Ground and Surface Water Sampling and Analysis Plan

Prepared for

Iredell County Subtitle D Landfill
Statesville, North Carolina

MESCO Project Number: G06035.6

This report is included as an Appendix E part of the Design Hydrogeologic Study completed for the Iredell County Subtitle D Landfill, Phase 4.

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1 INTRODUCTION

1.1 Objective

The objective of the Ground and Surface Water Sampling and Analysis Plan is to provide clear guidelines and procedures for field and laboratory personnel when obtaining and testing ground and surface water samples. The sampling procedures outlined in this analysis plan are guidelines by which sampling will be performed. Deviation from the procedures may be warranted depending on facility conditions or unforeseen sampling variables. Alternative sampling procedures need to conform to the N.C. Water Quality Monitoring Guidance Document for Solid Waste Facilities (Guidance Document). This plan applies to all of Phase 3 and Phase 4 portions of the Iredell County Subtitle D Landfill. Note that those ground and surface water monitoring points designed to monitor the Phase 4 area, in particular, shall be sampled a least once prior to acceptance of waste in the Phase 4 disposal area.

Four independent sampling events of monitoring wells MW-27S, MW-27D, MW-28 and MW-29 will be taken within six months after the date of issuance of the Permit to Operate for the Phase 4 disposal area, with at least one sampling event occurring prior to receiving waste. The results of these sampling events will be used as baseline water quality information for the subsequent sampling events of Phase 4. All ground and surface water monitoring points will be sampled semi-annually thereafter for the Appendix I list of constituents. In addition to the Appendix I list of constituents; the FORCEMAIN samples will also be tested for biochemical oxygen demand (BOD) chemical oxygen demand (COD), nitrate, nitrite, sulfate, total phosphorus, and pH.

1.2 Summary of Wells

This monitoring plan consists of eleven (11) monitoring wells numbered MW-17, MW-18, MW-19D, MW-19SR, MW-20, MW-21D, MW-21S, MW-27D, MW-27S, MW-28 and MW-29 one (1) surface water monitoring point numbered SW-5, and one (1) leachate collection point referred to as FORCEMAIN. Four (4) monitoring wells, MW-27S, MW-27D, MW-28 and MW-29 have recently been incorporated into the monitoring plan for inclusion of Phase 4. MW-28 will be converted from piezometer P4-11, MW-29 will be converted from P4-12, MW-27D will be converted from P4-13D and MW-27S will be converted from P4-13S. Monitoring points included in this plan are summarized on Table E-1. Note that the leachate lagoon is monitored under the Phase 1 and Phase 2 sampling. In addition down stream surface water point SW-1 is also monitored under the Phase1 and Phase 2 sampling.

MW-17 serves as the background monitoring well for the Phase 3 and Phase 4 portion of the facility. MW-17 is located up-gradient of the disposal area. MW-18 monitors the down gradient southern portion of the

Phase 3 waste limit. MW-19D and MW-19SR monitor down gradient of Phase 3 and the sum area for Phase 3. MW-20 monitors southeast of Phase 3. MW-21D and MW-21S monitor the northeast portion of Phase 3.

MW-27S and MW-27D, currently piezometers P4-13S and P4-13D are located approximately 95' from the waste limit. These down gradient wells will intercept the majority of groundwater that does not pass into the jurisdiction of the Phase 3 monitoring wells. They will also be responsible for monitoring the sump area for any possible leaks. MW-27S straddles the water table with its screened section, allowing for significant seasonal fluctuation. MW-27D is screened on top of rock to monitor for deep contamination traveling along the top of rock of the observed basin feature.

MW-28, currently piezometer P4-11, is located at the compliance boundary west of the waste limit. It will serve as a down gradient compliance well to intercept the groundwater flowing south, and detect changes in the small, unnamed stream.

MW-29, currently piezometer P4-12, is located approximately 200' southwest from the waste limit. Established as a down gradient review well it will monitor groundwater flow between MW-28 and MW-27S/D.

1.3 Equipment

Groundwater samples will be obtained in the field using a laboratory-cleaned, stainless steel bailer sanitized in accordance with the following procedure:

1. Completely disassemble bailer.
2. Phosphate-free, laboratory grade soap and organic-free, distilled water wash.
3. Organic-free, deionized water rinse.
4. Isopropyl alcohol rinse.
5. Organic-free, deionized water rinse.
6. Air dry.
7. Wrap bailer in aluminum foil, shiny side out.
8. Wrap bailer in plastic.

Alternative sampling equipment, such as a disposable Teflon bailer, may be warranted; all alternative equipment and procedures must conform to the Guidance Document. The standard equipment necessary to conduct sampling for each well consists of sample containers (including trip blanks and equipment blanks), one wide-mouth container, at least two 600-ft spools of 1/4-inch nylon rope, at least two boxes of latex gloves, one box of large plastic bags, temperature indicator, pH indicator, conductivity indicator, water level indicator, storage coolers, and ice. If the total depth of all wells to be sampled exceeds 1,200 feet, additional spools of

rope will be required to complete the sampling. If the number of wells to be sampled exceeds one third of the number of pairs of gloves in stock, additional boxes of gloves will be necessary. The bailers, wrapped in foil and plastic, will be transported between pieces of peaked foam rubber to prevent damage to the wrappings. All equipment subject to damage and contamination will be transported in sealed, plastic bags.

Each sample container will be clearly labeled providing the site name, county location, well identification number, parameters to be analyzed, preservative added, date and time of sampling, and initials of the sampler. Samples to be analyzed for organic content will be collected in four 40-ml glass vials with Teflon caps. The sample vials will be completely filled with no air left in the vials. Samples to be analyzed for inorganic contamination will be collected in a -quart/1-liter polyethylene container with ½ inch space for air permitted.

All sample containers will be obtained from an independent laboratory in a sterilized condition. Some of the containers will have a pre-measured amount of preservative in them as necessary. In this event, care will be taken not to rinse the container or allow the preservative to wash out during sampling.

2 SAMPLING

Wells will be sampled in order from least contamination, unless no information is available then the will be sampled in order working down gradient.

2.1 Set-Up

A clean sheet of plastic should be placed around the well to provide a clean surface for sampling equipment. The total well depth read from the well tag and the measured depth to water, determined using the water level indicator, will be used to compute the depth of water in the well. The total well depth will be measured and compared to the depth indicated on the well tag as a check for siltation or blockage at depth, using the chart on Plate C. For example, if a two-inch well is 29 feet deep and has a measured depth to water of 10 feet, there are 19 feet of standing water or 3.3 gallons in the well.

The EPA recommends the indicator parameters: pH, specific conductance, and temperature will be measured on purged and recovered monitoring wells before collecting samples. When three consecutive measurements are within a 10% range, temperature and specific conductance are considered stable, pH is considered stable when three consecutive measurements are within a range of 0.2 units. All information will be recorded on a field data sheet or in a field logbook with copies submitted to the Division of Waste Management with the analytical results.

All meters will be calibrated immediately prior to purging and sampling and those readings recorded in a field logbook. The meters should be recalibrated at the end of each sampling event and those readings recorded in

the log also. Entries will always include pre- and post- calibration readings as well as the model and serial number of the equipment and the date, time, and person performing the calibration(s). Two standards, which bracket the average or suspected measurements for pH and specific conductance, will be used at the site. Additionally, if an equipment blank needs to be run, it should be done before any sampling is started.

2.2 Purging

Purging is done prior to sampling to remove stagnant water from the well, and to introduce fresh groundwater for sampling. Each well will be purged three to five well volumes (quantity of water in the well), or until dry. In the previous example, 10 gallons would be adequate.

After determining the amount of water to be purged from a well, the equipment necessary will be assembled including rope, a 5-gallon bucket, bailer, and gloves. Pull the top portion of foil away exposing the eyelet, keeping the bailer in a stable upright position. Using gloved hands: secure rope to the bailer via the eyelet hole and suspend to remove the remaining plastic and foil. These gloves are now contaminated and cannot touch the bailer or the rope. Clean, gloved hands will lower the suspended bailer into the well until the bailer contacts the bottom. Cut the rope to length and secure it, to prevent loss of the bailer, again replace contaminated gloves. During purging the rope cannot touch the ground or contaminated surfaces including, dirtied plastics, gloves, boots, etc.; many methods are available and it is to the sampler's discretion which method they prefer. The wind-mill method, looping the rope between thumbs, bucket method, where rope is lowered into a clean plastic bag lining a bucket, or simply placing plastic onto the ground near the well covering shoes, are all commonly used.

If purging and sampling of a well are performed at separate times, the bailer will be left suspended in the well, above the water table, with the rope secured. The remaining rope will be removed, in order to prevent contamination issues. The rope may be doubled and grasped in a tight loop in one hand then covered by pulling the corresponding hands glove on top, inside out. The procedure can be repeated using the other hand if necessary. The glove-encased rope will be set on top of the well head until time to sample. Alternatively, the rope remaining after securing may be gathered in a tight loop and pushed into the 2-inch PVC well pipe and left. Even when sampling immediately follows purging, new gloves will be necessary.

Based on the number of wells to be sampled and their proximity to each other, all the wells may be purged one after another with sampling to follow. In this manner, if a well is purged dry, it may be allowed to recharge prior to sampling.

2.3 Groundwater

Lower the bailer into the well slowly, with gloved hands, to avoid releasing any volatiles from the groundwater; the bailer should not splash or smack the water surface. Once full, the bailer will be retrieved and containers filled by emptying the water through the hole at the bottom of the bailer. To top off the VOC's collect some of the groundwater in the cap and pour it onto the samples contents to acquire the needed meniscus to eliminate air bubbles. The polyethylene containers will be filled and sealed with the cap, leaving about 1/2 inch of airspace at the top. In addition to collecting the samples, water will be collected in the wide-mouth container for pH, temperature, and conductivity measurements. Upon completion of sampling, sample containers will be placed in labeled and sealed plastic bags, including equipment and trip blanks, and stored on ice in coolers. The contaminated latex gloves and rope will be discarded.

2.4 Surface Water

Surface water sampling will be taken with given consideration to minimize turbulence and aeration. Surface water sample containers will be handled with gloves on, keeping one hand near the base; containers will be dipped at location points with extreme caution in order to avoid contamination at the mouth of the container, pushing rapidly at an angle into the water, mouth up, and tilted towards the stream current to fill, so as not to lose any of the preservative into the surrounding water. If there is little current movement, the container will be moved slowly through the water laterally. During times of drought, if the water is not deep enough to allow filling of the container, a pool may be scooped out of the bottom of the stream to obtain a sample. The pool will be allowed to clear before sampling. All containers will be filled in the same manner and treated as the ground water samples were. The samples will be sealed in labeled, plastic bags, stored and transported on ice. In addition to collecting the samples, water will be collected in the wide-mouth container for pH, temperature, and conductivity measurements.

2.5 Leachate Sampling

The Phase 4 leachate will be pumped along the waste boundary to connect with the Phase 3 leachate and they will be sampled together at the current Phase 3 leachate sampling site (FORCEMAIN). Leachate will be obtained from the riser pipe located immediately down gradient of the Phase 3 sump, west of the stream. When collecting leachate samples, sample containers will be handled with extreme caution in order to avoid contamination at the mouth of the container. Fill containers by holding them under the spigot. All containers will be filled in the same manner and treated the same as the ground water samples. The samples will be sealed in labeled, plastic bags, stored and transported on ice. In addition to collecting the samples, water will be collected in the wide-mouth container for pH, temperature, and conductivity measurements.

2.6 Chain of Custody

Trip blanks, equipment blanks, and sample containers will all travel and be stored together on ice in coolers. Trip blanks will remain in the condition they are received from the laboratory and will not be opened or tampered with during the sampling. A chain-of-custody record will be completed for each day's samples, indicating the date and time, sample location, sample matrix (soil, water, etc.), and laboratory analyses to be conducted. In addition, a field sampling data sheet will be completed indicating the depth to water, pH, temperature, and specific conductivity of the sample measured in the field at each well sampled. Chain of custody forms are also used to document every time the samples change hands, for example from the sampler to the driver, or from the driver to the laboratory.

3 ANALYSIS

When the water samples reach the laboratory, they will be transferred to a sample custodian who will sign the chain of custody documentation as receipt of the samples. Internal control of the water samples in the laboratory will be in accordance with QA/QC procedures for the laboratory. Copies of QA/QC manuals for approved laboratories are on file at the Division of Solid Waste.

Groundwater and surface water will be analyzed for the Appendix I list of chemical constituents. In addition, practical quantitation limits (PQLs) for each of the constituents will be determined in accordance with the equipment that is used in the laboratory testing. QA/QC procedures utilized during the testing will be in conformance with laboratory QA/QC manual.

4 CONCLUSION

This report, included as part of the Design Hydrogeologic Report for the proposed Iredell County Subtitle D Landfill Phase 4, completes the requirements as described in rule 15A NCAC 13B .1623(b)(3). The ground and surface water monitoring plan is designed to be effective in the early detection of any possible release of hazardous constituents or the leachate surface impoundment to the uppermost aquifer.

Respectfully submitted,

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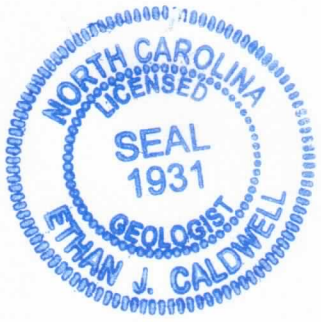

Table E-1: Summary of Ground and Surface Water Monitoring Points

Sampling Point	Type	Gradient	Total Depth (ft)	Designation
MW-17	Monitoring Well	Up	45	Background
MW-18	Monitoring Well	Down	20	Phase 3 Monitoring Well
MW-19SR	Monitoring Well	Down	22	Phase 3 Monitoring Well
MW-19D	Monitoring Well	Down	59	Phase 3 Monitoring Well
MW-20	Monitoring Well	Down	30	Phase 3 Monitoring Well
MW-21S	Monitoring Well	Down	41	Phase 3 Monitoring Well
MW-21D	Monitoring Well	Down	138.25	Phase 3 Monitoring Well
MW-27S	Monitoring Well	Down	20	Phase 4 Monitoring Well
MW-27D	Monitoring Well	Down	44.4	Phase 4 Monitoring Well
MW-28	Monitoring Well	Down	12.4	Phase 4 Monitoring Well
MW-29	Monitoring Well	Down	17.7	Phase 4 Monitoring Well
SW-5	Surface Water	Up Stream		Unnamed Stream Confluence