ENVIRONMENTAL MONITORING PLAN
DOLBY LANDFILL
EAST MILLINOCKET, MAINE

Prepared for

DEPARTMENT OF ADMINISTRATIVE AND FINANCIAL SERVICES – BUREAU OF GENERAL SERVICES

Augusta, Maine

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TABLE OF CONTENTS

TABLE OF CONTENTS
(cont'd)

Section No.	Title	Page No.

LIST OF APPENDICES

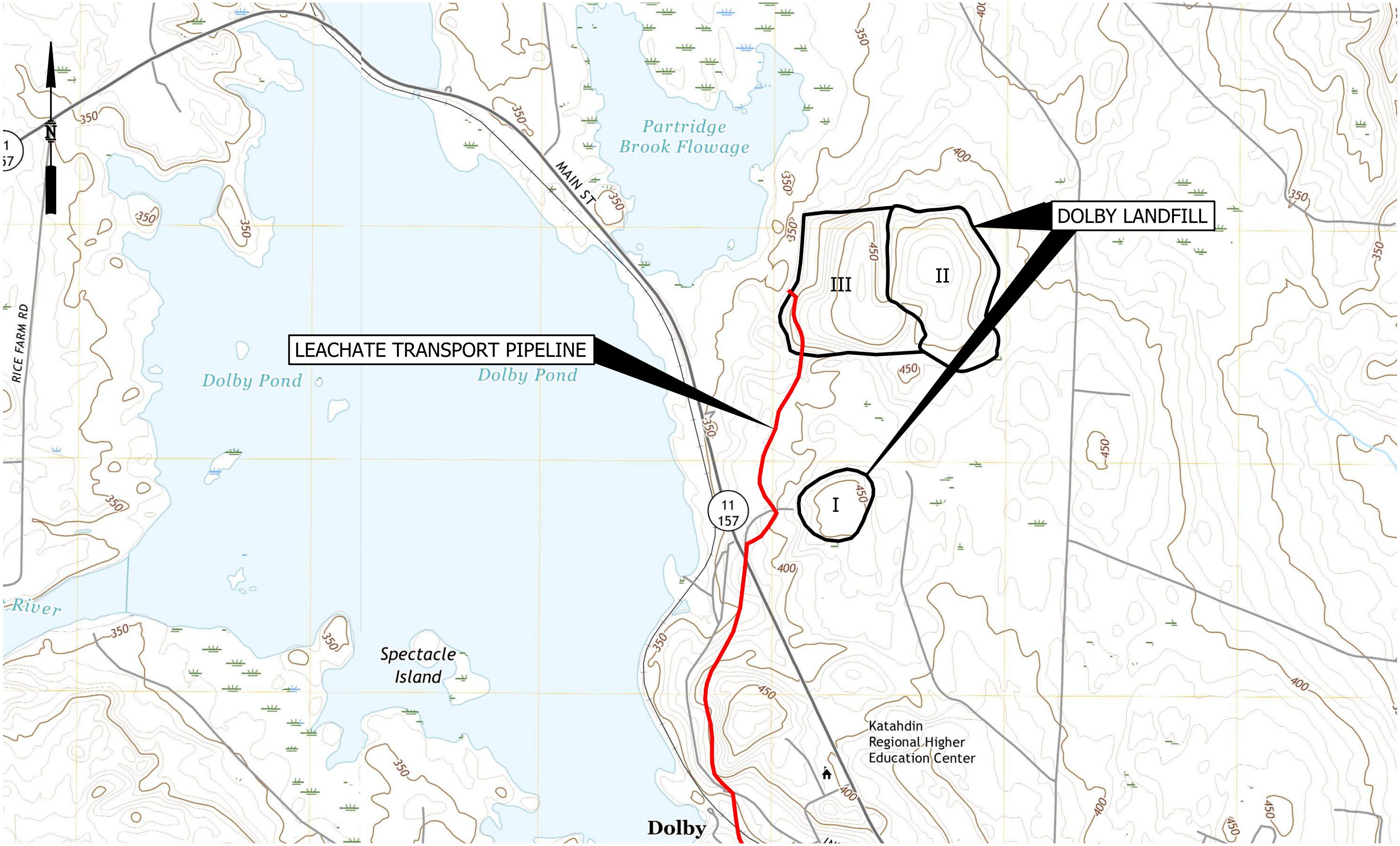
LIST OF FIGURES

LIST OF TABLES

ENVIRONMENTAL MONITORING PLAN
DOLBY LANDFILL
EAST MILLINOCKET, MAINE

1.0 INTRODUCTION

The State of Maine Department of Administrative and Financial Services – Bureau of General Services (DAFS-BGS) owns and operates the Dolby Solid Waste Landfill Facility in East Millinocket, Maine (see Figure 1-1). The operating license issued by the Maine Department of Environmental Protection (MEDEP) requires monitoring of the groundwater, surface water, and leachate in the vicinity of the landfill. This Environmental Monitoring Plan (EMP) summarizes the sampling procedures and analytical techniques that are used for the groundwater, surface water, and gas detection monitoring programs at the Dolby Landfill.



BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLES
MILLINOCKET, ME - 1988
EAST MILLINOCKET, ME - 1988

1000 0 2000 FEET

FIGURE 1-1
SITE LOCATION MAP
DOLBY LANDFILL FACILITY
EAST MILLINOCKET, MAINE

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DWG: SITE LMN: SITELOC-2025 CTB: SME-STD REV: 4/29/2025

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2.0 OBJECTIVES OF THE ENVIRONMENTAL MONITORING PROGRAM

The purpose of this EMP is to detect any potential impacts of the site groundwater, surface water, and ambient air attributable to the landfill. Previous owners of the landfill have conducted water quality monitoring programs since 1982 and have compiled a comprehensive database on the groundwater and surface water quality at the site. In July 2000, the groundwater sampling program was revised to include low-flow sampling techniques. The State of Maine became owner of the landfill in 2011.

3.0 SELECTION OF MONITORING PARAMETERS

This section describes the analytical parameters and parameter groupings used to monitor water quality at the landfill site. The analysis of water quality at the selected sampling locations is the primary method to evaluate the landfill's performance and its influence on the surrounding groundwater and surface waters. Three separate programs have been established to evaluate site water quality. These programs include: (1) site characterization; (2) detection; and (3) assessment monitoring programs. The site characterization program is intended to quantify existing water quality at the various sampling locations and follows the requirements set forth in Maine Solid Waste Management Rules (SWMR) Chapter 405.2.C(1). The detection monitoring program includes a list of parameters that will be sampled three times per year and used to evaluate changes in site water quality. The detection monitoring program is discussed in further detail in the next section. The assessment monitoring program will be used to further evaluate water quality at a particular monitoring location when evaluation of the detection monitoring results suggests significant changes in site water quality as described by the requirements set forth in SWMR Chapter 405.2.C(2)(i).

3.1 Detection Monitoring Program

A detection monitoring program has been implemented to detect trends and reflect changes in water quality in relation to the established site characterization and/or existing water quality. This plan must be carried throughout the active life of the facility and through the closure and post-closure periods. Samples will be obtained and analyzed three times per year from the monitoring points described in Section 4.0 of this report. Water quality parameters, analytical method references, and method reporting limits for the site are presented on Table 3-1.

If results of the detection monitoring program indicate possible deterioration in water quality at one or more groundwater monitoring wells or surface water monitoring sites, an evaluation of the cause(s) must be initiated within 30 days of receipt of the laboratory results. A report of the evaluation will be prepared by a qualified professional and submitted to the MEDEP for approval within ninety days of the evaluation. The evaluation will include the following:

A statistical analysis of the data from the monitoring report:

- Evaluation of the source(s) that may have caused the groundwater deterioration; and
- Evaluation of possible errors with the groundwater monitoring program (i.e., sampling or analysis error).

3.2 Assessment Monitoring

Assessment monitoring will be initiated within 90 days of the date the report required by SWMR Chapter 405.2.C(2)(i) is submitted. The assessment monitoring plan will be submitted to the MEDEP for approval prior to plan initiation and include the following elements:

- Proposed changes to the water quality monitoring plan will be submitted to the MEDEP at least 15 days prior to the first sampling event;
- The plan will include three sampling events per year on groundwater wells that had a statistically significant change in concentration of a parameter; and
- Samples taken during the first two rounds will be analyzed for SWMR Chapter 405, Appendix A, Column 3 parameters. Requests for elimination of parameters based on the results of the first two rounds will be submitted to the MEDEP for approval.

3.3 Corrective Action Plan

Upon verification through statistical analysis and assessment monitoring that significant deterioration has occurred to one or more groundwater monitoring wells, a corrective action plan will be submitted to the MEDEP for approval within 90 days of that verification. The plan will include an evaluation of corrective action(s) and a proposal to initiate the corrective action(s). These actions will be performed to minimize the impact of the contaminants on the groundwater. The evaluation plan will be updated and resubmitted annually until successful corrective action has been demonstrated. The action plan will include the five elements outlined in SWMR Chapter 405.2.D.

TABLE 3-1

ANALYTICAL PROGRAM

Detection Monitoring Program Test Parameters:

Water Quality Parameters	Method	Reporting Limit (mg/l)	Groundwater	Surface Water	Leachate
		Field Parameters			
Dissolved Oxygen (D.O.)	Field Parameter		X	X	
Field Observations	Field Parameter		X	X	X
Monitoring Well Pump Rate	Field Parameter		X		
pH	Field Parameter		X	X	X
Turbidity	Field Parameter		X	X	
Specific Conductance	Field Parameter		X	X	X
Static Water Elevations	Field Parameter		X		
Surface Water Flow Rates	Field Parameter			X [1]	
Temperature	Filed Parameter		X	X	X
		Indicator Parameter			
Alkalinity	SM 2320B	1.0	X	X	X
Bicarbonate	SM 2320B	1.0	X	X	X
Chloride	EPA 9056	2.0	X	X	X
Nitrogen, Ammonia	EPA 350.1	0.2	X	X	X
Nitrogen, Nitrate	EPA 9056/300.0	2.0	X	X	X
Phosphorous, Total	EPA 6010	0.1		X	X
Sulfate	EPA 9056/300.0	1.0	X	X	X
Total Dissolved Solids (TDS)	SM 2540C	1.0	X	X	X
Total Organic Carbon (TOC)	EPA 9060	1.0	X	X	X
Total Suspended Solids (TSS)	EPA 160.2	1.0	X	X	X
		Inorganic Parameters			
Arsenic (Total)	EPA 200.7/6010	0.008	X	X	X
Calcium (Total)	EPA 6010B	1.0	X	X	X
Hardness (Mg & Ca)	Calculation	NA	X	X	X
Iron (Total)	EPA 6010B	0.01	X	X	X
Magnesium (Total)	EPA 6010B	1.0	X	X	X
Manganese (Total)	EPA 6010B	0.01	X	X	X
Potassium (Total)	EPA 6010B	1.0	X	X	X
Sodium	EPA 6010B	1.0	X	X	X

TABLE 3-1

ANALYTICAL PROGRAM (cont'd)

Assessment Monitoring Program Test Parameters:

Water Quality Parameters	Method	Reporting Limit (mg/l)	Groundwater	Surface Water	Leachate
Inorganic Parameters					
Aluminum (Total)	EPA 6010B	0.020			X [2]
Antimony (Total)	EPA 6010B	0.003			X [2]
Barium (Total)	EPA 6010B	0.010			X [2]
Beryllium (Total)	EPA 6010B	0.002			X [2]
Cadmium (Total)	EPA 6010B	0.0004			X [2]
Chromium (Total)	EPA 6010B	0.005			X [2]
Cobalt (Total)	EPA 6010B	0.050			X [2]
Copper (Total)	EPA 6010B	0.003		X [1]	X [2]
Lead (Total)	EPA 6010B	0.003			X [2]
Nickel (Total)	EPA 6010B	0.003			X [2]
Selenium (Total)	EPA 6010B	0.005			X [2]
Silver (Total)	EPA 6010B	0.007			X [2]
Thallium (Total)	EPA 6010B	0.0028			X [2]
Zinc (Total)	EPA 6010B	0.010			X [2]
Organic Parameters					
Volatile Petroleum Hydrocarbons (VPH)	MADEP VPH Method	(4)	X[3]		X [2]
Extractable Petroleum Hydrocarbons (EPH)	MADEP EPH Method	(5)	X[3]		X [2]

Notes:

1 Only measured at PBFR (Partridge Brook Flowage).
2 The leachate pond (LP) is sampled for the detection monitoring parameters every monitoring event and sampled for assessment parameters once a year (as per Chapter 405 leachate sampling requirements).
3 Monitoring wells MW-301, MW-302B, and MW-302C sampled for VPH and EPH once a year (fall).
4 The individual compounds reported for the VPH analysis have reportable detection limits (RDLs) from 0.2 to 5.0 µg/L.
5 The individual compounds reported for the EPH analysis have reportable detection limits (RDLs) from 0.2 to 1.0 µg/L.

4.0 SAMPLE LOCATIONS AND FREQUENCY

Samples will be collected from 21 locations, as summarized on Table 4-1. The sampling locations are shown on Figure 4-1. The samples will be collected twice per year, once in late spring/early summer and once in the fall.

TABLE 4-1

SAMPLING LOCATIONS

GROUNDWATER MONITORING WELLS

DOLBY III

MW-107A	MW-304A	MW-402A
MW-301	MW-304B	MW-402B
MW-302B	MW-401A	
MW-302C	MW-401B	

DOLBY II

MW-104B	MW-205B	MW-303B
MW-202AR	MW-206A	
MW-202B	MW-206B	
MW-205A	MW-303A	

DOLBY I

MW-103	MW-113

SURFACE WATER SAMPLING LOCATIONS

PBFB	Partridge Brook Flowage – Background
PBFR	Partridge Brook Flowage – Revised location beginning 2012
ND	North Ditch
SPO	Siltation Pond Outlet
SPON	Siltation Pond North
SPOS	Siltation Pond South

LEACHATE SAMPLING LOCATIONS

LP	Leachate Pond South of Dolby III
LPD2	Leachate Pond East of Dolby II
LDS	Leachate Pond Leak Detection Sump
UDLP	Leachate Pond Underdrain Manhole

AERIAL PHOTO DATED JULY 8, 2008

LEGEND

GROUNDWATER WELLS

SURFACE WATER SITES

500 0 1000 FEET

FIGURE 4-1
WATER QUALITY
MONITORING LOCATIONS
DOLBY LANDFILL FACILITY
EAST MILLINOCKET, MAINE

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DWG: AERIAL-2008 LMN: WAT SAMPL SITES WO CTB: SME-STD REV: 3/28/2023

\\NSERVER\cfs\Kpc\Dol\ACAD\WaterSampleSites\Aerial-2008.dwg, EMP FIGURE 4-1 W_O, 3/28/2023 12:20:40 PM, jrl

4.1 Monitoring Wells

Dolby I reached the end of its post-30-year closure monitoring requirement during 2010. Historical monitoring wells MW-103 and MW-113 were removed from the monitoring program in 2011. In an agreement with the MEDEP, the DFAS-BGS will continue to monitor field parameters at MW-103 and MW-113. Monitoring wells will be sampled at 19 locations around the Dolby II and Dolby III Landfills and include nine wells for Dolby II (MW-104B, MW-202AR, MW-202B, MW-205A, MW-205B, MW-206A, MW-206B, MW-303A, and MW-303B), and ten wells for Dolby III (MW-107A, MW-301, MW-302B, MW-302C, MW-304A, MW-304B, MW-401A, MW-401B, MW-402A, and MW-402B). Monitoring well MW-104B is upgradient of the landfill and is used as a background monitoring location.

Monitoring wells will be sampled using the low-flow sampling technique as required in SWMR Chapter 405.2.A(2)(b).

4.2 Surface Water

Surface water samples will be collected in six locations; one stormwater ditch along the northwest side of Cell 9 (ND), three stormwater siltation basins (SPO, SPON, and SPOS), and two locations on Partridge Brook Flowage (PBFR and PBFB). PBFR will be collected east of the landfill, downgradient of level spreader at a location west of likely drainage; and PBFB will be collected as a sample unaffected by discharge north of PBFR. Prior to 2012, Partridge Brook Flowage was sampled at a location west of the leachate pond underdrain outlet. Sampling of that location was discontinued at the end of 2011, since the leachate pond underdrain no longer discharges to Partridge Brook Flowage. Water from the leachate pond underdrain is collected and treated with the leachate.

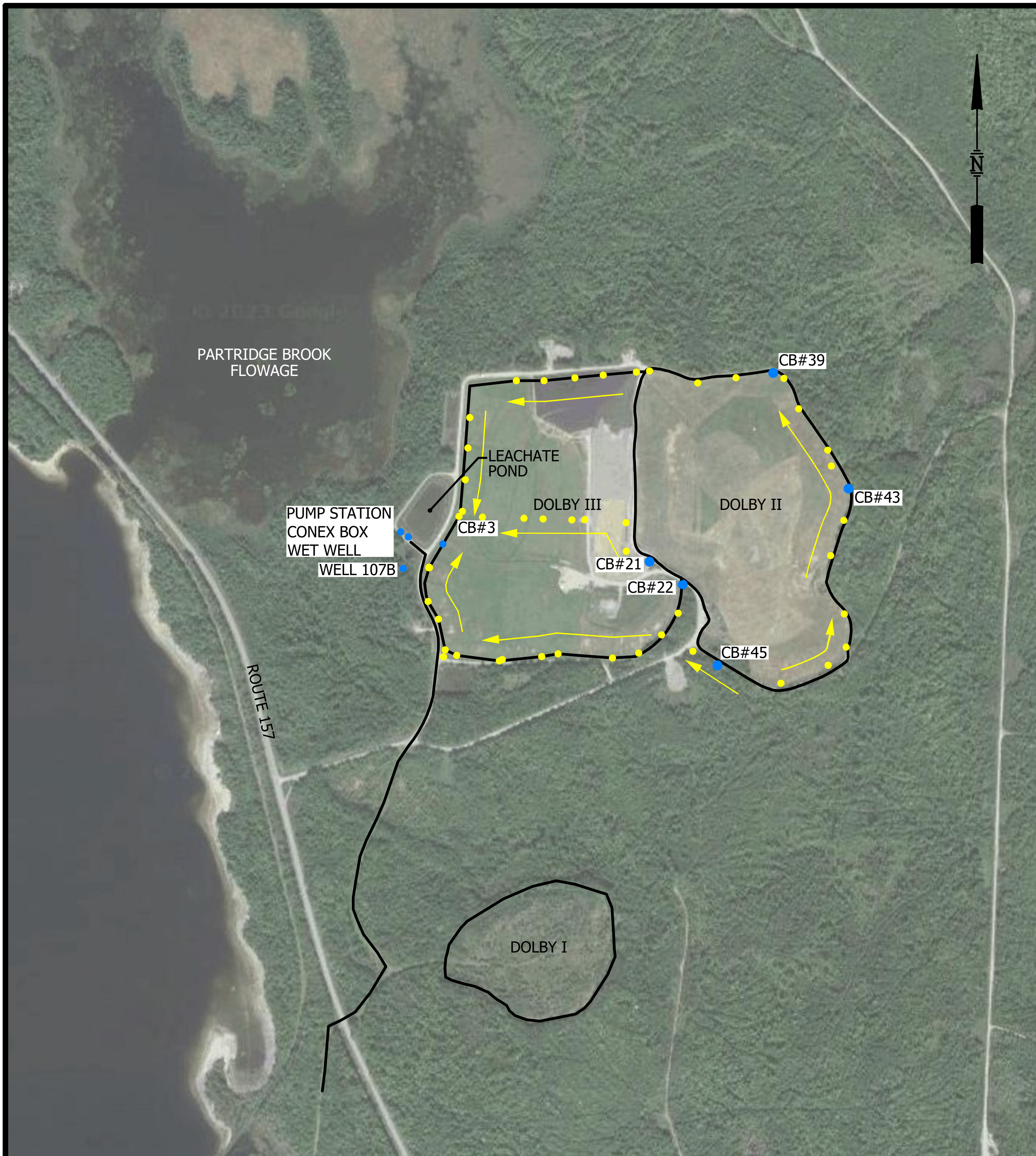
4.3 Leachate

The leachate pond (LP) will be sampled for the detection monitoring program test parameters every monitoring event and sampled for assessment monitoring parameters once a year. Parameters consistently undetected in the leachate sample will be deleted from the leachate monitoring program upon approval by the MEDEP.

Since spring 2005, the small leachate collection pond (LPD2), East of Dolby II, is sampled for detection monitoring parameters. Since spring 2008, the leachate pond leak detection system (LDS) for the leachate pond is sampled for detection monitoring parameters.

4.4 Gas Monitoring

The purpose of gas testing at Dolby Landfill is to ensure that operators, transient employees, and contractors are not being exposed to harmful levels of Hydrogen Sulfide (H_2S) or explosive gases. Gas monitoring at Dolby Landfill is conducted to protect workers. The gas monitoring locations are tested during each water quality sampling event. The locations consist of several manholes spaced along the perimeter of the landfill (i.e., CB#3, CB#21, CB#22, CB#39, CB#43, and CB#45), one former groundwater monitoring well (107B), the Conex Box, the leachate pond pump station, and the associated wet well. Each location will be tested for H_2S and explosive gases as methane equivalent. The MEDEP is to be notified within 24 hours of any gas readings greater than 25 percent LEL. The gas monitoring sampling locations are shown on Figure 4-2.



AERIAL IMAGE FROM GOOGLE EARTH, DATED SEPTEMBER 16, 2022

500 0 1000 FEET

LEGEND

SAMPLE LOCATIONS

EXISTING MANHOLE/CATCH BASIN

FLOW DIRECTION OF LEACHATE COLLECTION SYSTEM

FIGURE 4-2
LANDFILL GAS MONITORING LOCATIONS
DOLBY LANDFILL FACILITY
EAST MILLINOCKET, MAINE

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DWG: AERIAL-2008 LMN: CB GAS MONITOR CTB: SME-STD.CTB REV: 4/2/2025

\\Nserver\cfs\Kpc\Dol\ACAD\WaterSampleSites\Aerial-2008.dwg, EMP FIGURE 4-2, 4/2/2025 11:39:26 AM, bwb

5.0 WATER QUALITY SAMPLING EQUIPMENT STAGING PROCEDURE

This section lists the equipment used for sampling groundwater, surface water, and leachate.

- Sample Containers. New sample containers are received from the contracted laboratory prior to each sampling event.
- Tubing. Due to biological contamination and iron staining over time, tubing at each well must be inspected and replaced if necessary every two years.
- pH Meters. The portable pH meters (Hach One and Hach EC10) are checked using pH buffers and a certified known. This information is recorded in the Groundwater Staging Notebook. The pH buffer supply and expiration dates are inventoried at this time.
- Conductivity Meters. The portable conductivity meter (Hach Sension5) is checked using purchased conductivity standard in the range of groundwater conductivities. The results are entered in the Groundwater Staging Notebook. The conductivity standards and expiration dates are inventoried at this time.
- Water Level Meters. The batteries of the water level meter (Solinst Model 101) are checked by pressing the meter's battery test button and listening for the buzzer to sound. During sampling, the water level readings are compared to past.
- Levels to ensure the accuracy of the meter. If this reading is questionable, the meter will be checked for accuracy in a container of water.
- D.O. Meters. The batteries and probe membrane of the DO meters (YSI 58) are checked prior to each sampling event.
- Turbidimeter. Prior to the first sampling event of each year, the meter's calibration is checked using primary turbidity standards. Adjustments are made if necessary. Additionally, a certified known sample is analyzed to check the accuracy of the calibration curve. Secondary turbidity standards are used in checking for calibration drift prior to subsequent groundwater sampling events during that year.
- Gas Meter. RKI GX2003 portable gas detector (or equivalent) designed specifically to monitor landfill gas.
- Certified Known. A yearly inventory of certified known samples used for quality assurance purposes is performed prior to the first sampling event.
- Documentation. Records of these procedures are kept in the Groundwater Staging Notebook.
- Sample Collection. Samples will be collected in the following order:
    - VPH,

- TOC and Ammonia Nitrogen Bottle,
- EPH,
- Metals and Total Phosphorous,
- Chloride, Nitrate, Sulfate, and Alkalinity, and
- TSS and TDS.

6.0 SAMPLING PROCEDURES

The following sections describe the protocols involved in the sampling of groundwater monitoring wells and surface water sample locations, including leachate.

6.1 Groundwater Sampling Procedure

The following low-flow sampling procedure is used for the monitoring wells at the Dolby Landfill.

- Using the water level meter, obtain a static water level.
- Begin pumping each well at a flow rate of approximately 100 ml/min. Measure the water level at one-minute intervals over the next three minutes. Perform adjustments to the pump rate to obtain water level stabilization.
- After the first 3 minutes and at subsequent 3-minute intervals, a set of field parameters including water level is performed. The well will be purged until one of the four conditions listed below are met. After the well is stabilized, a complete set of field measurements will be obtained (pH, D.O., specific conductance, temperature, and turbidity) followed by filling the sample bottles. These measurements will be recorded on the Low-Flow Sample Purge Form (refer to Appendix A). All samples will be obtained through the peristaltic pump with no sample filtration.
    - Condition 1

      Both field parameters and water levels stabilize within 30 minutes. The stabilization criteria are listed below.

      Complete stabilization is defined as three successive field parameter and water level measurements at 3-minute intervals, which must meet the following criteria.

pH	+/- .1 standard pH unit with respect to previous pH measurement
Specific conductance	+/- 5 percent of previous measurement
Turbidity	+/- 10 percent of previous measurement when turbidity is above 10 nephelometer turbidity units (NTU) +/- 1 NTU with respect to previous measurement when turbidity is below 10 NTU
Dissolved Oxygen	+/- 1 mg/L when D.O. is greater than 1 mg/L +/- .1 mg/L when D.O. is less than 1 mg/L
Maximum Drawdown	0.0 feet over a six-minute period

- Condition 2

  A drawdown of 3 feet from the static water level has occurred.

- Condition 3

  A time period of 30 minutes has elapsed without water level stabilization; however, the field parameters have stabilized as listed in Condition 1.

- Condition 4

  Well recharge is not sufficient to perform field parameter stabilization. In this instance, the amount of water contained in the sample tubing will be removed followed by the collection of water quality samples followed by one complete set of field readings.

6.2 Surface Water and Leachate Sampling Procedure

Surface water and leachate samples must be analyzed using unfiltered samples and collected in the following manner:

- Collect the sample by immersing the sample bottle not more than 1 foot below the water surface. The sample will be collected upstream of the sampler with the opening of the sampling device oriented upstream but avoiding floating debris. Extreme care should be taken to avoid including bottom sediment in shallow water sampling sites. Surface water sample locations will always be taken from less than 10 feet deep to minimize the potential for stratification. The Dolby III leachate pond sample will be collected from the leachate pond. Extreme care should be taken to avoid including sediment in the samples that have been deposited onto the leachate pond liner. The leak detection sample will be collected using a peristaltic pump and tubing. A separate bottle is used to perform field parameter analyses for surface water samples.
- Directly fill the appropriate sample containers from the sampling device.
- Measure the following parameters, if possible, in the water body, not the sample:
  - Temperature;
  - pH;
  - Specific conductance;
  - Turbidity; and
  - Dissolved oxygen.

  If direct measurement is not possible, these parameters will be measured from a container separate from the sample collection container used for performing the laboratory analysis. This information will be recorded on the Surface Water Sampling Sheet, sample labels will be completed, and chain-of-custody procedures will be initiated.

- Estimate surface water flow rate. The surface water flow rate will be measured when possible. The flow rate will be estimated by using an H-flume, calculating flow in a discharge pipe, or by timing a floating chip. The flow rate will be recorded on the Surface Water Sampling Sheet. If the water flow cannot be measured at a location, the lack of flow will be noted on the Surface Water Sampling Sheet.

7.0 FIELD TEST PROCEDURES

Due to the instability of certain analytical parameters with respect to time, some testing will be performed in the field to achieve representative results. Below are the field tests and their corresponding procedures.

7.1 Conductivity

- Discussion. Conductivity measurements are useful indicators in detecting inorganic contamination. It is a numerical expression of the ability of an aqueous solution to carry an electrical current and is expressed as µmhos/cm.
- Sampling and Preservation. Conductivity measurements are made continuously prior to sample collection to determine well water stabilization.
- Methodology. Specific conductance, µmhos at 25°C – Method 120.1.
- Reference Literature. U.S.EPA "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-20), revised March 1983.
- Apparatus.
- a. Conductivity Meter (Hach Sension5)
- Reagents.
- a. Primary Calibration Standards (purchased)
- b. Water (distilled)
- Procedure.
    - Place the conductivity probe into the flow through sampling cell.
    - To measure conductivity, press the on/off button and allow time for the Automatic Temperature Compensator to correct for solution temperature changes. Start recording the conductivity readings, on the Low-Flow Sample Purge Form, every three minutes until one of the four sampling conditions are met. The conductivity readings for surface water and leachate samples will be taken once a stable reading is obtained.
- Notes.
    - Replace all batteries when the "bat" error message is displayed.
    - To improve performance, clean the stainless-steel electrodes by rinsing them in alcohol for 10 to 15 minutes.
    - Remove batteries if long-term storage is anticipated (2 to 3 months).

7.2 pH

- Discussion. pH is a measure of the activity of hydrogen ions by potentiometric measurements using a hydrogen and reference electrode. A pH shift in the groundwater is an important indicator of groundwater contamination.
- Sampling and Preservation. pH measurements are made continuously prior to sample collection to determine well water stabilization. If a problem should arise with the field pH meter, a backup meter will be used.
- Methodology. Electrometric – Method 150.1.
- Reference Literature. U.S.EPA "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-020), revised March 1983.
- Apparatus.
  - pH meter with combination electrode – portable (Hach One pH Meter).
  - pH meter with combination electrode – portable (Hach Model EC10).
- Reagents.
  - Buffers (various – purchased).
  - Water (distilled).
- Procedure.
  - Press the "POWER" button to turn meter on (display will light).
  - To perform pH measurements, insert the electrode into the groundwater sampling flow through cell and press the "pH" key. Start recording the pH readings, on the Low-Flow Purge Form; every three minutes until one of the four sampling conditions are met. The pH readings for surface water and leachate samples will be taken once a stable reading is obtained.
- Notes.
  - Rinse electrode with distilled water between measurements to avoid sample contamination.
  - b. Refer to operator's manual for error code information.
  - c. Remove batteries for long-term storage (three or more months).

7.3 Temperature

- Sampling and Preservation. Temperature measurements must be performed immediately.

- Methodology. Thermometric – Method 170.1.
- Reference Literature. U.S.EPA "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-020), revised March 1983.
- Apparatus.
    - Temperature readings are conducted using the temperature readings from the pH meter.
    - Thermometers (NBS traceable).
- Procedure.
    - Temperature measurements are made utilizing the temperature readings on the pH meter.
    - Start recording the temperature readings, on the Low-Flow Purge Form; every three minutes until one of the four sampling conditions are met. The temperature readings for surface water and leachate samples will be taken once a stable reading is obtained.
- Notes.
    - NBS traceable thermometers are used to ensure the accuracy of the digital thermometer. The results of these checks are kept in a laboratory bound notebook.

7.4 Water Level

- Discussion. Water level measurements are critical to low-flow sampling to ensure water column draw down does not occur, thus allowing the field technician the ability to collect only the groundwater flowing past the screened interval of the well.
- Sampling and Preservation. Water level readings must be taken immediately.
- Apparatus (Water level Meter).
    - Soil Test Water Level Indicator (DR-760A) is used for piezometric readings.
    - Solinst Water Level Indicator (Model 101) is used for groundwater well readings
- Groundwater and Piezometric Measurement Procedure.
    - Energize the water level meter.
    - Slowly lower the probe portion of the meter down the well until contact is made with the water. Contact will be either an audible alarm or visual signal.
    - Record the depth to the water from the top of the PVC well casing to within 0.01 feet on the Low-Flow Sample Purge Form.

- Record the water level depth every minute, for the first three minutes, on the Low-Flow Sample Purge Form. Then record the water level every three minutes along with the other field meter readings.
- Remove meter cable and probe and rinse with deionized water.

- Notes.
  - The static water level must be taken before there is any disturbance to the water in the well.

<u>7.5 Dissolved Oxygen</u>

- <u>Discussion</u>. Dissolve Oxygen (D.O.) measurements are important in a groundwater monitoring program in indicating when well water stabilization has occurred.
- <u>Sampling and Preservation</u>. Samples must be analyzed continuously throughout the low-flow sampling event.
- <u>Methodology</u>. Oxygen, Dissolved – Method 360.1 (Membrane Electrode)
- <u>Reference Literature</u>. U.S.EPA "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-20), revised March 1983.
- <u>Apparatus</u>.
  - D.O. Meters (YSI Model 58)
  - Accessories and replacement parts
- Reagents.
  - KCl electrolyte solution (or equivalent)
  - Distilled water
- Procedure.
  - Prior to performing D.O. measurements, check to ensure no air bubbles are present at the membrane interface. If a bubble is present, the membrane must be reconditioned as prescribed in the instrument's instruction manual.
  - Set the function switch to % mode. Place the end of the probe in a plastic bottle containing a wetted sponge. This will expose the membrane to a constant temperature and 100 percent relative humidity.
  - Set the function switch to "zero" and readjust the display to read 0.00 if necessary. Switch back to % air saturation mode.

- When the display reading has stabilized, unlock the "O_2 Calib" control locking ring, adjust the display to read 98.6, and relock the ring.
- Insert the probe's membrane in the groundwater flow through cell (water must be flowing through the cell) and the function switch should be set to the 0.1 mg/L range.
- Start recording the D.O. readings, on the Low-Flow Purge Form, every three minutes until one of the four sampling conditions are met. The D.O. readings for surface water samples will be taken once a stable reading is obtained.

- Notes.
  - Meter must be energized at least one-half hour prior to performing D.O. measurements to ensure probe stabilization.
  - Batteries should be removed from meter during long periods of storage (more than three months).
  - Refer to operator's manual for measurement errors.

7.6 Turbidity

- Discussion. An important field test parameter in determining well water stabilization is turbidity, since suspended matter can affect other test parameters (i.e., metals).
- Sampling and Preservation. Samples are analyzed every three minutes throughout the low-flow sampling event.
- Methodology. Turbidity, Method 180.1 (Nephelometric).
- Reference Literature. U.S.EPA "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-20), revised March 1983.
- Apparatus.
  - Turbidimeter (Hach 2100P or equal)
  - Cells
- Reagents.
  - Primary Turbidity Standards
  - Secondary Turbidity Standards
  - Distilled Water

- Procedure.
    - o Energize the instrument. Rinse a clean sample cell with dilution water several times. Fill the cell to the line with the groundwater sample and wipe the cell with a lint-free cloth to remove water and fingerprints.
    - o Insert the sample cell into the cell compartment by aligning the orientation mark on the cell with the mark on front of the cell compartment and close the lid.
    - o Select the automatic range selection by pressing the "Range" key. The display will show "Auto RNG" when the instrument is in the automatic range selection. This option will automatically be selected for subsequent samples.
    - o Select the signal averaging mode by pressing the "Signal Average" key. The display will show SIG AVG when the instrument is using signal averaging. This option will automatically be selected for subsequent samples.
    - o Press the "READ" button. The display will show ---- NTU, then the turbidity of the sample in NTU. Record the turbidity on the groundwater field data sheet.
    - o For additional sample measurements, repeat steps a, b, and e.
- Notes.
    - o Avoid entrained air bubbles by pouring the sample slowly down the side of the cell.
    - o Make sure cold samples do not fog the sample cell.
    - o Do not leave the sample cell in the sample compartment for extended periods of time, since this may compress the spring in the cell holder.
    - o When taking measurements make sure instrument is on a level, stationary surface.
    - o Remove sample cell and batteries from instrument if storing for an extended period of time.
    - o Avoid settling of sample prior to measurement.
    - o Wipe outside of sample cell prior to performing measurement with lint free cloth or paper.

7.7 H_2S Gas Testing

- Discussion. The purpose of the testing for Hydrogen Sulfide gas (H_2S) is to ensure that operators and transient employees are not being exposed to harmful levels.
- Sampling and Preservation. Sampling must be performed at the landfill.
- Methodology. Single Sensor Gas Detector
- Reference Literature. Refer to Biosystems Inc. Reference Manual.

- Apparatus.
    - RKI GX2003 portable gas detector (or equivalent) Aspirator and tygon tubing
- Reagents.
    - Calibration gas
- Procedure.
    - Energize the gas detector.
    - Measurements are made at the operator's building and leachate pumping station by aspirating the surrounding air for two to three minutes.
    - Measurements are performed on the leachate sump and catch basins by aspirating the air inside the structures for approximately two to three minutes.
    - Measurements are performed at wells (e.g., MW-107B) via a capped tubing connection from the well to the meter's sensor. Sample collection involves aspirating the air inside the well for approximately two to three minutes.
    - The highest value obtained over this two to three minutes is recorded on the Dolby Landfill Gas Monitoring Field Sheet (refer to Appendix A) at each location.
- Notes.
    - Refer to the reference manual for troubleshooting meter, calibrating, and changing batteries.

7.8 LEL/Gas Testing

Note, often time the H_2S meter will also include LEL (lower explosive limit) testing ability. If a separate LEL/Gas meter is used the following information applies.

- Discussion. The purpose of LEL/gas testing is to determine the concentration of combustible gases at the landfill.
- Sampling and Preservation. Samples must be analyzed in the field.
- Methodology. Combustible Gas Indicator.
- Reference Literature. Refer to Gascope Combustible Gas Indicator Instruction Manual.
- Apparatus.
    - Combustible Gas Indicator (Gascope MSA Model 62S).
    - Aspirator and tygon tubing.
- Reagents. (None)

- Procedure.
  - Open cover and set "RANGE" switch to LEL.
  - Set "ON/OFF" switch to ON. READY indicator light should turn on within four seconds. BATT indicator pointer should be a least halfway into white zone.
  - Squeeze aspirator bulb eight to ten times to purge instrument with fresh air. Permit bulb to inflate completely after each squeeze.
  - Lift and adjust "LEL/ZERO" control to obtain zero indication on meter.
  - Set "RANGE" switch to GAS. The READY indicator should momentarily turn off and then turn on within 4 seconds.
  - Lift and adjust "GAS ZERO" control to obtain zero indication on meter.
  - Measurements are performed at the leachate pump station and operator's building by aspirating the surrounding air for two to three minutes.
  - Measurements are performed on the leachate sump and catch basins by aspirating the air inside the structures for approximately two to three minutes.
  - Measurements are performed at the well (107B) via a capped tubing connection from the well to the meter's sensor. Sample collection involves aspirating the air inside the well for a two-to-three-minute time period.
  - The highest measurement read at these four sample locations is recorded on the Dolby Landfill Gas Monitoring Field Sheet.
- Notes.
  - Due to potential high concentration of combustible gas, set the function switch to GAS, rather than LEL, at the catch basin locations only. An extremely high concentration using the GAS mode could potentially ruin the gas detection sensor.
  - Refer to operator's manual for maintenance and troubleshooting issues.

7.9 Quality Assurance

Quality assurance is necessary to ensure:

- Representative samples have been collected.
- Collected samples are properly labeled and preserved.
- Field tests are performed accurately.

Quality assurance is accomplished by technicians trained in field testing and sample collection. The quality control measures implemented are as follows:

- Sample Containers. New sample containers are received from the contracted laboratory prior to each sampling event.
- Field Instrumentation. All probes (i.e., pH, temperature, D.O., and conductivity) and sample cells (i.e., turbidity) are rinsed thoroughly with distilled water between well sampling events to avoid contamination problems.
- Field Instrument Calibration. Prior to performing field test measurements, instrument calibrations must be performed. The following steps are taken to ensure accurate and precise measurements are made:
    - o pH Meter.
        - A two-point calibration curve is performed using pH buffers bracketing the anticipated well water pH measurement following the manual's calibration procedure.
        - A known pH buffer solution is measured at the beginning and end of the sampling event. This serves as the precision and accuracy check for the instrument.
        - A certified known is measured annually for verification of proper instrument and electrode operation.
            - (4) If a malfunction occurs with the field pH meter, the second portable pH meter will be utilized.
            - (5) The following information is recorded on the Groundwater Well Sampling Meter Check Form (refer to Appendix A).
        - Accuracy and precision check;
        - Buffers used to calibrate pH meter; and
        - Make and model number of pH meter used.
    - o Conductivity Meter.
        - A purchased conductivity standard is measured before and after the sampling event. The results of these measurements serve as the precision and accuracy check.
        - If the conductivity reading is not within the tolerance range as specified on the conductivity standard's label, corrective steps are taken as outlined in the instruction manual.

  - A check of the temperature compensator performance is performed by measuring a cooled conductivity standard at the anticipated well water temperature. If inaccurate readings are observed, temperature measurements must be made using an NBS traceable thermometer and corrections in measured conductivities made.
  - The following information is recorded on the Groundwater Well Sampling Meter Check Form:
    - Accuracy and precision check;
    - Conductivity of standard used; and
    - Type and model number of instrument used.
- Temperature Meter.
  - Before the first round of sampling, an annual accuracy check of the temperature portion of the pH meter probe is performed by checking the field temperature probe in the range of the expected groundwater temperatures versus an NBS traceable thermometer. If the probe temperatures are not within the tolerance limits, a correction factor is applied.
  - This information is recorded in the staging notebook along with the analyst's signature. The type and model number of the temperature meter used is recorded on the Groundwater Well Sampling Meter Check Form.
- Water Level Meter.
  - Before sampling the meter is checked to determine battery performance. If the meter does not respond, the battery is replaced and the meter rechecked.
  - If there is any doubt the meter is not reading correctly, the operator may check the probe in a container of water to confirm that it is working properly.
  - The type and model # of the water level meter being used is recorded on the Groundwater Well Sampling Check Form.
- D.O. Meter.
  - Check membrane of probe for bubble(s). If bubble(s) are present, remove membrane, refill the probe with electrolyte, and install a new membrane (refer to instruction manual).
  - Replace batteries when "LOBAT" warning is displayed.
  - An air calibration is performed by first placing a plastic bottle containing a wetted sponge over the probe. This subjects the membrane to a known oxygen concentration at 100 percent relative humidity. The function switch is set to % mode and after reading stabilization, the O_2 knob is adjusted to 100.0 percent and then locked in place.

- The function switch is then set to the proper concentration mode to perform D.O. measurements.
- The type and model # of the meter being used is recorded on the Groundwater Well Sampling Meter Check Form.

- Turbidity Meter.
  - An annual calibration check is performed prior to the first sampling event of each year using four primary standards. Follow the calibration procedure outline in the operator's manual.
  - After primary standard calibration, three secondary standards (gel filled) are measured. The values are recorded on a label and affixed to the cap of each secondary standard. The secondary standard is read prior to and after the subsequent groundwater monitoring event to ensure the instrument's calibration has not drifted. If a difference of more than +/- 10 percent has occurred, the instrument must be recalibrated.
  - The following information is recorded on the Groundwater Well Sampling Meter Check Form.
    - Type and model # of meter used.
    - Turbidity value of known secondary standard used.
    - Turbidity reading before and after sampling event.
- H_2S Meter.
  - The H_2S meter is calibrated prior to each sampling event using a known standard gas in approximately the same range as the anticipated air samples. The calibration procedure used is in the meter's reference manual.
- LEL/Gas Meter.
  - The LEL/Gas meter is calibrated periodically by the manufacturer.

- Calibration Standards. Purchased conductivity standards and pH buffers are dated when received and discarded before the expiration date.
- Duplicate Sampling. Duplicate samples are collected randomly on 10 percent of the total number of wells sampled at each groundwater facility. This verifies uniformity of well water quality and field collection techniques.
- Equipment Blanks. If non-dedicated sampling equipment is used, field equipment blanks will be collected. A field blank will be prepared using analyte-free water. This water will be passed through the sampling equipment and collected in an empty sample container for analysis. The field blank will be analyzed for the same sample parameters as the groundwater.

- Chain-of-Custody. The contracted laboratory will supply a Chain-of-Custody form.
- Trip Blanks. A VPH trip blank will accompany all VPH samples from sample collection to analysis to ensure airborne contamination has not occurred.

7.10 Well Maintenance

In order to maintain well integrity, a program was implemented, to perform annual well inspections. The inspection includes examination of:

- The steel guard pipe;
- Inner PVC pipe;
- Bentonite seal around base of guard pipe; and
- Ensure wells are locked.

If any damage is noticed (i.e., broken lock or PVC pipe), the following steps are taken:

- The information is noted on the Groundwater Well Maintenance Form (refer to Appendix A) and a follow up entry is made when the repair work is completed.
- The damage is reported immediately to the Landfill Operator, who is responsible for the repair work; and
- All well maintenance work performed throughout the year is summarized in the yearend report sent to the MEDEP.

Annual well depth determinations are performed to monitor any sediment build-up. If significant build-up has occurred (>1 foot), the build-up must be pumped out. Well depths used for comparison will be the well depths in 1994. The depths recorded on the well logs were not used because the readings taken in 1994 varied by as much as four feet. The wells were cleaned in 1994 with no change in well depth. Therefore, the depths recorded in 1994 are considered baseline for the well depths. This information is recorded and kept on file at the Landfill Operator's office.

Additionally, the surface seal and protective casing is inspected during each sampling event. The condition of each well is recorded on the Low-Flow Sample Purge Form.

7.11 Site Location Maps

Site location maps showing monitoring well locations for Dolby I, II, and III and gas monitoring locations are included in sampling event reports to the MEDEP (Figure 4-1 and Figure 4-2). This provides a visual picture with regard to:

- Groundwater, surface water and gas monitoring sampling locations;
- Locations of potential impact areas; and
- Drawing conclusions on analytical test results performed on ground and surface water.

7.12 Sample Volume, Preservation, and Holding Times

All sample volumes, preservation, and holding times will be set by the contracted laboratory and will follow required standard and EPA methods.

7.12.1 Sample Volume

The contracted laboratory will determine the needed sample size for each analysis.

7.12.2 Sample Preservation

The contracted laboratory will set the sample preservation for each sample.

7.12.3 Holding Times

The contracted laboratory will follow the holding times set forth in each analytical method.

8.0 DECONTAMINATION OF EQUIPMENT

Decontamination of sampling equipment is required both prior to initiation of sampling and between each sample location to eliminate the potential for cross contamination of samples with the analytes of interest.

8.1 Field Instrumentation

Field instrumentation, i.e., pH and specific conductance probes will, under no circumstances, be introduced into a sampling device or sample bottle. However, to minimize latent influences between sampling locations, the probes will be rinsed with clean water and, when appropriate, wiped dry with clean paper towels.

9.0 SAMPLE CHAIN-OF-CUSTODY

Chain-of-Custody forms supplied by the contracted laboratory will be utilized.

9.1 Sample Monitoring Form

The use of this form accomplishes one or more of the specific objectives of sample custody, identification, control, and written documentation that the Dolby Landfill EMP is being followed. The forms that have been mentioned in previous sections are discussed below and include:

- Low-Flow Sample Purge Forms;
- Surface Water Sampling Sheet;
- Piezometer Well Sampling Sheet;
- Groundwater Well Sampling Meter Checks;
- Groundwater Well Maintenance Form; and
- Dolby Landfill Gas Monitoring Field Sheet.

A copy of these sample forms is provided in Appendix A.

9.1.1 Low-Flow Sample Purge Form

The function of this form is to note weather conditions, conditions of the well's surface seal and protective casing, field test measurements, and the sampling conditions met prior to sample collection.

9.1.2 Surface Water Sampling Sheet

The Surface Water Sample Data Sheet will be completed by the field technicians. The function of this form is to note weather conditions, date and time sample collected, flow at sample location (if applicable), and field test measurements.

9.1.3 Piezometer Well Sampling Sheet

This field sheet contains required information for the three piezometer wells. This information includes the water level, weather conditions, date of site visit, and field technician involved.

9.1.4 Groundwater Well Sampling Meter Checks Form

The purpose of this form is to document that the field instrumentation has been properly calibrated prior to the sampling event. This ensures accurate groundwater measurements are taken. The form is completed in the laboratory and signed by the field technician performing the calibration checks.

9.1.5 Groundwater Well Maintenance Form

The purpose of this form is to inspect the condition of each well, document any needed repair, and report this information to the Landfill Operator, who will oversee the repair work. This preventive maintenance schedule will help avoid any well water contamination problems. The form has a check list of critical items to inspect, any helpful comments describing the maintenance problem, and a follow-up section outlining what and when the repair work was performed. These forms are kept on file at the Landfill Operator's office. The maintenance work performed during the year is summarized in the yearend report sent to the MEDEP.

9.1.6 Dolby Landfill Gas Monitoring Field Sheet

The purpose of the sheet is to document gas testing performed by the field technicians at the landfill. The sheet contains information on the sample location, meters used, technician performing tests, and H_2S (ppm) and LEL (%) levels.

9.2 Packing and Shipping

In addition to sample collection and preservation requirements, especially the maintenance of sample temperature at four degrees centigrade until extraction or analysis, samples will be so packed and shipped as to maintain the sample container integrity and the health and safety of sample transporters.

9.2.1 Packing

Sample containers are generally packed in picnic coolers for shipment. Bottles are to be packed tightly, with ice, so that no motion is possible. All chain of custody forms are placed into a "Ziploc" bag and placed into the cooler. The cooler top is then taped shut. Custody seals and taping of coolers may be required for certain samples.

9.2.2 Shipping

The standard procedure followed for shipping environmental samples to the analytical laboratory is:

- All shipping to outside laboratories of environmental samples collected by field personnel must be done through Federal Express or equivalent overnight delivery service.

If prompt shipping and laboratory receipt of the samples cannot be guaranteed (i.e., Sunday arrival), the samplers will be responsible for proper storage of the samples until suitable transportation arrangements can be made.

10.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

QA/QC is an integral part of the sampling and analytical program to allow assessment of the adequacy of analytical results for their intended use. QA/QC activities associated with sampling include the utilization of standardized collection procedures and sample data records (as described above), calibration of field instruments, and the use of chain-of-custody procedures. Analytical QA/QC involves the use of approved analytical protocols by qualified laboratories. Assessment of analytical data quality is performed through review of method-specified quality control data, to be delivered along with the analytical results.

10.1 Data Validation

The following data validation methods will be used to verify the accuracy and precision of the reported results:

- Verification of continuous chain-of-custody for each sample;
- Verification that sample holding times were met;
- Total dissolved solids/specific conductivity ratio calculation and tabulation;
- Duplicate sample Relative Percent Difference (RPD) calculation and tabulation;
- Evaluation of duplicate analysis performance;
- Comparison of current data with historical data and identification of anomalous results; and
- Identification of any parameter in field equipment blanks.

10.2 Statistical Analyses

Where data is sufficient, statistical analysis of the sample data from each monitoring well will be completed annually and reported. Statistical analysis will be conducted in accordance with the July 1992 Addendum to Interim Final Guidance for Statistical Analysis of Groundwater Monitoring at RCRA Facilities and/or other approved procedures that are appropriate for the database.

11.0 PFAS SAMPLING AND ANALYSIS

In the event that PFAS sampling becomes necessary for the site water(s) or soil, standard procedures for PFAS sampling have been added to this EMP as Appendices B and C.

12.0 REPORTING REQUIREMENTS

Monitoring data will be submitted to the MEDEP within 30 days of receipt and evaluation of laboratory results. A report including the following will be submitted to the MEDEP on an annual basis:

- Map showing the licensed facility, waste handling boundaries, and location of each monitoring point;
- Summary of results of the environmental monitoring program;
- Historical data summary;
- Statistical analysis;
- Data validation results;
- Table of current and historical data (including field parameters and groundwater elevation levels);
- Identification of elevation reference datum;
- Exceedance of MCL/MEGs; and
- Copies of laboratory data sheets, chain of custody forms, all field data sheets, and recommendations for any proposed changes are kept on file for at least two years after sampling event.

APPENDIX A

FIELD DATA SHEETS

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MONITORING WELL SAMPLE PURGING FORM

(page ___ of ___)

SITE: ________________ PROJECT NO: ________ DATE: ________

SAMPLE LOCATION: ________________ WEATHER: ________________

SAMPLE ID: ___ ______ __ ______ START TIME: __________ END: __________

(DUPS) ___ ______ __ ______ TRIP BLANK ID: ___ ______ __ ______

___ ______ __ ______

WELL DEPTH: ________________ FT
( ) TOP OF WELL ( ) TOP OF CASING
( ) MEASURED ( ) HISTORICAL

WATER DEPTH: ________________ FT
( ) TOP OF WELL ( ) TOP OF CASING
( ) MEASURED ( ) HISTORICAL

CONDITION OF WELL:
SURFACE SEAL: ( ) GOOD ( ) CRACKED
( ) OTHER: ________________
PROTECTIVE CASING: ( ) LOCKED
( ) NO LOCK
( ) SECURE
( ) NEEDS REPAIR (ABLE TO MOVE)

TUBING INLET (TPVC) __________
TUBING DIAMETER __________ (ID)
SCREENED INTERVAL (TPVC) ________ TO ________

WELL: ( ) CAP ( ) NO CAP
WELL MATL: ( ) PVC ( ) SS ( ) OTHER: ________________

PUMPING START TIME: ______________ PUMPING END TIME: ______________

EQUIPMENT DECONTAMINATION

PURGING	SAMPLING	
( )	( )	PERISTALTIC PUMP ISCO
( )	( )	PERISTALTIC PUMP GEOTECH
( )	( )	SUBMERSIBLE PUMP
( )	( )	BLADDER PUMP
( )	( )	AIR LIFT PUMP
( )	( )	BAILER I.D. __________
( )	( )	LDPE/SILICON TUBING
( )	( )	TEFLON/SILICON TUBING
( )	( )	IN-LINE FILTER
( )	( )	DEDICATED SIL. TUBING
( )	( )	DEDICATED POLY. TUBING

DECONTAMINATION FLUIDS USED

( ) DISTILLED/DEIONIZED WATER
( ) TAP WATER
( ) NON-PHOSPHATE DETERGENT
( ) 10% NITRIC ACID
( ) HIGH-PRESSURE STEAM CLEAN
( ) ________________________

AMOUNT OF WATER CONTAINED IN DEDICATED SYSTEM: ________________
AMOUNT OF WATER PURGED PRIOR TO GRAB SAMPLE COLLECTION: ________________

NOTES: ____

____

____

____

SAMPLED BY: ________________________

MONITORING WELL SAMPLE PURGING FORM - PART II

(page ___ of ___)

SITE: ______________________________ DATE: ____________________

SAMPLE LOCATION: ____________________ ORP OFFSET: __________ mV

Elapsed Time (min)	Liters Pumped	Flow Rate (ml/min)	WL TPVC (ft)	WL Top of Casing (ft)	Turb (1)	pH (2)	Spec Cond (3)	Temp °C (4)	DO (5)	ORP (6)	Comments
Unit ID Number:											
Model ID :											

NOTES:

(1) TURBIDITY (NTU)
(2) pH (STD UNITS)
(3) SPECIFIC CONDUCTANCE (umhos/cm @25C)
(4) TEMPERATURE (C)
(5) DISSOLVED OXYGEN (ppm)
(6) UNADJUSTED OXIDATION REDUCTION POTENTIAL (+- mV)

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SAMPLE DATA RECORD
SURFACE WATER

SITE ID: ____________________ SAMPLE DATE / TIME : ____________________

SAMPLE LOCATION: ____________________ SAMPLER : ____________________

SAMPLE ID ____________________ WATER BODY SAMPLED ____________________

SAMPLE COLLECTION METHOD ____________________ DEPTH @ SAMPLE SITE ____________________

DEPTH OF SAMPLE ____________________

DECON (Y/N) ____________________ FLOW RATE/VELOCITY ____________________

SAMPLE APPEARANCE/ODOR ____________________

TEMPERATURE __________C

E_H __________mV

CONDUCTIVITY __________µmhos/cm

E_H OFFSET __________mV

DISS. OX. __________mg/L

PHENOLTHALIEN ALKALINITY _____ (# of drops) x
_____ (mg/L per drop) =
_____ mg/L

TURBIDITY __________NTU

pH __________

TOTAL ALKALINITY _____ (# of drops) x
_____ (mg/L per drop) =
_____ mg/L

INSTRUMENTS CALIBRATED (date) ____________________

DUPLICATE SAMPLE COLLECTED (Y/N) __________ IF YES, SAMPLE ID ____________________

SAMPLE BOTTLES FILLED (ID) ____________________(SEE COC)

NOTES:

LOCATION SKETCH:

H:\Sme\Docs\SMESTDS\forms\SW1197.DOC
January 31, 2000

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MONITORING WELL – SAMPLE PURGING

SITE: ______________________

PROJECT NO. ________ DATE: ________

SAMPLE LOCATION: ______________________

WEATHER: ______________________

SAMPLE ID: ______________________

START TIME: ________ END TIME: ________

(Duplicates) ______________________

TRIP BLANK ID: ______________________

____

WELL DEPTH: ________ FT

- [ ] Top of Well
- [ ] Top of Casing
- [ ] Measured
- [ ] Historical

WATER DEPTH: ________ FT

- [x] Top of Well
- [ ] Top of Casing
- [x] Measured
- [ ] Historical

CONDITION OF WELL: ______________________

SURFACE SEAL: [ ] Good [ ] Cracked [ ] Other: ________

PROTECTIVE CASING:

- [ ] Locked
- [ ] No Lock
- [ ] Secure
- [ ] Needs Repair (able to move)

TUBING INLET (TPVC):

TUBING DIAMETER:

WELL: [ ] Cap [ ] No Cap

SCREENED INTERVAL (TPVC)

WELL MATERIAL: [ ] PVC [ ] SS [ ] Other ________

PUMPING START TIME: ________ PUMPING END TIME: ________

EQUIPMENT DOCUMENTATION

PURGING	SAMPLING	
[ ]	[ ]	Peristaltic Pump ISCO
[ ]	[ ]	Peristaltic Pump Geotech
[ ]	[ ]	Submersible Pump
[ ]	[ ]	Bladder Pump
[ ]	[ ]	Air Lift Pump
[ ]	[ ]	Bailer I.D. ________
[ ]	[ ]	LDPE / Silicon Tubing
[ ]	[ ]	Teflon / Silicon Tubing
[ ]	[ ]	In-Line Filter
[ ]	[ ]	Dedicated Silicone Tubing
[ ]	[ ]	Dedicated Polyethylene Tubing

DECONTAMINATION FLUIDS USED

- [x] Distilled / Deionized Water
- [ ] Tap Water
- [ ] Non-phosphate Detergent
- [ ] 10% Nitric Acid
- [ ] High-Pressure Steam Clean
- [ ] Other ______________________

AMOUNT OF WATER CONTAINED IN DEDICATED SYSTEM: NA

AMOUNT OF WATER PURGED PRIOR TO GRAB SAMPLE COLLECTION: NA

NOTES:

SAMPLED BY : ______________________

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MONITORING WELL – SAMPLE PURGING

SITE: ____________________ DATE: ____________________

SAMPLE LOCATION: ____________________ ORP OFFSET: 0 mV

Elapsed Time (min)	Liters Pumped	Flow Rate (mL/min)	WL TPVC (FT)	WL Top of Casing (FT)	Turbidity (1)	pH (2)	Specific Cond. (3)	Temp °C (4)	DO (5)	ORP (6)	Comments
Unit ID No.:		↓		NA	←		SET		→		
Model ID:					*	REF	TO	CAL	SHEET		
0	0	0		NA							
5	1.0	200		NA							
10	2.0	200		NA							
15	3.0	200		NA							
18	3.6	200		NA							
21	4.2	200		NA							
24	4.8	200		NA							

NOTES:

1 TURBIDITY (NTU)
2 pH (STD UNITS)
3 SPECIFIC CONDUCTANCE (µmhos/cm @25°C)
4 TEMPERATURE
5 DISSOLVED OXYGEN (mg/L)
6 UNADJUSTED OXIDATION REDUCTION POTENTIAL (+/- mV)

Facility Location:__________________ **Well No.** __________

Date: __________________

Performed By: __________________

Well Depth: __________________ (measure to top of PVC pipe)

Top of PVC pipe to ground: __________________

Well Condition:

Surface Seal:	( ) Good	( ) Cracked	( ) Other (See Comments)	
Protective Casing:	( ) Good	( ) Locked	( ) Unlocked	( ) Needs Repair
PVC Pipe Conditions:	( ) Good	( ) Cracked	( ) Other (See Comments)	

Comments: ____

____

____

____

Completed Well Work: ____

____

____

____

____

____

WATER LEVEL OBSERVATIONS FIELD DATA SHEET					
Project: MSPO – DOLBY LANDFILL				**Date:**	
Field Personnel:				**Job Number:**	
Well Number	**Time of Reading**	**Stickup** PVC (ft)	**Water Depth From Top of PVC (ft)**	**Bottom Depth From Top of PVC (ft)**	**Comments (Condition of Well)**

SITE: DOLBY LANDFILL GAS MONITORING PROJECT NO.:______________________

DATE: ______________________ WEATHER:______________________

METER ID:______________________ CALIBRATION GAS:______________________

LOCATION IDENTIFICATION NUMBER	TIME OF READING	METHANE EQUIVALENT		METHANE EQUIVALENT AMBIENT		H_2S ppm	H_2S AMBIENT ppm	COMMENTS
		% LEL	% VOLUME	% LEL	% VOLUME			
Catch Basin #4								
Catch Basin #6A								
Catch Basin #13								
Catch Basin #21								
Catch Basin #22								
Catch Basin #30								
Catch Basin #35								
Catch Basin #39								
Catch Basin #43								
Catch Basin #45								
Well 107B								
Operators Shack								
Leachate Pump Station								
Leachate Sump								

LEL CONVERSION: (%LEL/100) x 5 = %VOLUME

Sampler Signature:______________________

Ambient readings for % LEL and H_2S should be taken next to the sample site prior to the reading taken at the sample site
Attention: If your % Methane reading equals 0, please write 0.1US as your reading

US – Not detected above the reported reporting limit determined by interpreted instrument specification

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smemaine.com

SAMPLE DATA RECORD
SOIL

SITE ID: ______________________ **SAMPLE DATE:** ______________________

SAMPLE LOCATION: ______________________ **SAMPLE TIME:** ______________________

SAMPLE ID: ______________________ **SAMPLER:** ______________________

MATERIAL SAMPLED: ______________________ **DEPTH OF SAMPLE:** ______________________

COLLECTION METHOD: ______________________

DECONTAMINATED: ☐ YES ☐ NO

DUPLICATE SAMPLE COLLECTED: ☐ Yes ☐ No **IF YES, SAMPLE ID:** ______________________

PFAS SAMPLE COLLECTED*:* ☐ Yes ☐ No (SEE PAGE 2 AND 3 FOR SPECIFIC PROTOCOL CHECKLIST)

SAMPLE APPEARANCE / ODOR: ______________________

NOTES:

LOCATION SKETCH:

FIELD INSTRUMENT CALIBRATION
DAILY OPERATING LOG

CLIENT:	DATE/TIME:
PROJECT SITE:	JOB NUMBER:

Meter Set	INSTRUMENT	MODEL ID NUMBER	UNIT ID NUMBER	UNITS OF MEASURE	STANDARD(S) USED IN CALIBRATION	CALIBRATION OR OFFSET CALCULATED	OPERATOR INITIALS
A	pH	Cole Palmer Acorn pH 6	Box:	pH		NA	
	Specific Conductivity	Cole Palmer Acorn Con 5	Box:	Microsiemens		NA	
	Turbidity	LaMotte 2020 Turb.Meter	Box:	NTU		NA	
	ORP	Cole Palmer pH Series 20	Probe: Box:	mV	4 - 7 – Quinhydrone		
B	pH	Cole Palmer Acorn pH 6	Box:	pH		NA	
	Specific Conductivity	Cole Palmer Acorn Con 5	Box:	Microsiemens		NA	
	Turbidity	LaMotte 2020 Turb.Meter	Box:	NTU		NA	
	ORP	Cole Palmer pH Series 20	Probe: Box:	mV	4 - 7 - Quinhydrone		

ADDITIONAL NOTES:

FLOW CELL METERS

SEVEE & MAHER ENGINEERS, INC.
November 12, 2001
\\192.168.10.15\Librarv\ARCHIVE\Sme\Forms\SME024fcm.doc

SME
SEVEE & MAHER ENGINEERS
4 Blanchard Road, P.O. Box 85A
Cumberland, ME 04021
Tel: 207.829.5016 / Fax: 207.829.5692
smemaine.com

FIELD INSTRUMENT CALIBRATION
DAILY OPERATING LOG

CLIENT:	
PROJECT SITE:	DATE:
	JOB NUMBER:

METER SET	INSTRUMENT	MODEL ID NUMBER	UNIT ID NUMBER	STANDARDS USED FOR CALIBRATION *	WAS CALIBRATION SUCCESSFULLY COMPLETED? (If yes, place ✓ in appropriate area) (Place results of calibration in appropriate box)		MIDDAY STANDARD(S) CHECK * (Place results of calibration in appropriate box)		OPERATOR INITIALS
							Standard	Reading	
C	pH	YSI PRO PLUS	SME003	4.01 7.01 10.00	☑ 4 reading 4.0 ☑ 7 reading 7.0 ☐ 10 reading ____		____ 7.01 ____	____ ____ ____	
	Specific Conductivity	YSI PRO PLUS	SME003	1413 Microsiemens	☑ 1413 reading 1413		1413 Microsiemens	____	
	DO	YSI PRO PLUS	SME003	100% ZERO Oxygen solution	☑ 100% reading 100 ☑ ZERO reading 0.0		100%	____	
	ORP	YSI PRO PLUS	SME003	240 mV ORP Solution	☑ 240 mV	Reading 240	240 mV ORP	____	
	Turbidity	LaMotte 2020we	SME003	1 NTU 10 NTU	☑ 1 NTU Reading 1.0	☑ 10 NTU Reading 10.0	1 NTU	____	

* Calibration of meters is completed once daily before work starts – a standards check for pH, conductivity, and turbidity should be completed midway through each day or if a particular field value falls outside of historic ranges.

ADDITIONAL NOTES: ____

CHAIN-OF-CUSTODY RECORD

PAGE ____ OF ____

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CLIENT:	PROJECT NAME:	PROJECT/ P.O. #:	
REPORT TO:	ADDRESS:		
INVOICE TO:	ADDRESS:		
SAMPLED BY: (PRINT)	SAMPLER SIGNATURE:		

FILTERED (Y/N)

PRESERVED

ANALYSIS REQUIRED

LEGEND FOR PRESERVATIVE

1 – 4° CELSIUS
2 – HCL
3 – HNO_3
4 – H_2SO_4
5 – $Na_2SO_3 + H_2SO_4$
6 – NaOH

ITEM NO.	SAMPLE IDENTIFICATION	DATE	TIME	COMPOSITE OR GRAB	W-WATER L-LIQUID S-SOLID	TOTAL NUMBER OF CONTAINERS									REMARKS	LAB SAMPLE #
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:

A CHAIN OF CUSTODY IS REQUESTED WITH EACH SET OF SAMPLES

APPENDIX B

SAMPLING AND ANALYSIS PROCEDURES FOR MEASURING PFAS

SME
SEVEE & MAHER
ENGINEERS

COVER SHEET
STANDARD OPERATING PROCEDURE-ADDENDUM

OPERATION TITLE: **DEVELOPMENT OF A SAMPLING AND ANALYSIS PLAN-**

ADDENDUM - A – ADDITIONAL REQUIREMENTS FOR THE SAMPLING OF PERFLUORINATED ALKYLATED SUBSTANCES (PFASs), PERFLUOROOCTANOIC ACID (PFOA) and PERFLUOROOCTANE SULFONATE (PFOS).

1.0 APPLICABILITY

This Standard Operating Procedure (SOP) ADDENDUM applies to all programs in the Maine Department of Environmental Protection's (MEDEP) Division of Remediation (DR). It is also applicable to all parties that may submit data that will be used by the DEP/DR.

This SOP ADDENDUM is not a rule and is not intended to have the force of law, nor does it create or affect any legal rights of any individual, all of which are determined by applicable statutes and law. This SOP does not supersede statutes or rules.

2.0 PURPOSE

The purpose of this document is to describe the MEDEP/DRs requirements for the development of a Sampling and Analysis Plan (SAP) and outline specific requirements for the sampling of compounds related to Per- and Polyfluoroalkyl Substances (PFASs), including Perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS).

Prior to conducting any investigative field work, routine monitoring, post closure sampling or any data gathering/sample collection project, a SAP will be developed that outlines the goals of the activity and methodology to achieve that goal. A well-developed SAP that is reviewed by all field team members will assure that the goals are obtainable, the methodology is consistent, and the data generated will meet the Data Quality Objectives (DQOs) for the project.

Given the ubiquitous nature of PFAS compounds, the low detection levels that are generally requested, and the different methodologies for which these compounds are tested, additional requirements regarding sampling methodology, equipment, and analysis for PFAS compounds should be included as part of the sampling plan and during the sampling event. This document outlines those specific requirements to be included in a PFAS sampling plan and during sampling.

3.0 GUIDELINES AND PROCEDURES

3.1 INTRODUCTION

A sampling and analysis plan, regardless of whether sampling for PFAS compounds or other potential contaminants, should include all the elements in SOP RWM-DR-014 – Development of a Sampling and Analysis Plan. Although not required to be included in the SAP, (as outlined in SOP RWM-DR-014), an assessment of the existing data should be conducted, a site reconnaissance completed, a conceptual site model developed, and data quality objectives determined as part of planning to assure the SAP will meet the goals of the sampling.

The SAP itself should include the goal of the sampling, end use of data, data quality objectives, schedule, sampling methodology, sampling locations, media to be sampled, analytical parameters, and QA/QC samples. Additionally, a site-specific health and safety plan may be necessary (see SOP-DR-014) depending on the scope of the sampling event. For example, collection of samples in a large or moving water body, or as part of large sampling effort involving drilling rigs and/or excavation equipment would require a health and safety plan; residential well or routine monitoring well sampling would not.

3.2 SAMPLING METHODOLOGY/EQUIPMENT

A description of the sampling methodology will be included in the SAP. Generally, reference to an appropriate SOP for the sample methodology will be sufficient. The Division has developed multiple SOPs for sample collection of most media; please refer to the Division of Remediation's Quality Assurance Plan - Attachment B – Data Collection SOPs for a list of all data collection standard operating procedures.

3.2.1 Sampling Methodology

Sampling for PFAS will follow the standard procedures as outlined in the specific sampling method SOPs. In addition, the following task must be included in the SAP and field staff must perform the task as described below to prevent the introduction of contamination during collection of the sample:

> "Prior to sampling each location the sample handler must wash their hands and don nitrile gloves. This is particularly important when driving between locations or carrying pumps and other equipment between sample points. PFAS contamination during sample collection can occur from several common sources, including food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will help to minimize this type of accidental contamination of the samples."

It should be noted that samples collected for PFAS analysis do not have to be headspace free.

3.2.2 Sampling Equipment/Supplies/Personal Protective Equipment (PPE)

The low detection limits required for PFAS water analysis and their common occurrence in frequently used items warrant attention to equipment and PPE used for sampling. A sampling equipment list for PFAS projects should follow the material guidelines in Table 1 of Attachment A, avoiding use of LDPE and any Teflon-lined equipment or tubing. If field decontamination of submersible pumps or large non-disposable equipment is necessary, washing with a PFAS-free soap solution, rinsing with DI water and then a rinse with laboratory-supplied PFAS-free water is recommended. Small field equipment such as scoops or bowls can omit the DI rinse. New nitrile gloves should be used between locations and activities. For water sampling where there is adequate separation between the sample point (for example a kitchen tap) and sampler footwear then boot restrictions and PPE such as chicken boots may not be needed. Other recommended clothing and PPE requirements are noted in Table 1 of Attachment A.

3.3 Media Sampled/Analytical Parameters

A chart outlining the media collected and sample analysis methodology will be included in the SAP.

PFOA and PFOS are common potential contaminants of concern (COCs) at PFAS sites, but a wider suite of PFAS must be considered when evaluating a site. Laboratory reporting lists typically include approximately 20 PFAS compounds depending upon method and laboratory, and the DEP PFAS analytical services request required that laboratories report a list of 24 compounds PFAS. Until additional USEPA methods are finalized or unless otherwise required specifically for the project, the standard analysis for drinking water and groundwater will be Modified Method 537 using isotope dilution with the standard DEP reporting list from the most recent contract.

For sites where potential unidentified PFAS precursors are a concern, additional analyses such as the total extractable fluorinated compounds (TOP analysis) can be followed by analysis of specific compounds, to assess the presence of precursors in environmental media that are not captured by the compound specific methods. USEPA has also released a newer drinking water method (Method 533) with a longer standard list of compounds, but as of this revision few labs are offering this method.

Parameters will be identified by either laboratory analysis methodology number, or generally accepted name of analysis. Given the different methods currently available for sampling PFAS, there must be a clear understanding between the project manager and the laboratory providing the analysis as to what the media sampled, test methodology, and detection levels will be.

Table 1 provides the current standard methods with their associated media, other methods may be appropriate based on the data quality objectives of the sampling project:

Other methods may be appropriate based on the data quality objectives of the sampling project.

The contracted analytical laboratory must be Maine certified to perform any method for which Maine provides certification. The contract lab must be able to accommodate the sample load and perform the analyses within holding times. The contract lab must be able to achieve PQLs, for all analyses, which are below the associated regulatory guideline value. The contract lab must also provide electronic data deliverable (EDD) results for all samples.

Deviations can be made from the laboratory method on a site or event specific basis, based on the goals of the sampling, end use of the data, and the data quality objectives. Rationale for deviations from these methods should be described in the SAP and/or the final report.

All parameters, containers, preservation, and holding times will be as recommended by the laboratory providing analytical services. Special or out of the ordinary containers or preservation should be noted in the SAP.

TABLE 1
Media/Analytical Methodology

MEDIA	LABORATORY METHOD	HOLD TIME*/ PRESERVATION	ANALYSIS TIME	Reporting List
Public Drinking Water Supply **	USEPA Method 537.1	14 days to extraction/Trizma***	28 days after extraction	Method specific
Groundwater and Private Water Supplies	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Surface Water	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Soil/Sediment/sludge	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Other (vegetation…)	Modified Method 537 (Isotope Dilution)	Lab specific	Lab specific	DEP Minibid list ****
Water or Soil	TOP or other total fluorinated analysis	Lab specific/<6°C	Lab specific	Method specific

* Hold time of 14 days is specified by DEP
** USEPA 537.1 is currently the only Maine certified method for drinking water, others such as Method 533 will be offered in the future
*** Trizma needed for samples that may contain residual chlorine from treated water sources
*** Longer reporting lists may vary between laboratories, generally the DEP mini-bid list can be used for all projects

3.4 FIELD QC SAMPLES

Sample collection for PFAS analysis does not require specific field QC samples outside the normal requirements.

General recommendations for all sampling include one aqueous field blank, per field event, to be analyzed for PFASs to determine if water samples have been contaminated by sources unrelated to the project area, and to assess the overall field procedures. The field blank is typically one bottle of PFAS-free water supplied by the laboratory, which is uncapped and poured to a second bottle. For multi-day events, one blank per day should be considered. If non-dedicated or non-disposable equipment is used a PFAS-free water equipment blank is warranted to check field decontamination procedures.

4.0 PFAS SPECIFIC TEMPLATE

In the instances of a PFAS only sampling event, in which samples are being collected from a project which has a history of sampling for other analytes and a well-developed conceptual site model and/or an SAP already exists, a PFAS sampling specific template has been developed which provides the general requirements of a sampling plan. This template can be found in Attachment A of this Addendum.

5.0 REPORT GENERATION

As stated in SOP RWM-DR-014, A Sampling Event Trip Report (SETR) will be developed for every sampling event (see MEDEP/DR SOP# RWM-DR-013). The staff person responsible for developing the SETR will be stated in the SAP. Data obtained as part of the SAP will be assessed in the final report for which the data has been collected.

ATTACHMENT A
PFAS SAMPLING AND ANALYSIS PLAN FORM TEMPLATE

1.1 INTRODUCTION

The introduction will state the objectives of the sampling plan which include:

- Goals of the sampling plan;
- End use of data.

2.0 BACKGROUND INFORMATION

A BRIEF explanation of the background of the Site and/or conceptual site model (CSM) and reason for sampling for PFAS will be presented.

3.0 SITE SPECIFIC HEALTH AND SAFETY PLAN

If determined necessary, a Site-Specific Health and Safety plan (HASP) will be developed and attached.

4.1 SAMPLING METHODOLOGY/ EQUIPMENT

A description of the sampling methodology will be included in the SAP. In instances where a MEDEP/DR SOP is available, reference to SOPs by either name or document number is sufficient.

Currently, the MEDEP/DR QAP has SOPs for the following sample collection tasks which may be pertinent to PFAS sampling:

- 001-Water-Sample-Colllection-From-Water-Supply-Wells;
- 002-Groundwater-for-Site-Investigation;
- 003-Low-Flow-Groundwater-Sampling;
- 004-surface-water-sediment;
- 006-soil-sampling;
- 010-Container-Sampling;
- 015-Incremental-sample-methodology;
- 023-Pore-Water-Sampling.

Other SOPs may be utilized on a project specific basis if MEDEP/DR does not have a current SOP for sampling a particular media or situation. Prior Department approval is necessary.

Prior to sampling each location the sample handler must wash their hands and don nitrile gloves. PFAS contamination during sample collection can occur from a number of common sources, including food packaging and certain foods and beverages. Proper hand washing and wearing nitrile gloves will help to minimize this type of accidental contamination of the samples, particularly when moving pumps, generators or other equipment between sample points.

Some sampling equipment, field supplies, field clothing and personal protective equipment are prohibited when sampling for PFAS. Table 1 outlines the prohibited items. This table must be included in the SOP and field staff informed as to what equipment is allowed.

Table 1: Summary of Prohibited and Acceptable Items for Use in PFAS Sampling

Prohibited Items	Acceptable Items
Field Equipment	
Teflon® containing materials. Aluminum foil.	High-density polyethylene (HDPE) and stainless steel materials
Storage of samples in containers made of LDPE materials	Acetate direct push liners
Teflon® tubing	Silicon or HDPE tubing
Waterproof field books. Water resistant sample bottle labels.	Loose paper (non-waterproof). Paper sample labels covered with clear packing tape, or lab-applied labels.
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum or Masonite field clipboards
	Sharpies®, pens
Post-It Notes	
Chemical (blue) ice packs	Regular ice
Excel Purity Paste TFW Multipurpose Thread Sealant Vibra-Tite Thread Sealant	Gasoils NT Non-PTFE Thread Sealant Bentonite
Equipment with Viton Components (need to be evaluated on a case by case basis, Viton contains PTFE, but may be acceptable if used in gaskets or O - rings that are sealed away and will not come into contact with sample or sampling equipment.)	
Field Clothing and PPE	
New clothing or water resistant, waterproof, or stain treated clothing, clothing laundered with fabric softeners, clothing containing Gore-Tex™	Well-laundered clothing, defined as clothing that has been washed 6 or more times after purchase, made of synthetic or natural fibers (preferable cotton). Cotton coveralls are one option that reduces the need for specialized personal clothing.
Clothing laundered using fabric softener	No fabric softener
Boots containing Gore-Tex™	Boots made with polyurethane and PVC for wet conditions, or rubber overboots (“chicken boots”)
	Reflective safety vests, Tyvek®, Cotton clothing, synthetic under clothing, medical braces

No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling	**Sunscreens** - sunscreens that are "free" or "natural", or UV blocking clothing **Insect Repellents** - Sawyer permethrin clothing treatment, Deep Woods Off, Insect Shield pre-treated clothing (1)
Sample Containers	
LDPE, glass containers or passive diffusion bags.	HDPE (any media) or polypropylene (only for EPA Method 537.1 samples)
Teflon®-lined caps	Lined or unlined HDPE or polypropylene caps
Rain Events	
Gore-Tex™ or similar breathable coated waterproof or resistant rain gear	Polyurethane, vinyl, wax or rubber-coated rain gear. Gazebo tent that is only touched or moved prior to and following sampling activities
Equipment Decontamination	
Decon 90	Alconox® and/or Liquinox®
Water from an on-site well	Potable water from municipal drinking water supply (if tested as PFAS-free); Lab-supplied PFAS-free water
Food Considerations	
All food and drink, with exceptions noted on the right	Bottled water and hydration drinks (i.e. Gatorade® and Powerade®) to be brought and consumed only in the staging area

(1) Bartlett SA, Davis KL. Evaluating PFAS cross contamination issues. *Remediation*. 2018;28:53–57.

It is recommended that all water samples will be collected using dedicated or disposable sampling equipment where possible. Any re-usable equipment, such as plumbing fittings, that may be needed in certain cases to obtain a sample from the pressure tank tap, should be deconned using Alconox/Liquinox soap and rinsed with PFAS-free water prior to use and between locations.

5.0 Sample Locations

A map showing planned sampling locations will be included in the sampling plan. If locations are not pre - determined, the method that samples will be chosen and collected (field observations, random, etc.) will be outlined in the SAP. Field or laboratory compositing procedures will also be described, if applicable.

This section should also indicate sampling collection priority and order, to assure that the most important samples are obtained, and that sampling is generally done from low areas of contamination to higher levels of contamination. It is recommended that critical samples be collected in duplicate.

6.0 Media Sampled

A chart outlining the media collected and sample analysis will be included in the SAP. Table 2 provides several current methods with their associated media:

TABLE 2
Media/Analytical Methodology

MEDIA	LABORATORY METHOD	HOLD TIME*/ PRESERVATION	ANALYSIS TIME	Reporting List
Public Drinking Water Supply **	USEPA Method 537.1	14 days to extraction/Trizma***	28 days after extraction	Method specific
Groundwater and Private Water Supplies	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Surface Water	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Soil/Sediment/sludge	Modified Method 537 (Isotope Dilution)	14 days to extraction/<6°C	28 days after extraction	DEP Minibid list ****
Other (vegetation…)	Modified Method 537 (Isotope Dilution)	Lab specific	Lab specific	DEP Minibid list ****
Water or Soil	TOP or other total fluorinated analysis	Lab specific/<6°C	Lab specific	Method specific

* Hold time of 14 days is specified by DEP
** USEPA 537.1 is currently the only Maine certified method for drinking water, others such as Method 533 will be offered in the future
*** Trizma needed for samples that may contain residual chlorine from treated water sources
**** Longer reporting lists may vary between laboratories, generally the DEP mini-bid list can be used for all projects

Other methods may be appropriate based on the data quality objectives of the sampling project.

The contracted analytical laboratory must be Maine certified to perform any method for which Maine provides certification. The contract lab must be able to accommodate the sample load and perform the analyses within holding times. The contract lab must be able to achieve PQLs, for all analyses, which are below the associated regulatory guideline value.

Containers, preservation, and holding times will be as recommended by the laboratory providing analytical services. Special or out of the ordinary containers or preservation should be noted in the SAP.

7.0 FIELD QC SAMPLES

The specific needs for QC samples for the project will be outlined. General requirements for PFAS sampling events include one aqueous field blank, per field event, to be tested for PFASs to determine if water samples have been contaminated by sources unrelated to the project area, and to assess the overall field procedures. The field blank is typically one bottle of PFAS-free water supplied by the laboratory, which is uncapped and poured to a second bottle. An equipment blank should be collected if non-dedicated equipment is used. For multi-day events, one blank per day should be considered, and for large events one blank per 10 or 20 samples is warranted, depending upon the project requirements. All blanks should be collected with laboratory supplied PFAS-free water. A source-water blank is handled like a trip blank, and assesses the laboratory supplied water and sample containers. This blank may be warranted depending on DEP experience with the laboratory or sensitivity of the project.

Additionally, any QC samples that will be collected in the field that are required as part of laboratory QC requirements and to allow data validation will be outlined.

4.9 REPORT GENERATION

A Sampling Event Trip Report (SETR) will be developed for every sampling event (See MEDEP/DR SOP# RWM-DR-013). Staff person responsible for developing the SETR will be stated.

APPENDIX C

PFAS PROTOCOL CHECKLIST

SME
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SME
SEVEE & MAHER
ENGINEERS
4 Blanchard Road, P.O. Box 85A
Cumberland, ME 04021
Tel: 207.829.5016 / Fax: 207.829.5692
smemaine.com

PFAS PROTOCOL CHECKLIST

- ☐ Nitrile powderless gloves
- ☐ Sample area clear of possible PFAS contaminants
- ☐ All surfaces touching sample bottle are PFAS free
- ☐ No contact with inside of sample bottle and bottle cap
- ☐ Sample bottle kept sealed and only opened during sample collection
- ☐ New gloves used before sample bottles touched and filled
- ☐ Label attached after bottles are filled/use ball point pen
- ☐ Field blank taken prior to sample collected/new gloves used
- ☐ Use ice in Ziplock bag for sample preservation
- ☐ Each PFAS sample has its own cooler
- ☐ Decontamination with PFAS free water when sampling material used across multiple locations
- ☐ PFAS free clothing and footwear worn
- ☐ No bug repellent or cosmetics used containing PFAS

SME
SEVEE & MAHER
ENGINEERS
4 Blanchard Road, P.O. Box 85A
Cumberland, ME 04021
Tel: 207.829.5016 / Fax: 207.829.5692
smemaine.com

Field Clothing and Personal Protective Equipment

- Do not wear clothing or boots containing Gore-Tex®.
- Wear new nitrile gloves.
- Wet weather gear should be made of polyurethane and polyvinylchloride (PVC) only.
- Wear safety boots made from polyurethane and PVC.
- Do not use materials containing Tyvek® or polytetrafluoroethylene (PTFE), also known as Teflon®.
- Do not use fabric softener on clothing to be worn in field.
- Do not use cosmetics, moisturizers, hand cream or other related products the morning of sampling.
- Do not use prohibited sunscreen or insect repellant. See Do's and Don'ts table below for more information.

Food Considerations

- No food or drink allowed on-site with exception of bottled water.

Field Equipment

- Must not contain Teflon® (aka PTFE) or low-density polyethylene (LDPE) materials.
- All sampling materials must be made from stainless steel, high-density polyethylene (HDPE), acetate, silicone or polypropylene.
- No waterproof field books can be used.
- No plastic clipboards, binders or spiral hard cover notebooks can be used.
- Permanent markers not allowed; regular ball point pens are acceptable.
- Keep PFAS samples in separate cooler, away from sampling containers that may contain PFAS.
- Coolers filled with regular ice in Ziploc bags only – Do not use chemical (blue) ice packs.

Sample Containers

- All sample containers must be high-density polyethylene (HDPE).
- Caps must be unlined HDPE (no Teflon®-lined caps).

Equipment Decontamination

- Have "PFAS-free" water on-site for decontamination rinsing of sample equipment. No other water sources are to be used.
- Only Alconox® and Liquinox® can be used for decontamination washing.

APPENDIX D

WATER QUALITY MONITORING FREQUENCY

SME
SEVEE & MAHER
ENGINEERS

STATE OF MAINE
Department of Environmental Protection (MEDEP)
Bureau of Remediation and Waste Management

MEMORANDUM

TO: Lou Pizzuti, Project Manager, Solid Waste Licensing Unit

FROM: Sean Dougherty, Senior Environmental Hydrogeologist, Division of Technical Services

DATE: July 23, 2020

RE: 2019 Annual Report, Dolby Landfill, East Millinocket, Maine

Consultant – Sevee & Maher Engineers, Inc. (SME)
EGAD Site No. 31341

I have reviewed the 2019 Annual Report for the Dolby landfills, located in East Millinocket, as submitted by SME, dated May 2020. My review was primarily focused on the water quality monitoring portion of the report. To support my review, I prepared the following figures and tables.

- Figure 1 – Groundwater Monitoring Results 2010-2019, Dolby I Landfill;
- Figure 2A – Groundwater Monitoring Results 2010-2019, North Side Dolby II Landfill;
- Figure 2B – Groundwater Monitoring Results 2010-2019, East Side Dolby II Landfill;
- Figure 2C – Groundwater Monitoring Results 2010-2019, West Side Dolby III;
- Figure 2D – Groundwater Monitoring Results 2010-2019, South Side Dolby III; and
- Figure 3 – Surface Water, Storm Water, and Leachate 2010-2019.
- Table 1 – Summary of Sampling Results, 2019; and
- Table 2 – Mann Kendall Trend Analysis, 2010 through 2019.

Summary and General Comments

Active water quality monitoring locations in the vicinity of the Dolby landfills are currently monitored three times per year. Overall, water quality monitoring results from 2019 are generally consistent with historical sampling results. While water quality appears to be improving in some areas, other monitoring locations show evidence of degrading water quality. In particular, several groundwater monitoring locations to the north and west of Dolby III show elevated dissolved ion content and many indicator parameters with increasing concentration trends.

Surface water sample locations at the Partridge Brook Flowage continue to show minimal evidence of impact from the landfill; however, concentrations of several landfill indicator parameters appear to have started to increase over the past couple of years at location PBFR. Water quality in the site sedimentation ponds continues to remain relatively stable.

DOLBY I

upgradient bedrock - monitoring well 103
shallow bedrock - monitoring well 113

Currently, monitoring wells 103 and 113 are monitored for field parameters, only. Specific conductance at 103 remains low and relatively consistent. Measurements at 113 are still elevated, but may be slowly decreasing, as would be expected as the landfill continues to mature.

DOLBY II

shallow bedrock - monitoring wells 104B, 205A, 206A, 303A
deep bedrock - monitoring well 202AR
overburden - monitoring wells 202B, 205B, 206B, 303B

In general, water quality appears to be stable or improving in the majority of monitoring locations around the Dolby II landfill. The exception to this is monitoring location 206A. Well 206A is located near the boundary between Dolby II and Dolby III. This monitoring location exhibits elevated dissolved ion content and several landfill indicator parameters with increasing concentration trends. The specific conductance measurements at 206A during the August and October 2019 sampling events were significantly higher than the specific conductance measurements at the two site leachate ponds.

The MCL and/or MEG for arsenic, iron, manganese, sodium and ammonia was exceeded in monitoring locations sampled in the vicinity of the Dolby II landfill, in 2019.

DOLBY III

bedrock - monitoring wells 107A, 302B, 304A, 401A, 402A
overburden - monitoring wells 301, 302C, 304B, 401B, 402B

Groundwater quality in monitoring locations along the east side of the Dolby III landfill shows the most significant impact from the landfill. Monitoring locations 107A, 301, 302B and 302C all show high dissolved ion content and several landfill indicator parameters with increasing concentration trends. Alternatively, monitoring locations 304A and 304B, located immediately downgradient from the leachate pond show little evidence of impact.

Monitoring locations 301, 302B and 302C were tested for VPH and EPH in 2019, No VPH or EPH were detected.

There were MEG exceedances for sodium and manganese measured at monitoring locations 107A, 301, 302B and 302C in 2109.

Monitoring locations to the south of Dolby III exhibit low to moderate concentrations of landfill indicator parameters. Concentrations at monitoring locations 401A, 401B and 402A appear to be slowly increasing, while many indicator parameters at location 402B are decreasing in concentration.

There were MCL and/or MEG exceedances for sodium, arsenic, iron and manganese measured at monitoring locations to the south of Dolby III, in 2019.

SURFACE WATER AND LEACHATE

Samples collected from the Leachate Pond (LP) located west of Dolby III are typical of landfill leachate, with high specific conductance and dissolved ion content. Leachate Pond 2 (LP2), located east of Dolby II, exhibits much lower specific conductance and dissolved ion content. This likely due to that fact that the Dolby II landfill is a more mature landfill. The Leak Detection System (LDS) sample appears to show relatively high concentrations of landfill indicator parameters. Overall, the Leachate Detection System sample results for 2019 were within historical ranges for this location.

Monitoring of the Partridge Brook Flowage continues to show minimal evidence of impact to the surface water from the landfill. Field monitoring results at location PBFR during the October 2019 sampling event appear to be far outside of the normal range for this monitoring location. Specific conductance was measured at 378 uS/cm during the October event, compared to 61 uS/cm during the August 2019 event. The reported TDS for the October 2019 event was 70 mg/L, which does not equate to the specific conductance measurement. The pH measurement during the October 2019 event was 3.8 SU, compared to 8.0 SU during the August 2019 event. This would be an unusually low and potentially alarming pH measurement for a surface water body. For now, I would assume that this pH value is attributable to either instrument malfunction or recording error.

Comments on 2019 Annual Report

- In section 3.10 System Failures and Repairs, SME states that:

  "On October 15, 2019 leachate from the pond exceeded the action leakage rate (ALR). The conductivity of the pond, leak detection layer, and underdrain pump station at the time was 1750 microsiemens per centimeter (uS/cm), 997 uS/cm, and 750 uS/cm, respectively. The leak detection conductivity is closer to the underdrain pump station conductivity than the leachate conductivity. Accordingly, it appears the leak detection layer may be more influenced by groundwater in the underdrain layer than from a leak in the primary liner for the leachate pond.".

  While this seems like a reasonable assessment, I think that it is also debatable. SME has concluded in the past that groundwater likely seeps into the leak detection layer of the pond liner system. I suspect that this is true. However, it is also possible that the elevated specific conductance in the leak detection layer is not entirely attributable to groundwater with elevated dissolved ion content. The fluid in the leak detection layer may very well be leachate that has seeped through the primary liner and has been diluted by groundwater that has infiltrated the secondary liner. Monitoring results at groundwater monitoring locations 304A and 304B, located immediately downgradient of the leachate pond, do not show groundwater in this area to have elevated specific conductance in the range observed in the leak detection layer, or the underdrain pump station. This is also evidence that any leakage from the leachate pond is not significantly impacting groundwater.

- In section 4.1 Monitoring Locations, SME states that:

  "… monitoring events occurred during the periods of June 3 through 6, August 12 through 15, and November 21 through 24".

  I think there might be an error here. Based on the data tables provided in the report it looks like the fall sample event was conducted in October rather than November.

- In section 10.0 Recommendations, SME recommends that water quality monitoring frequency be reduced from three events per year to two events per year, omitting the summer monitoring event.

  This is a bit unusual given that there is a portion of Dolby III that remains open; however, SME states that this open landfill area will only receive small amounts of waste material in the coming years and will be closed in the near future. Given this, I think it is reasonable to consider a decrease in monitoring frequency at this time. While some monitoring locations show clear landfill impact with changing concentration trends, I do not believe that reducing the monitoring frequency to two events per year will limit the ability to identify changes in the overall groundwater quality. The locations where monitoring frequency may be the most critical are in the leachate pond and the associated leak detection system. These monitoring locations do exhibit relatively wide fluctuations in parameter concentrations between monitoring events; however, two monitoring events per year should be sufficient for identifying trends in the data indicative of significant leakage.

Recommendations

1. I am comfortable with SME's recommendation to decrease the groundwater and surface water quality monitoring frequency to two events per year.

Cc Kathy Tarbuck

FIGURE 1: Groundwater Monitoring Results 2010 - 2019
Dolby I Landfill, East Millinocket

Figure prepared by Sean Dougherty, MEDEP
July 2020

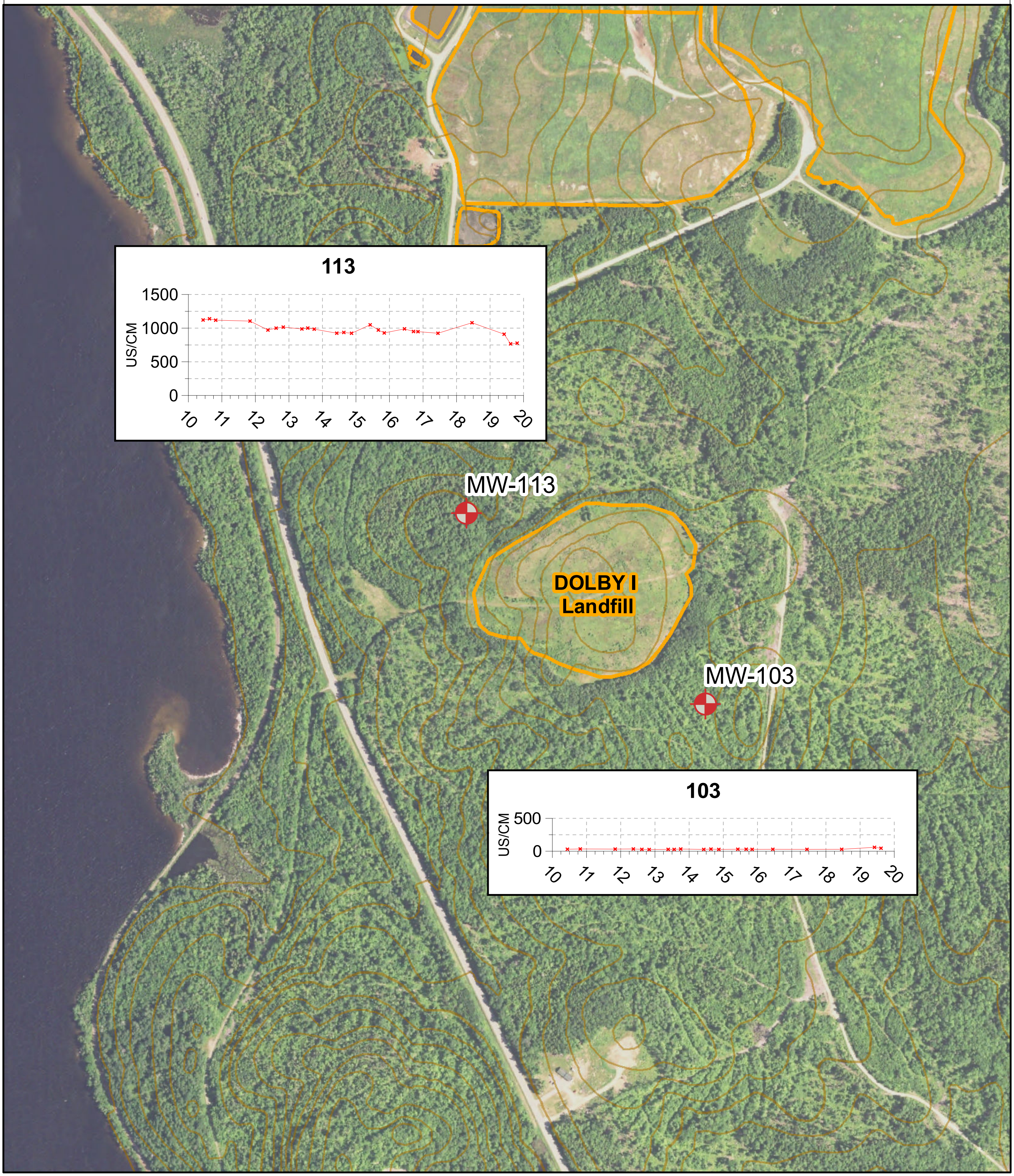
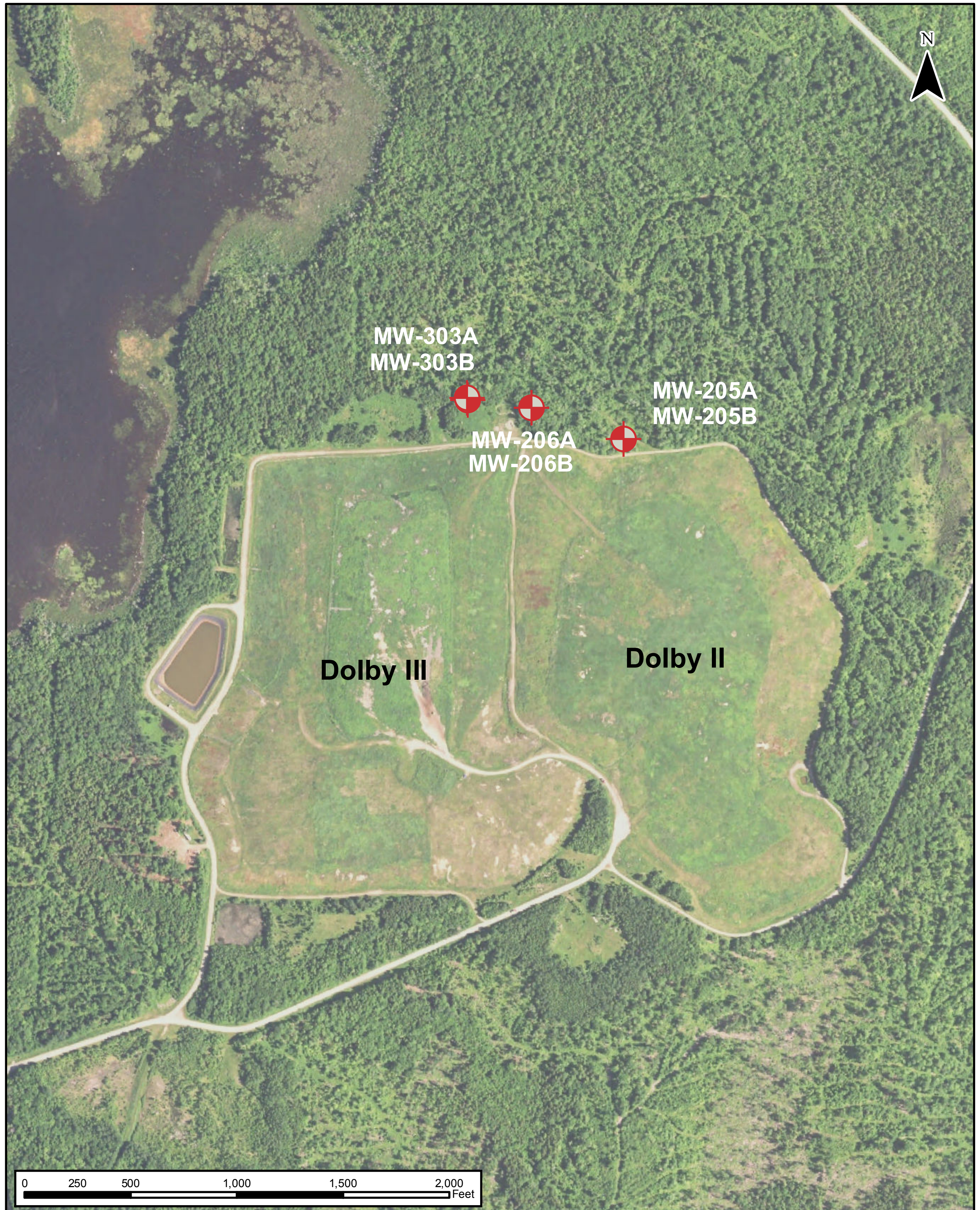


FIGURE 2A: Groundwater Monitoring Results 2010 - 2019
North Side Dolby II Landfill, East Millinocket



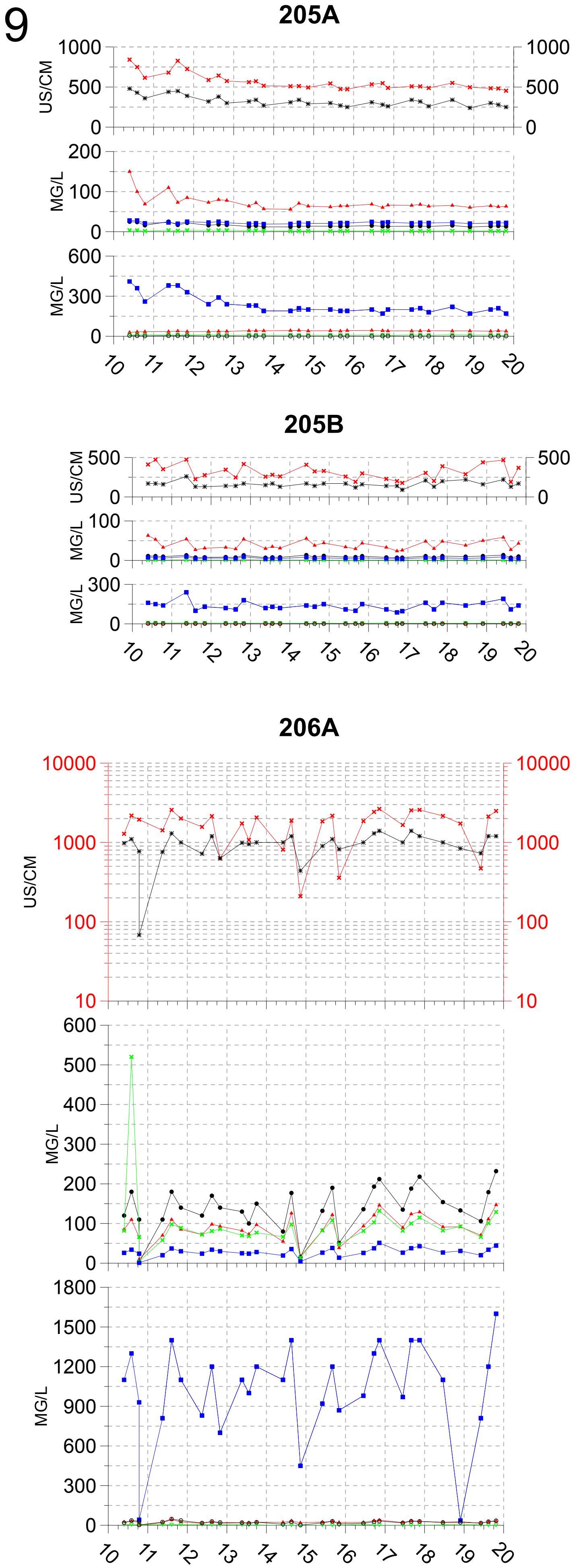
PLOT LEGEND

Indicator
SPC

Indicator
TDS

Cations
CA
MG
K
NA

Anions
HCO3
CL-
SO4-
ALK
TOC



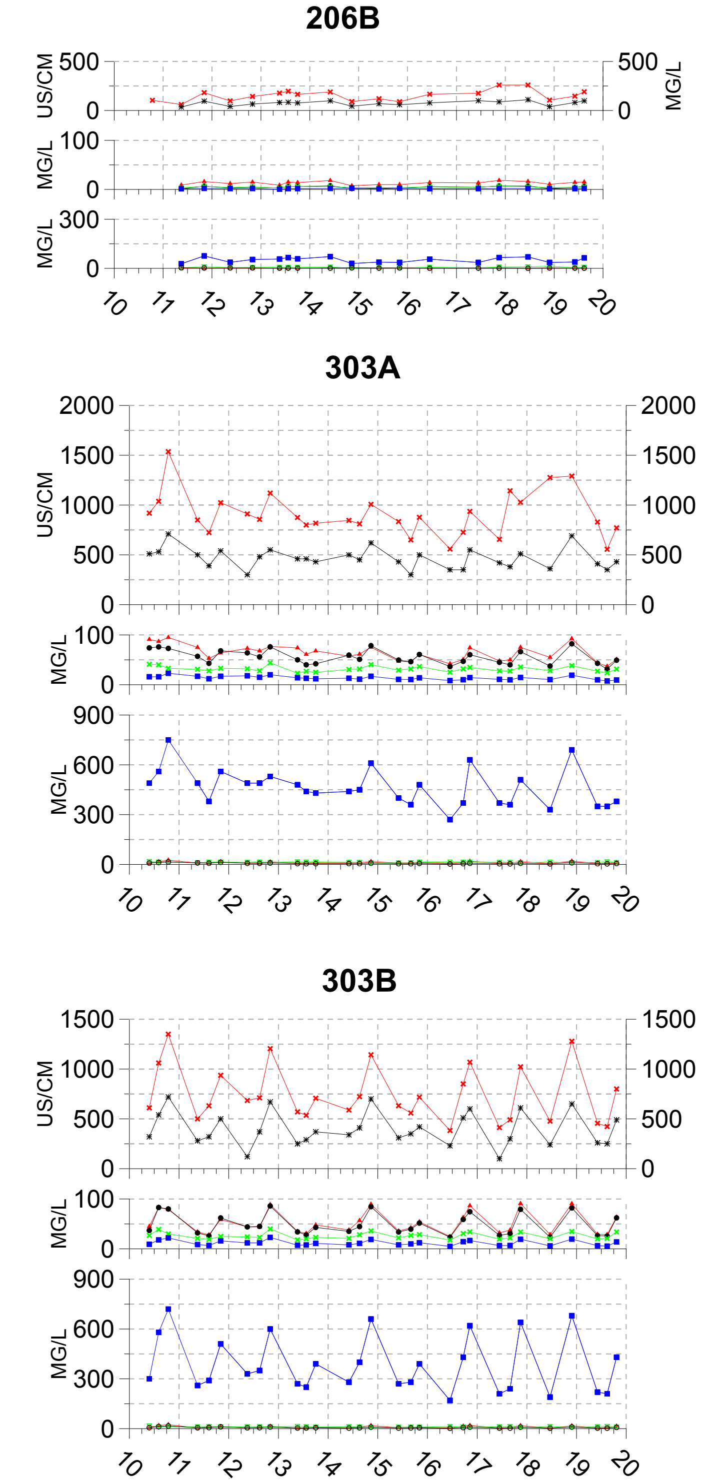
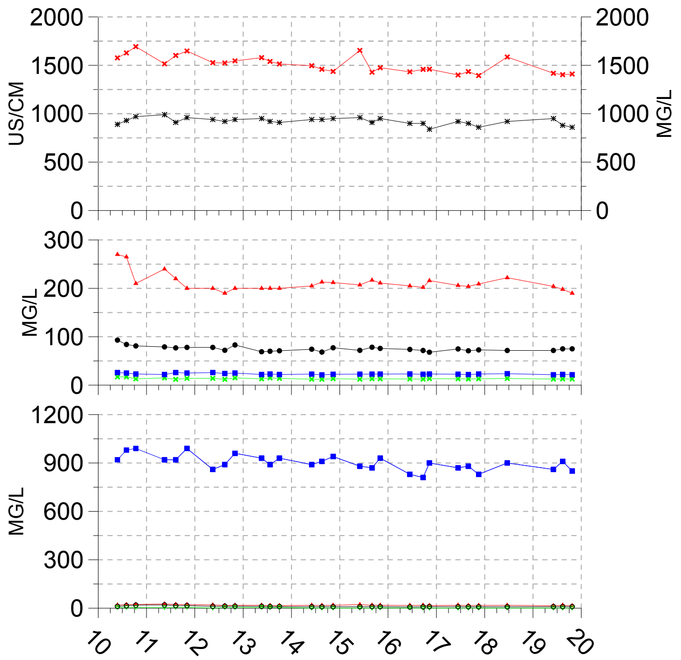


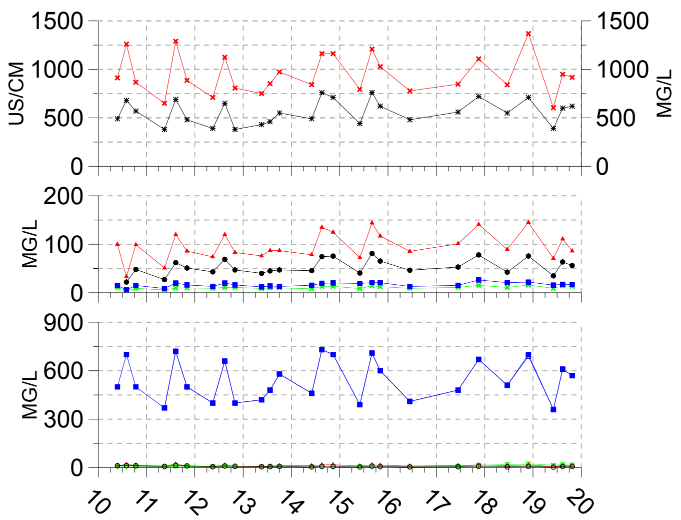
Figure prepared by Sean Doughety, MEDEP
July 2020

FIGURE 2B: Groundwater Monitoring Results 2010 - 2019
East Side Dolby II Landfill, East Millinocket

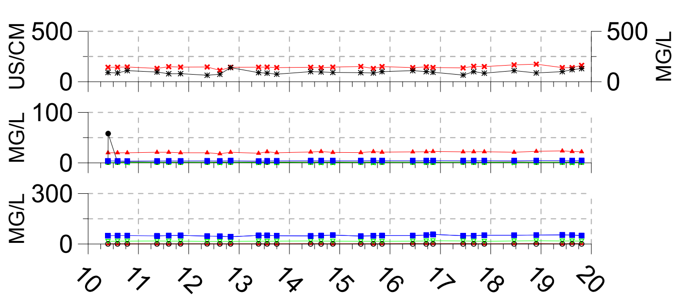
202AR

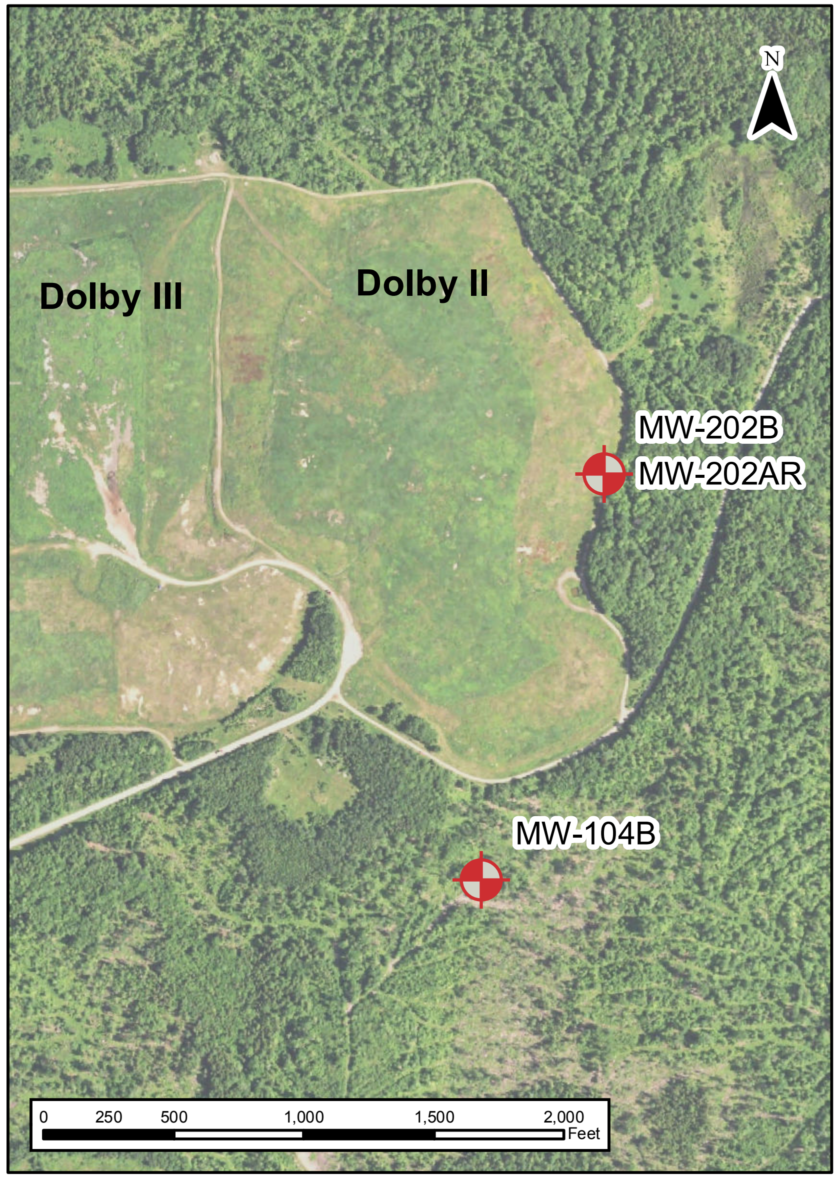


202B



104B





PLOT LEGEND

Indicator
SPC

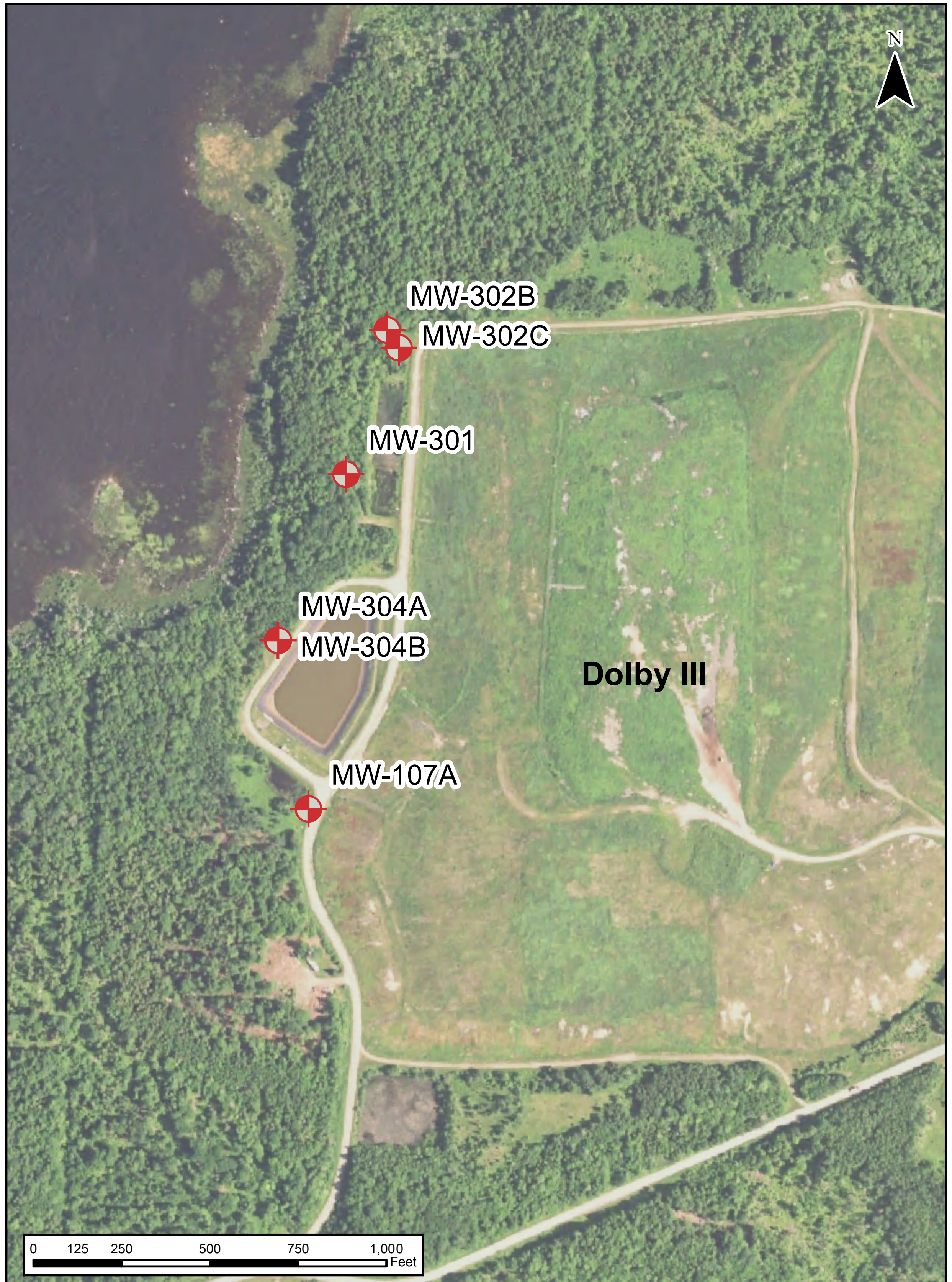
Indicator
TDS

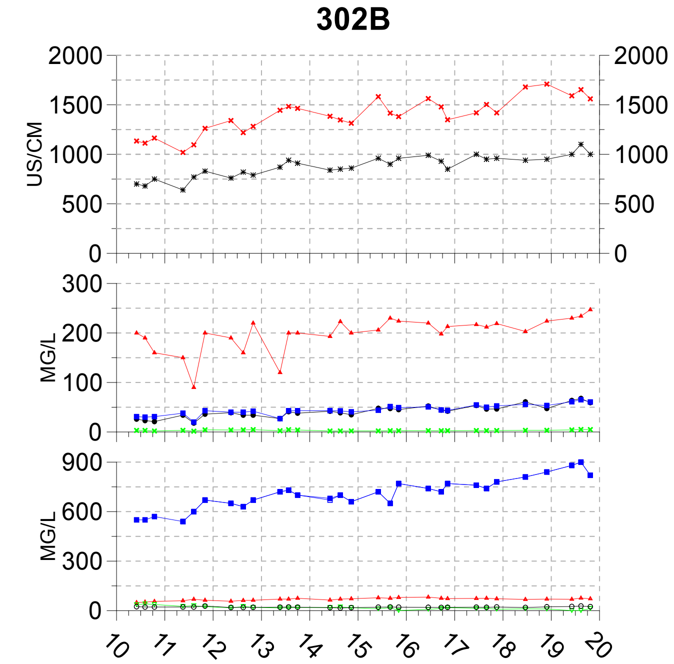
Cations
CA
MG
K
NA

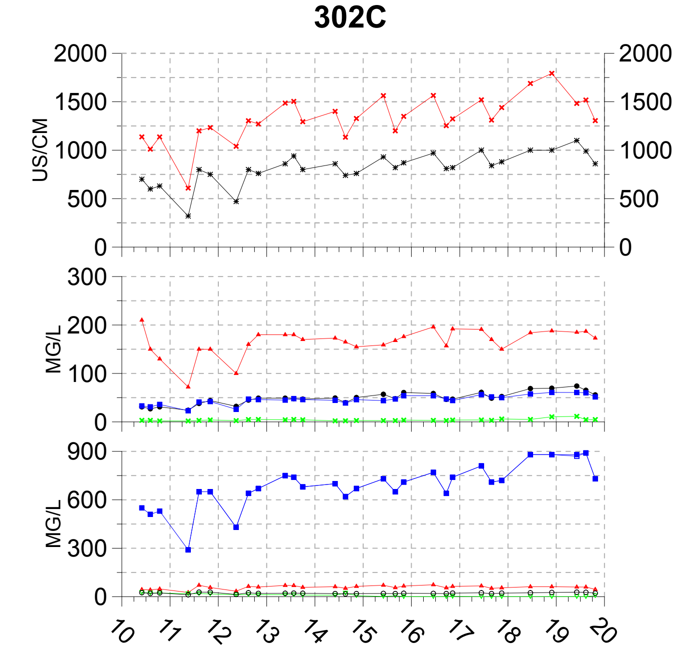
Anions
HCO3
CL-
SO4-
ALK
TOC

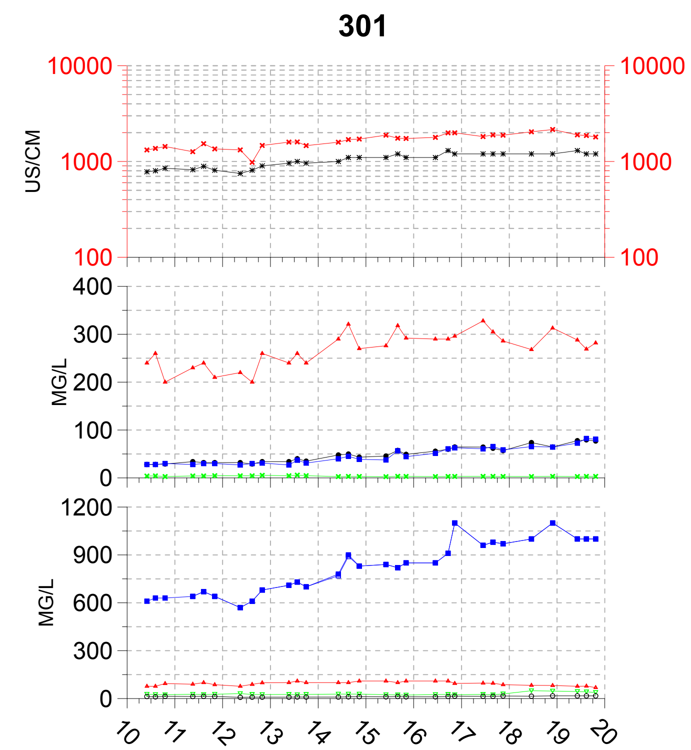
Figure prepared by Sean Dougherty, MEDEP
July 2020

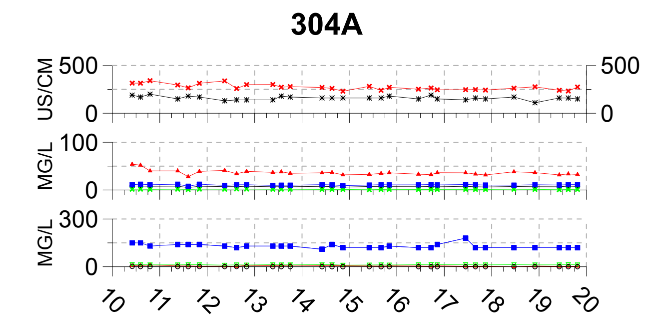
FIGURE 2C: Groundwater Monitoring Results 2010 - 2019
West Side Dolby III Landfill, East Millinocket

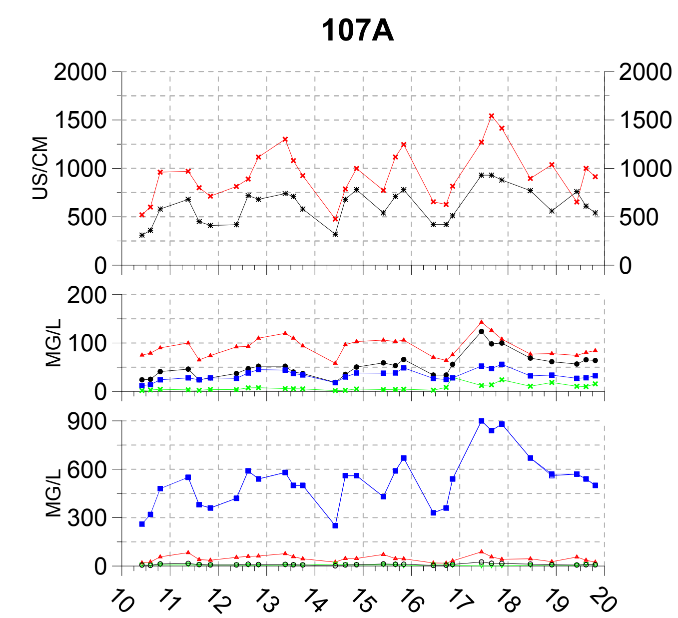


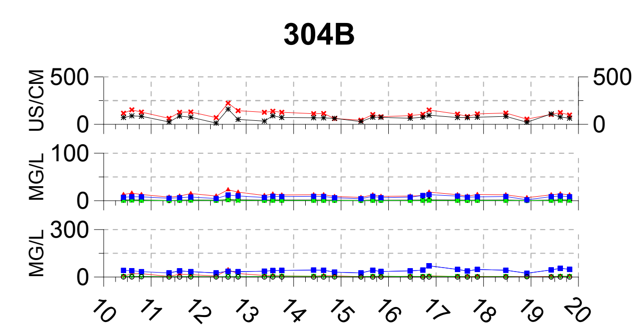


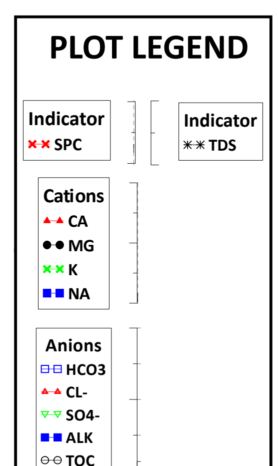






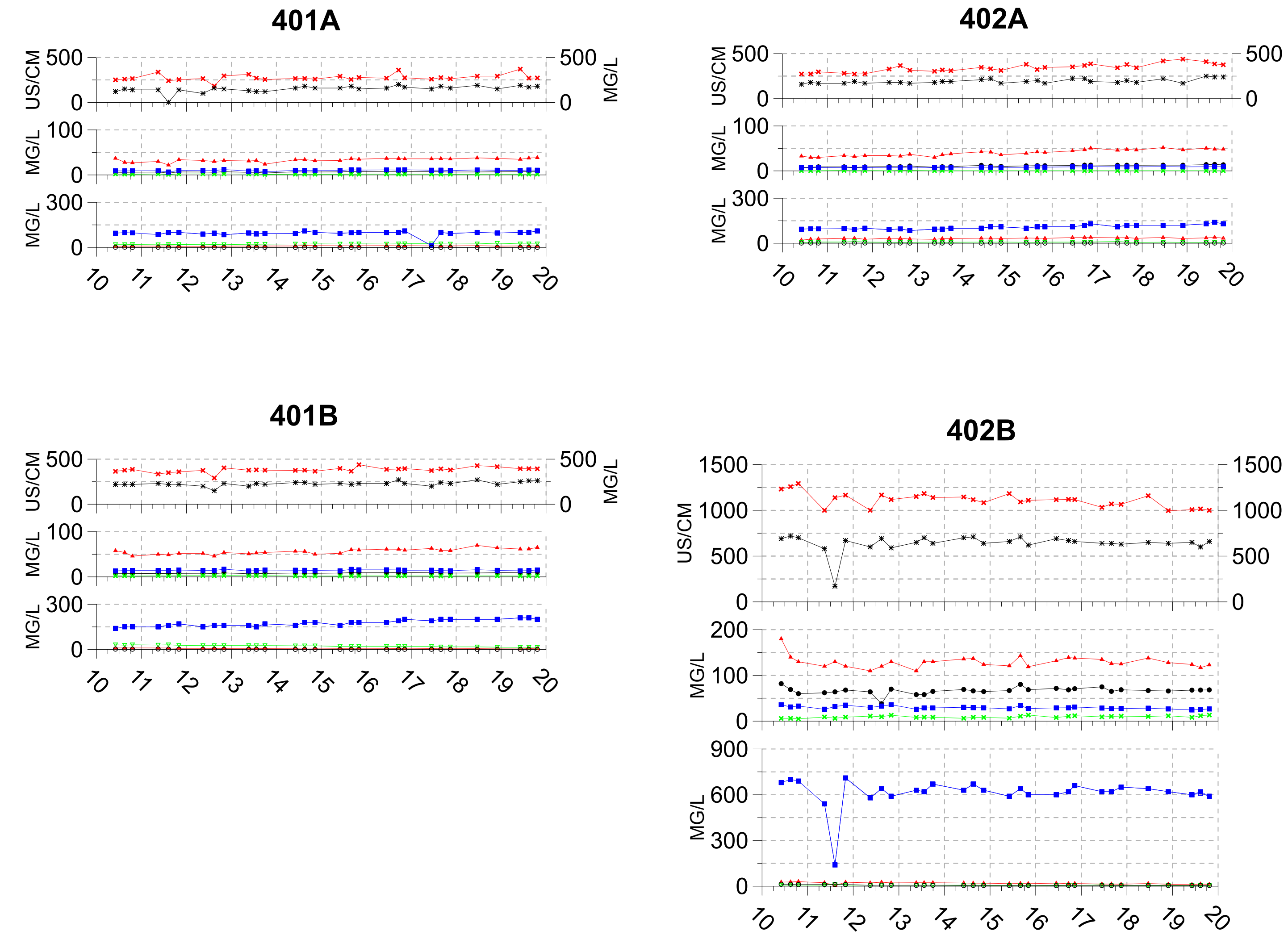






Map created by Sean Dougherty, MEDEP
July 2020

FIGURE 2D: Groundwater Monitoring Results 2010 - 2019
South Side Dolby III Landfill, East MIllinocket



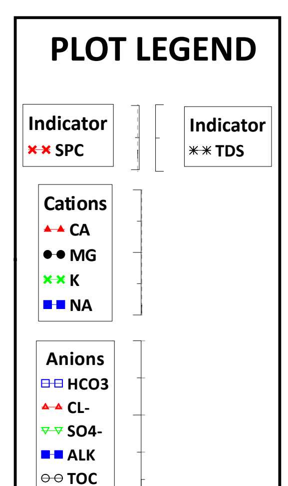
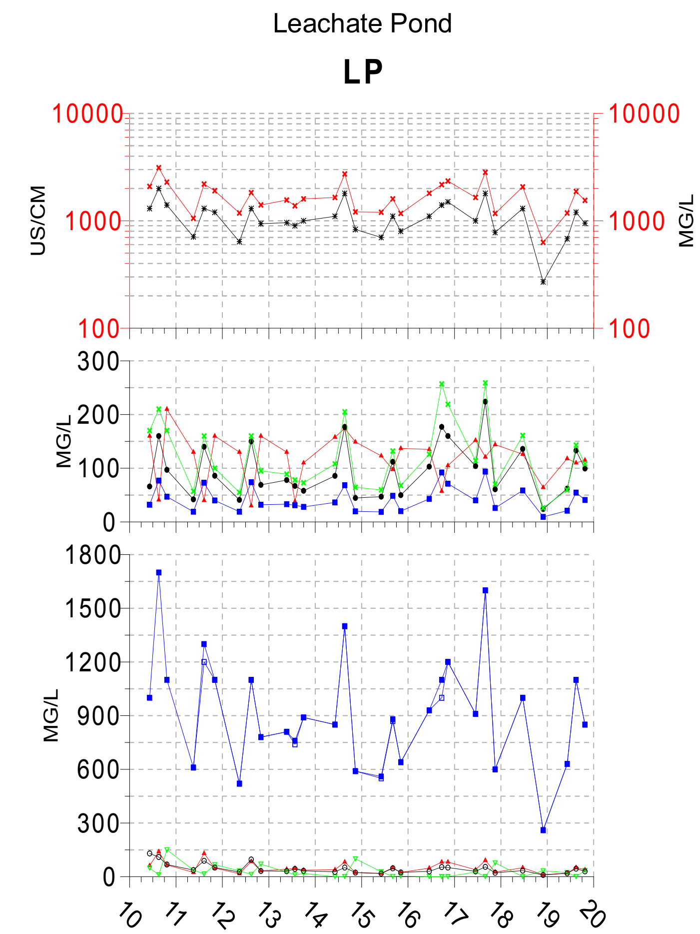
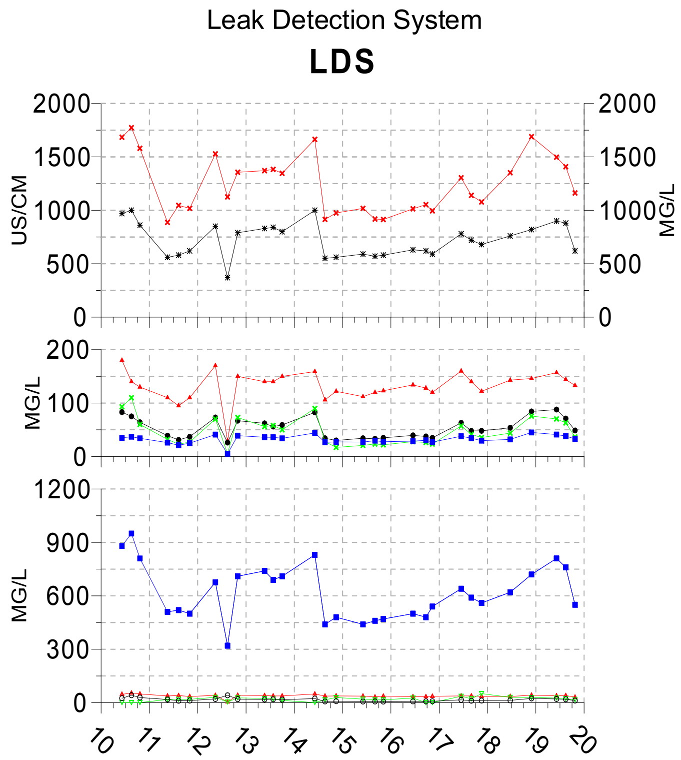
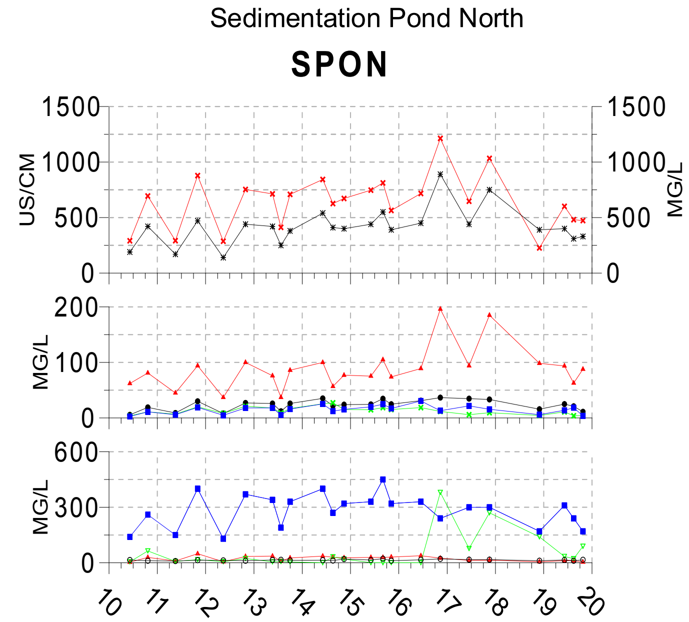


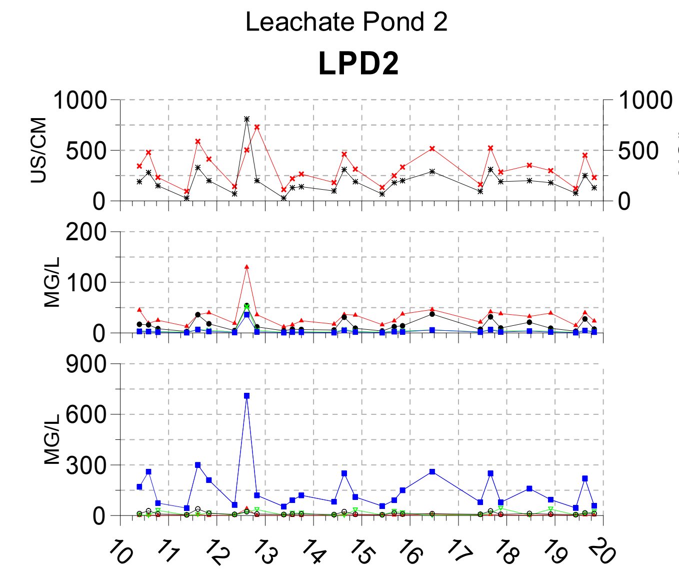
Figure prepared by Sean Dougherty, MEDEP
July 2020

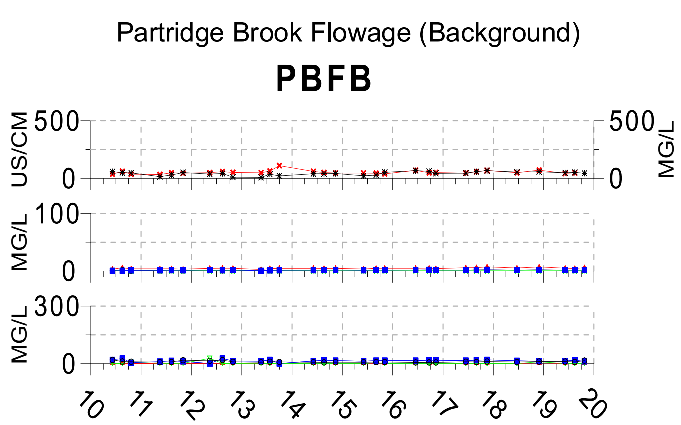
FIGURE 3: Surface Water, Storm Water, and Leachate 2010 - 2019
Dolby II & III Landfills, East Millinocket

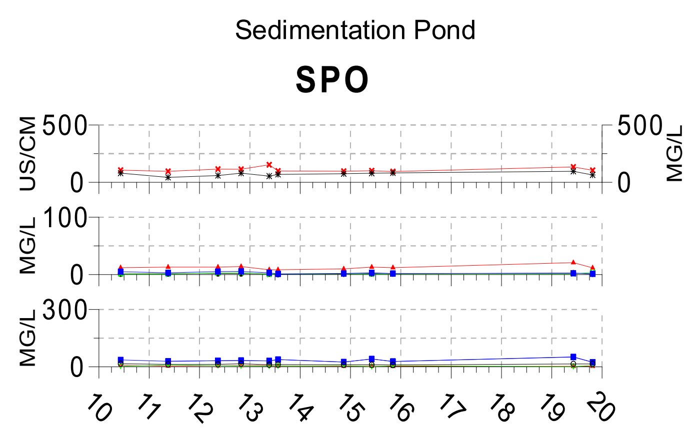


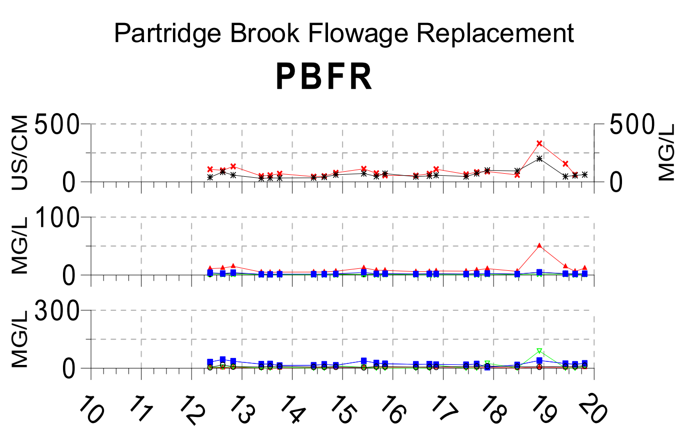


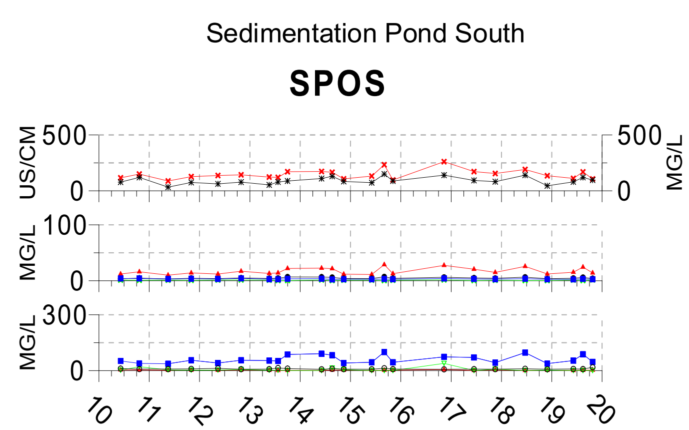


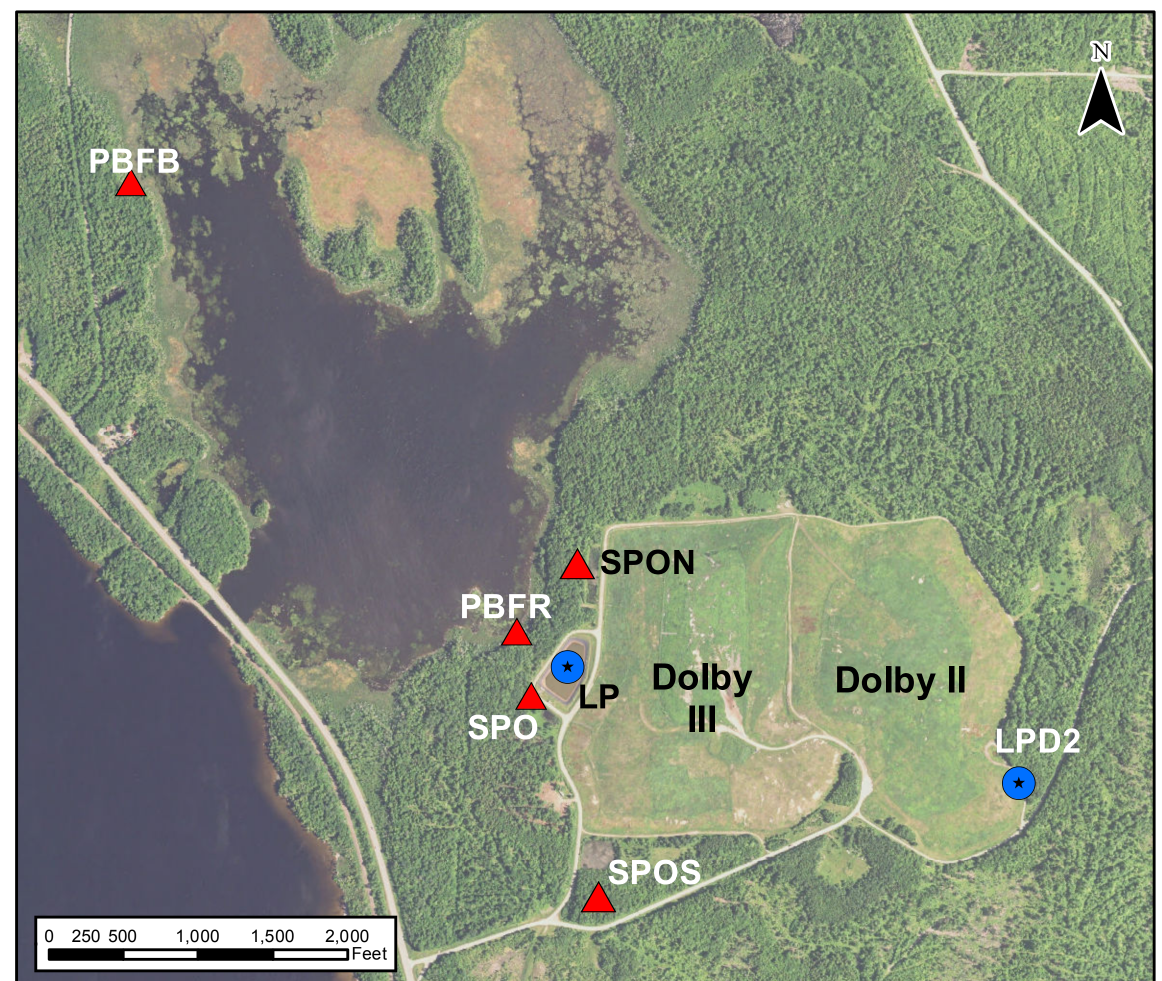












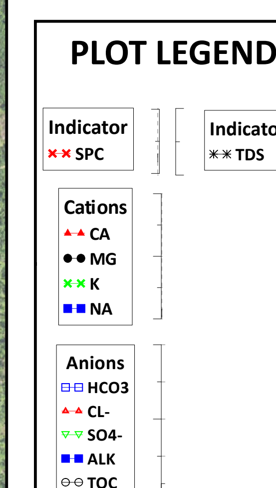


Figure prepared by Sean Dougherty, MEDEP
July 2020

TABLE 1
Summary of Sampling Results
Dolby Landfills, East Millinocket
2019

	SAMPLE LOCATION	SAMPLE DATE	GUIDELINES	ANION					CATION				FIELD		INDICATOR									
				ALKALINITY, BICARBONATE	CHLORIDE	SULFATE	TOTAL ALKALINITY	TOTAL ORGANIC CARBON	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	DISSOLVED OXYGEN	PH	TOTAL DISSOLVED SOLIDS	TOTAL HARDNESS	TOTAL SUSPENDED SOLIDS	ARSENIC	BARIUM	IRON	MANGANESE	AMMONIA AS NITROGEN	NITRATE AS NITROGEN	SPECIFIC CONDUCTANCE
				MG/L					MG/L				MG/L	STU	MG/L			MG/L						UMHOS/CM
			MCL															0.01	2				10	MODERATE
			MEG									20						0.01	1	5	0.3	30	10	HIGH
GROUNDWATER	103	6/1/2019											12.7	7.6										59
		8/1/2019											12.3	7										45
	104B	6/1/2019		54	<2	18	54	<1	23.7	1.84	<1	4.62	4.6	7.8	120	66.8	<4	<0.008		<0.1	0.0132	<0.1	0.092	140
		8/1/2019		53	3.4	18	53	<1	22.5	1.78	<1	4.38	5.5	8.3	120	63.5	<4	<0.008		<0.1	0.0144	<0.1	0.076	140
		10/1/2019		50	2.3	17	50	<1	22.1	1.78	1.03	4.81	5	7.1	130	62.5	<4	<0.008		<0.1	0.0079	<0.1	0.082	162
	107A	6/1/2019		570	56	3.4	570	6.5	74.3	56.6	10.6	27.1		7.2	760	419	<4	<0.008		<0.1	8.16	<0.1	0.22	653
		8/1/2019		540	36	10	540	7.9	80.5	65.4	9.96	28.2	3.5	6.9	610	470	<4	<0.008		<0.1	17	0.21	<0.05	1000
		10/1/2019		500	24	6.2	500	7.6	84.3	63.9	15.6	32.3	0.5	7.1	540	474	<4	<0.008		0.197	18.6	0.92	<0.05	914
	113	6/1/2019											9.9	7.1										910
		8/1/2019											3.2	6.9										767
		10/1/2019											8.3	7.3										777
	202AR	6/1/2019		860	15	<1	860	9.2	204	71.6	12.6	21.5	2.8	6.6	950	804	<4	0.026		1.66	15	3.5	<0.05	1418
		8/1/2019		910	18	<1	910	9.4	198	75	12.9	22.1	1.6	6.6	880	802	<4	0.016		1.48	14.5	3.4	<0.05	1403
		10/1/2019		850	15	<1	850	9.5	190	75	12.7	21.6	0.4	6.9	860	784	5.6	0.014		1.58	14.5	3.2	<0.05	1410
	202B	6/1/2019		360	6.5	15	360	3.7	70.8	34.8	9.12	15.8	2.4	6.7	390	320	8.8	<0.008		1.68	4.66	1.5	<0.05	604
		8/1/2019		610	14	18	610	6.9	111	63.5	14.1	17.3	3.5	6.6	600	539	<4	<0.008		1.16	8.13	2.6	0.052	949
		10/1/2019		570	14	16	570	7.3	86.2	56.1	13.1	17	0.6	6.9	620	446	6.8	<0.008		0.538	5.89	2.3	0.24	917
	205A	6/1/2019		200	38	9.4	200	1.3	64.7	13.6	1.82	21.5	2.1	7.5	300	217	<4	<0.008		<0.1	0.16	<0.1	<0.05	484
		8/1/2019		210	41	7.9	210	1.3	62.3	14.4	1.84	22.1	4.5	7.3	280	215	<4	<0.008		0.112	0.913	0.13	<0.05	482
		10/1/2019		170	38	7.5	170	1.6	63.3	13.1	1.98	22.1	0.6	7.6	250	212	<4	<0.008		0.138	0.911	0.29	<0.05	454
	205B	6/1/2019		190	<2	4.3	190	1.1	58.5	13.5	1.24	9.01	2.1	7.4	220	202	<4	<0.008		<0.1	0.14	<0.1	<0.05	467
		8/1/2019		110	2.6	3.6	110	<1	27.3	6.88	<1	3.64	4.4	7.2	130	96.5	<4	<0.008		<0.1	0.0924	<0.1	<0.05	190
		10/1/2019		140	<2	3.9	140	1.2	43	9.89	1.16	4.93	0.5	7.9	170	148	<4	<0.008		<0.1	0.205	<0.1	<0.05	369
	206A	6/1/2019		810	16	2.3	810	17	70.5	106	66.2	20.1	2.1	6.7	730	614	24	0.122		19.6	2.62	23	0.2	470
		8/1/2019		1200	27	<1	1200	27	111	179	101	33.9	5.1	6.7	1200	1020	90	0.309		45.4	3.95	39	<0.05	2125
		10/1/2019		1600	30	<1	1600	34	147	232	129	44.3	0.5	6.9	1200	1320	96	0.316		49.2	4.19	47	<0.05	2490
	206B	6/1/2019		39	<2	4.1	39	1.5	14.4	4.12	4.2	1.54	10.6	7.2	81	53	<4	<0.008		<0.1	0.0182	<0.1	0.17	146
		8/1/2019		64	3	7.8	64	1.2	15.3	6.24	5.56	1.93	10.7	6.8	98	64	19	<0.008		2.43	0.194	<0.1	0.45	191
	301	6/1/2019		1000	77	44	1000	17	288	77.8	2.85	72.6	1.1	6.6	1300	1040	<4	<0.008		0.197	0.709	<0.1	<0.05	1896
		8/1/2019		1000	78	42	1000	17	269	79.4	3.2	82.3	2.5	6.6	1200	999	<4	<0.008		0.106	0.597	<0.1	<0.05	1867
		10/1/2019		1000	69	38	1000	17	282	77	3.2	80.8	0.3	6.8	1200	1020	<4	<0.008		0.166	0.631	<0.1	<0.05	1803
		11/1/2019						17																
	302B	6/1/2019		880	69	<1	880	25	230	63.6	4.22	61.1	12.5	6.6	1000	837	4.4	<0.008		<0.1	35.5	0.81	0.068	1591
		8/1/2019		900	76	<1	900	28	234	67.7	5.06	65.2	6	6.6	1100	863	<4	<0.008		<0.1	39.8	1.1	<0.05	1653
		10/1/2019		820	72	13	820	24	247	59.3	4.85	60.6	0.5	6.7	1000	861	<4	<0.008		<0.1	37.5	0.86	<0.05	1560
		11/1/2019			73																			
	302C	6/1/2019		870	60	<1	880	28	185	74	11.4	60.7	6.6	6.5	1100	767	<4	<0.008		0.167	55	4	<0.05	1483
		8/1/2019		900	61	<1	900	27	187	65.2	4.49	60.1	4.5	6.5	1000	736	<4	<0.008		1.11	<0.01	0.72	<0.05	1518
		10/1/2019		750	47	<1	750	23	178	60.1	8.28	55.2	0.4	6.7	860	692	<4	<0.008		0.673	44.9	1.9	<0.05	1305
		11/1/2019			46																			
	303A	6/1/2019		350	5.9	12	350	4.8	43.8	43	27.1	9.84	0.1	6.7	410	286	<4	<0.008		<0.1	6.83	5	2.5	830
		8/1/2019		350	6.9	16	350	3.9	40	34.1	26.2	8.22	3.9	6.6	370	240	<4	<0.008		<0.1	5.58	5.3	1.1	556
		10/1/2019		380	11	12	380	5.9	50.9	49.2	31.5	9.56	3.5	6.7	430	330	<4	<0.008		<0.1	8.19	5.7	<0.05	771
	303B	6/1/2019		220	3.1	12	220	3.4	29.1	26.5	19.9	6.37	2.4	6.7	260	182	<4	<0.008		<0.1	4.24	3.9	2.6	456
		8/1/2019		210	6.3	14	210	3.2	28.8	25.7	21	5.46	4.2	6.4	250	178	<4	<0.008		<0.1	4.34	3.2	1.8	423
		10/1/2019		430	15	9.6	430	7.6	63.7	62.2	33.8	13.9	4.2	6.4	490	415	<4	<0.008		<0.1	10.1	4.6	0.16	800
	304A	6/1/2019		120	3.7	12	120	<1	32.6	7	<1	10.7	4	8.2	170	110	<4	<0.008		<0.1	0.0066	<0.1	<0.05	241
		8/1/2019		120	3.1	14	120	<1	33.7	7.95	1	11.2	3.6	8.1	160	117	<4	<0.008		0.134	0.0327	<0.1	<0.05	233
		10/1/2019		120	3.3	12	120	<1	32.5	7.49	1.1	11.3	0.3	7.9	160	112	<4	<0.008		0.13	0.0264	<0.1	<0.05	275
		11/1/2019																				<0.1		
	304B	6/1/2019		45	3.8	2.3	45	<1	12.4	1.39	<1	8.54	13.5	7	110	36.7	5.2	<0.008		<0.1	0.015	<0.1	<0.05	104
		8/1/2019		55	6	4.6	55	<1	14.2	1.67	<1	9.81	9.5	7.2	77	42.4	47	<0.008		0.198	0.0337	<0.1	<0.05	124
		10/1/2019		49	5.3	4.2	49	<1	12.4	1.66	<1	8.36	4.4	7.5	65	37.7	47	<0.008		0.952	0.108	<0.1	<0.05	98
	401A	6/1/2019		100	10	24	100	<1	34.8	7.19	1.7	10.1	10.9	7.8	190	116	<4	0.141		<0.1	<0.005	<0.1	<0.05	370
		8/1/2019		100	11	24	100	<1	37.5	7.6	1.78	11	10.5	8.1	170	125	<4	0.148		<0.1	0.0055	<0.1	<0.05	270
		10/1/2019		110	8.9	24	110	<1	38.5	7.53	1.71	10.5	4.6	7.9	180	127	<4	0.135		<0.1	0.0053	<0.1	<0.05	272
	401B	6/1/2019		210	3.6	14	210	<1	61.6	9.64	1.88	13.4	2.4	8	250	194	<4	<0.008		<0.1	0.085	<0.1	<0.05	394
		8/1/2019		210	5.7	15	210	<1	61.8	9.59	1.91	13.8	4.4	8	260	194	<4	<0.008		<0.1	0.383	<0.1	<0.05	394
		10/1/2019		200	4.3	14	200	<1	65.1	10.3	2.11	15.2	0.7	8	260	205	<4	<0.008		<0.1	0.606	<0.1	<0.05	393
	402A	6/1/2019		130	36	6.5	130	1.5	50.5	14	<1	9.19	0.4	7.7	250	184	<4	<0.008		0.143	0.176	<0.1	<0.05	410
		8/1/2019		140	40	6.6	140	1.6	48.4	14.4	<1	9.38	6.8	7.9	240	180	<4	<0.008		0.228	0.175	<0.1	<0.05	385
		10/1/2019		130	34	7.4	130	1.9	48.4	13.6	<1	9.16	3	7.8	240	177	<4	<0.008		0.12	0.164	<0.1	0.44	376
	402B	6/1/2019		600	11	4.9	600	4.3	124	67.8	8.42	24.5	0.4	7	650	588	<4	<0.008		<0.1	0.452	<0.1	<0.05	1007
		8/1/2019		610	14	5.6	620	4.9	117	68	11.9	25.6	1.6	7.1	600	572	<4	<0.008		<0.1	0.891	<0.1	<0.05	1016
		10/1/2019		590	12	6.4	590	5	123	68.3	13.4	26.7	1.9	7	660	588	<4	<0.008		<0.1	1.32	<0.1	<0.05	1000
LEACHATE	LDS	6/1/2019		810	39	26	810	21	157	87.9	70.3	41.1	3.4	7.1	900	755	4.8	0.01		5.06	5.46	6.6	<0.05	1497
		8/1/2019		760	40	23	760	19	144	71	62.9	38.2	2.5	7.1	880	651	8	0.015		5.16	4.86	6	<0.05	1408
		10/1/2019		550	31	16	550	12	133	48.7	36.6	33	0.5	7.2	620	533	23	0.013		7.9	3.76	2.3	<0.05	1162
	LP	6/1/2019		630	20	23	630	19	118	62	59.7	20.9	12.4	7.4	680	551	17	0.01		3.46	4.63	7.5	0.18	1182
		8/1/2019		1100	51	<1	1100	45	110	133	143	54.6	6.6	7.9	1200	824	<4	0.015		1.88	1.7	16	<0.05	1875
		10/1/2019		850	39	35	850	30	115	99.4	108	40.9	5.4	7.7	950	696	6.8	0.012	0.107	3.69	2.68	12	0.68	1549
	LPD2	6/1/2019		45	<2	2.9	45	5.2	14.8	3.32	1.15	<1	8.5	7.8	76	50.5	<4	<0.008		1.28	0.0706	<0.1	<0.05	123
		8/1/2019		220	4.4	11	220	15	39.9	27.6	4.96	4.68	0.5	7.5	250	213	7.2	<0.008		3.18	1.04	4.5	<0.05	451
		10/1/2019		58	3.6	23	58	12	23.6	7.44	2.82	1.57	2.3	7.6	130	89.7	8	<0.008		3.62	1.02	1	2.7	231
			AWQC																	1				
SURFACE WATER	PBFB	6/1/2019		14	<2	<1	14	11	4.89	1.48	<1	1.65	7.5	7.9	48	18.3	<4	<0.008		0.511	0.0595	<0.1	<0.05	43
		8/1/2019		18	3.2	<1	18	9.1	4.38	1.58	<1	1.48	9.1	7.9	51	17.4	<4	<0.008		0.226	0.0267	<0.1	<0.05	48
		10/1/2019		12	3.5	<1	12	16	5.78	1.41	<1	1.73	7.6	7.7	44	20.2	7.2	<0.008		0.952	0.153	<0.1	0.06	
	PBFR	6/1/2019		24	2.3	<1	24	8.9	14.7	2.17	<1	2.44	5.8	7.3	48	45.6	<4	<0.008		0.267	0.548	<0.1	<0.05	156
		8/1/2019		20	4	<1	20	9	6.26	1.88	<1	1.9	8.1	8	55	23.4	<4	<0.008		0.133	0.0415	<0.1	<0.05	61
		10/1/2019		25	4.3	11	25	13	12	1.96	1.4	2.44	7.1	3.8	70	38.1	<4	<0.008		0.271	0.0405	<0.1	0.14	378
	SPO	6/1/2019		51	2.8	<1	52	15	20.8	2.55	1.44	2.26	8.5	7.5	96	62.5	16	<0.008		2.18	0.715	<0.1	<0.05	134
		10/1/2019		24	3.1	7.9	24	15	11.7	1.33	3.85	1.33	7.8	7.8	64	34.8	5.2	<0.008		0.331	0.0434	<0.1	0.34	105
	SPON	6/1/2019		310	11	34	310	15	93.6	24.9	10.9	13.8	3.4	7.3	400	336	5.6	<0.008		0.394	4.28	0.26	0.093	601
		8/1/2019		240	11	22	240	11	62.8	21	3.87	18.4	3	7.5	310	243	16	<0.008		1.55	1.95	<0.1	<0.05	481
		10/1/2019		170	3.7	89	170	16	87.8	11.1	4.36	3.85	7.9	7.7	330	265	7.6	<0.008		0.606	0.223	<0.1	0.52	473
	SPOS	6/1/2019		54	<2	<1	54	9.2	15.2	4.39	1.41	2.45	8.1	7.8	80	56	<4	<0.008		0.33	0.0919	<0.1	<0.05	111
		8/1/2019		88	2.5	<1	88	8.6	24.4	5.88	<1	3.34	9	8.1	120	85.2	<4	<0.008		0.704	0.211	<0.1	<0.05	169
		10/1/2019		47	3.1	<1	47	18	14	3.94	1.71	2.67	9.2	7.8	96	51.1	<4	<0.008		0.132	0.0265	<0.1	<0.05	106

TABLE 2
Mann-Kendall Trend Analysis
DOLBY LANDFILLS, East Millinocket
2010 through 2019

Sample Type	Well ID	Trend	Confidence Level	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	TOTAL ALKALINITY	ALKALINITY, BICARBONAT	ARSENIC	CHLORIDE	SULFATE	DISSOLVED OXYGEN	IRON	MANGANESE	NITRATE AS NITROGEN	PH	SPECIFIC CONDUCTANCE	TOTAL DISSOLVED SOLIDS	TOTAL ORGANIC CARBON
GROUNDWATER	103	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	113	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	301	Down	0.95	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE
			0.99	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE
	104B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE
			0.99	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	107A	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE
			0.99	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	202AR	Down	0.95	FALSE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE
			0.99	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	202B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE
		Up	0.95	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	205A	Down	0.95	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE
			0.99	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	205B	Down	0.95	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	206A	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	206B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	302B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE
			0.99	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE
	302C	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE
			0.99	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE
	303A	Down	0.95	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE
			0.99	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	303B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	304A	Down	0.95	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
			0.99	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	304B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE

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Sample Type	Well ID	Trend	Confidence Level	CALCIUM	MAGNESIUM	SODIUM	POTASSIUM	TOTAL ALKALINITY	ALKALINITY, BICARBONAT	ARSENIC	CHLORIDE	SULFATE	DISSOLVED OXYGEN	IRON	MANGANESE	NITRATE AS NITROGEN	PH	SPECIFIC CONDUCTANCE	TOTAL DISSOLVED SOLIDS	TOTAL ORGANIC CARBON
		Up	0.95	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE
	401A	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE
			0.99	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE
	401B	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
		Up	0.95	TRUE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE
			0.99	TRUE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE
	402A	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE
			0.99	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE
	402B	Down	0.95	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE
			0.99	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE
LEACHATE	LDS	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	LP	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	LPD2	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
SURFACE WATER	PBFB	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE
			0.99	TRUE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	PBFR	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE
			0.99	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
	SPO	Down	0.95	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	SPON	Down	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
	SPOS	Down	0.95	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
		Up	0.95	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE
			0.99	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE