settle from the liquids generated during performance of the additional hydrogeologic investigation activities (*i.e.*, bedrock drilling, development, heat pulse flow meter testing, packer testing and decontamination activities). As discussed above, those liquids will be temporarily stored in polyethylene storage tanks and/or 55-gallon drums. The water will then be transferred to the on-site frac tanks located in the pole barn and disposed of off-site as discussed in Section 3.2. The settled solids (*i.e.*, sediment) will be transferred into drums and labeled with the dates on which the sediments were containerized, and a description of the type of material (*i.e.*, sediment). Representative samples of the drummed sediment will be submitted to Pace for laboratory analysis for VOCs by EPA SW-846 Method 8260B and PCBs by EPA SW-846 Method 8082. The final disposition of the sediment will be determined based on the results of the laboratory analysis. After receiving the necessary approval(s), the sediment will be transported for off-site disposal at a permitted facility in accordance with the Transportation and Disposal Plan conditionally approved by EPA.

3.5. PPE AND ASSOCIATED DEBRIS

Used PPE and other associated debris (*e.g.*, ground plastic, tubing, etc.) will be containerized in 55-gallon drums and transported to a central location at the landfill proper. These drums will be temporarily stored adjacent to the gravel turnaround in a manner that does not impede truck traffic. These materials will be characterized as necessary for profile approval, and will then be transported off-site for disposal at a permitted facility in accordance with the Transportation and Disposal Plan conditionally approved by EPA.

4. LABORATORY ANALYSIS AND DATA VALIDATION

As discussed above, samples of the potable water supply, groundwater, bedrock and IDM will be collected for laboratory analyses during implementation of the additional hydrogeologic investigation activities. Level 4, Contract Laboratory Program (CLP) equivalent data packages will be obtained from Pace for the VOC analytical data associated with the potable water sample and the groundwater samples collected during packer testing. Level 2 equivalent data packages will be obtained from Pace for the waste characterization samples that will be collected of IDM as discussed in Section 3. Level 1 or Level 2 equivalent data packages will be obtained from Golder and PTS for the core samples submitted for laboratory analysis of bedrock physical properties as discussed in Section 2.6.

Data validation will be performed for the VOC analytical data associated with the groundwater samples collected during the additional hydrogeologic investigation activities. Full validation of the analytical data will be performed in accordance with the procedures detailed in the Quality Assurance Project Plan (QAPP) approved by EPA. [Note that a revised QAPP will be submitted to EPA before the DR/IP is implemented.]

5. REPORTING

As required by Paragraph 74 of the Consent Order, progress reporting to EPA will take the form of daily oral, weekly written and monthly written reports. The proposed schedule for these forms of reporting during the additional hydrogeologic investigation activities is described below.

Daily oral reports to EPA will be completed at the end of each day of significant field work during the following activities: casing installation, bedrock coring, borehole geophysics, packer testing, detailed hydraulic conductivity profiling, borehole reaming, extraction well installation and extraction well development. These oral reports will be made by telephone at the end of the day to EPA's Remedial Project Manager (RPM [currently Mr. Benedetto Conetta]) and, if not available, a voice message will be left. A follow-up email to document the oral report will be sent no later than the following day.

Weekly and monthly written progress reports will have a similar format to the progress reports that have been and are currently being submitted to EPA by Respondents. Weekly written progress reports will be prepared and submitted during periods of significant field work during the following activities: casing installation, bedrock coring, borehole geophysics, packer testing, detailed hydraulic conductivity profiling, borehole reaming, extraction well installation and extraction well development. During other times monthly written progress reports will be submitted. The weekly and monthly written progress reports will include any laboratory analytical data (preliminary or validated) for the groundwater samples collected during the packer testing program that are received from the laboratory during the reporting period. The reports will be submitted to EPA's RPM and On-Scene Coordinator (OSC) and other parties as required by the Consent Order.

The results of the additional hydrogeologic investigation activities discussed above will be incorporated into a summary report. This report will include a summary of the work scope, the specific field investigation methodologies used during implementation of the work scope and a presentation of the data generated during the investigation activities in a clear and logical format using tables, graphs, and figures. Analytical data will be presented on computer-generated summary tables. In addition, reports generated by the various laboratories (*i.e.*, Pace, Golder and PTS) and subcontractors (*i.e.*, MAG and FLUTe™) will be presented as appendices to the summary report.