April 2017

QIKIQ15 BAFFIN REGION DEW LINE SITE MONITORING

2016 FOX-5 Monitoring Report

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Golder Associates

Executive Summary

Golder Associates Ltd. (Golder) has been contracted by Public Services and Procurement Canada (PSPC), on behalf of the Department of National Defence (DND), to complete the 2015-2018 Distant Early Warning (DEW) Line Sites Landfill Monitoring Program in the Baffin Region of Nunavut. The five DEW Line sites that were monitored in 2016 as part of the QIKIQ15 contract are FOX-2, FOX-3, FOX-4, FOX-5 and DYE-M. These sites are all now in the Post-Construction Monitoring Phase of their remedial program.

This Monitoring Report presents the 2016 post-construction inspection and monitoring results for the three landfills at FOX-5: Middle Site Non-Hazardous Waste Landfill (NHWL) and Tier II Disposal Facility, Main Landfill and Station Area NHWL. The 2016 monitoring was year 10 for FOX-5; remediation was completed in 2006. FOX-5 was last monitored in 2014. The next FOX-5 monitoring event is scheduled for 2021.

Middle Site Non-Hazardous Waste Landfill and Tier II Disposal Facility

The Middle Site NHWL and Tier II Disposal Facility has exhibited some observed minor settlement, self-armouring erosion, cracking, tire tracks and a small hydrocarbon stain on the top of the northwest corner of the landfill. The landfill does not have any observed exposed waste or indications of slope instability. Observed cracking is either very weathered or likely caused by thaw creep and not considered to be of concern. All previously observed erosion appears to be self-armouring and has not changed from the last inspection in 2014 and therefore is not considered to be of concern. The small hydrocarbon stain appears to be from a fuel spill and the tire tracks are not causing erosion. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”.

At all five sampling locations, the concentrations of most metals were similar to or less than those observed in previous years. Concentrations of metal parameters in soil were highest overall at the deep MW-7 sample location. No detectable concentrations of cadmium, mercury, PHC or PCB were noted in any of the soil samples in 2016. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

In 2016, groundwater samples were collected from four of five monitoring wells adjacent to the landfill; no sample was collected at MW-7 because the well was dry. Zinc was detected at MW-5 and MW-8, at concentrations less than those observed in previous years. No detectable concentrations of other metals, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater was highest at MW-5, and lowest towards the south at MW-8, which follows the topography in the area.

The historical graphs in Appendix C show concentration trends at the Middle Site NHWL and Tier II Disposal Facility. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at all five monitoring locations. There is no evident ongoing impact of the Middle Site NHWL and Tier II Disposal Facility on soil or groundwater quality. No modifications to the ongoing monitoring program at this landfill are recommended.

Main Landfill

The Main Landfill located at the Station Area exhibited some observed erosion, debris and potential slope creep. No settlement, ponded water, cracking, sloughing or exposed waste were observed. There is some previously observed erosion along the northeast toe of the landfill (Feature D) that has been caused by upstream runoff draining down the steep slope around the toe of the landfill. At the time of 2016 visual inspection, the erosion along the northeast toe had not undermined the rip-rap protected landfill slope, nor was causing evident slope instability. The existing rip-rap on the landfill slope is quite large and is currently stable. Other previously observed erosion along the south, east and west toe of the landfill (Features F and H) does not appear to have changed significantly from the last inspection in 2014 and is not considered to be of concern. The inclination of the thermistor casings installed in the northeast slope of the landfill has been previously reported to potentially indicate slope creep (Feature A), however, the inclination angles have not previously been measured and therefore it cannot be determined if the inclination is an as-built condition or related to slope creep. The inclination angles of the thermistor casings were measured during the 2016 visual inspection for future reference. No other indications of slope instability were observed at the Main Landfill during the 2016 visual inspection. Observed metal and plastic debris around the toe of the landfill appears to be construction debris and is not exposed buried waste. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”.

The concentrations of most metals in soil were highest at the MW-11 sampling location, located immediately downgradient of the northeastern toe. At all five sampling locations, the concentrations of most metals were less than or similar to those reported in previous years. PHC were only detected at the MW-12 sampling location; the modified TPH concentration of 40.5 mg/kg remained below the range of concentrations reported from 2009 to 2012 (49 mg/kg to 91 mg/kg). No detectable concentrations of cadmium, arsenic, mercury or PCB were noted in any of the soil samples in 2016. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

In 2016, groundwater samples were collected from only one of the five monitoring wells adjacent to the landfill, MW-13. No metals, PHC F1 fraction or PCB were detected at this location in 2016.

The historical graphs in Appendix C show concentration trends at the Main Landfill. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at all four monitoring locations. There is no evident ongoing impact of the Main Landfill on soil or groundwater quality.

It is recommended that the inclination of all eight thermistors installed at the Main Landfill be measured on an annual basis until the next scheduled monitoring event in 2021 to help identify if there is any movement of the northeast slope. If this recommendation is put into effect, we also recommend that the erosion channels along the northeast toe of the landfill should be monitored at the same time to evaluate the risk of undermining the rip-rap landfill slope due to potential erosion (e.g., deep channel cutting). Consideration should also be given to setting up benchmarks (i.e., survey monuments) around the perimeter of the Main Landfill that could be surveyed on an annual basis along with the thermistors to determine if there is any ongoing slope movement. No other modifications to the ongoing soil and water monitoring program at this landfill are recommended.

Station Area Non-Hazardous Waste Landfill

The Station Area NHWL exhibited some minor settlement, self-armouring erosion, cracking, tire tracks and debris. No ponded water, exposed waste or indications of slope instability were observed during the 2016 visual inspection. The previously observed minor settlement and self-armouring erosion does not appear to have changed since the last inspection and is not considered to be of concern. Previously observed cracking is weathered, does not appear to have changed since the last inspection and is not considered of concern. Previously observed steel cable and metal debris are not exposed buried waste. Previously observed tire tracks on the landfill surface do not appear to have changed since the last inspection and are not considered of concern. The Station Area NHWL was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”.

The concentrations of most metals in soil were highest overall at the deep MW-15 sampling location, located upgradient (cross-gradient) of the eastern toe and at the shallow MW-16 sampling location, located upgradient of the western toe. At MW-16, the concentrations of most metals were similar to those reported in previous years, with the exception of zinc, which exceeded the baseline mean concentration plus 3σ and represents a new historical maximum concentration. The concentration of chromium at the deep MW-15 sample location also marginally exceeded the baseline mean concentration plus 3σ, but remained less than the historical maximum concentration reported in previous years. PHC were only detected at the MW-16 sampling location; the modified TPH concentration of 80.5 mg/kg was similar to the range of concentrations reported in previous years (21 mg/kg to 264 mg/kg). No detectable concentrations of cadmium, mercury or PCB were noted in any of the soil samples in 2016.

In 2016, groundwater samples were collected from four of five monitoring wells adjacent to the landfill. The concentration of zinc at MW-16, the only parameter detected at any of the four locations sampled, was less than those observed in previous years.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater in was highest at MW-15, and lowest towards the south at MW-18, which follows the topography in the area.

The historical graphs in Appendix C show concentration trends at the Main Landfill. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at downgradient monitoring locations MW-17, MW-18 and MW-19. Slight increasing trends are observed for a number of metals (i.e. nickel, cobalt, lead, zinc and chromium) at the upgradient monitoring locations, which are largely attributed to increases at MW-16. Given that the environmental sampling results are largely the same as the previous sampling sessions, it is concluded that there is no evident impact of the landfill on soil quality. Similarly, there does not appear to be significant impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill. No modifications to the ongoing monitoring program at this landfill are recommended.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been contracted by Public Services and Procurement Canada (PSPC), on behalf of the Department of National Defence (DND), to complete the 2015-2018 Distant Early Warning (DEW) Line Sites Landfill Monitoring Program in the Baffin Region of Nunavut (hereafter referred to as the "Project"). The contract number with PSPC is W6837-151002/001/NCS. The DND file number for the Project is QIKIQ15. The contracted scope of work is in accordance with the project Terms of Reference (TOR) dated April 2015, Golder Proposal P1530908 dated June 16, 2015 ("Golder Proposal") and the minutes of the May 12, 2016 meeting attended by Golder and DND.

The five DEW Line sites that were monitored in 2016 as part of the QIKIQ15 contract are FOX-2, FOX-3, FOX-4, FOX-5 and DYE-M. These sites are all now in the Post-Construction Monitoring Phase of their remedial program. Post-Construction Monitoring was carried out in accordance with the TOR and implemented as per Golder's Logistics and Work Plan (LWP) dated July 25, 2016. Monitoring activities included geotechnical visual inspection, thermal monitoring, soil and groundwater sampling.

This monitoring report presents the 2016 post-construction inspection and monitoring results for FOX-5 (the Site). The 2016 monitoring event was Year 10 for FOX-5; remediation was completed in 2006.

Appendix A is a summary of the report limitations and forms part of the report.

1.1 Objective of the Study

The objective of the Landfill Monitoring Program is to collect sufficient information to assess the performance, integrity, and stability of the landfills from a geotechnical and environmental perspective for the protection of human health and the environment. The monitoring program is designed to monitor landfill integrity and to determine in the event of any evident deterioration impacts identified from sampling results, if remedial measures are required.

1.2 Scope of Work

The scope of work for this Project includes the following:

1) Project management including liaison with DND, project team coordination, scope management, cost management, schedule management and resource coordination;

2) Preparation of a site-specific Health Safety and Environment Plan (HASEP) and procurement of safety equipment and supplies (e.g., personal protective equipment, first aid kits and satellite phones);

3) Development of a Logistics and Work Plan (LWP) for each field season that outlines the field schedule, travel plans, accommodation, hiring of local Inuit contract workers, all-terrain vehicle (ATV) and charter aircraft rental;

4) Completion of field work consisting of visual inspection, photographic documentation, thermistor data collection and soil and water sample collection;

5) Preparation of a Field Work Progress Report that summarizes field work activities completed each year (submitted under separate cover);

6) Preparation of a Consultant Inuit Participation Plan (CIPP) and Report (CIPR), that contains the Inuit employment and subcontracting content (submitted under separate cover); and,

7) Preparation of draft and final monitoring reports for each site with visual inspection results, photographic log, thermistor data collection, figures of inspection features and photograph locations, soil and groundwater quality monitoring results, Quality Analysis / Quality Control (QA/QC) and data interpretation.

2.0 BACKGROUND

2.1 Site Description

The FOX-5 Broughton Island DEW Line site is located on the southeastern edge of Broughton Island. Broughton Island is a small island off the east coast of the Cumberland Peninsula of Baffin Island. The FOX-5 site is located at 67º 33' north latitude and 63º 49' west longitude. The station is located approximately 10 km east of the community of Qikiqtarjuaq (formerly Broughton Island) and sits on a high point about 1.6 km inland of the Davis Strait. The station was accessible by an all-season road during site cleanup, however, this road has not been maintained since. A helipad is maintained in the vicinity of the operating North Warning System (NWS) Short Range Radar (SRR) station.

The Station Area is located at an elevation of approximately 550 metres above sea level (masl). A ridge and steep slope is located to the east of the station, within a distance of 450 m at its nearest approach. A ridge and slope leading northeast is located approximately 800 metres to the northeast. These slopes terminate at Davis Strait.

FOX-5 was originally an auxiliary station within the original DEW Line system that was decommissioned in 1991. A remotely operated NWS SRR station has been constructed in its vicinity. The environmental cleanup and demolition of facilities not required for the operation of the NWS SRR station commenced in 2001 and was completed during the summer of 2006.

The following three landfills, shown in plan on Figure FOX-5.1, are part of the FOX-5 long-term monitoring program:

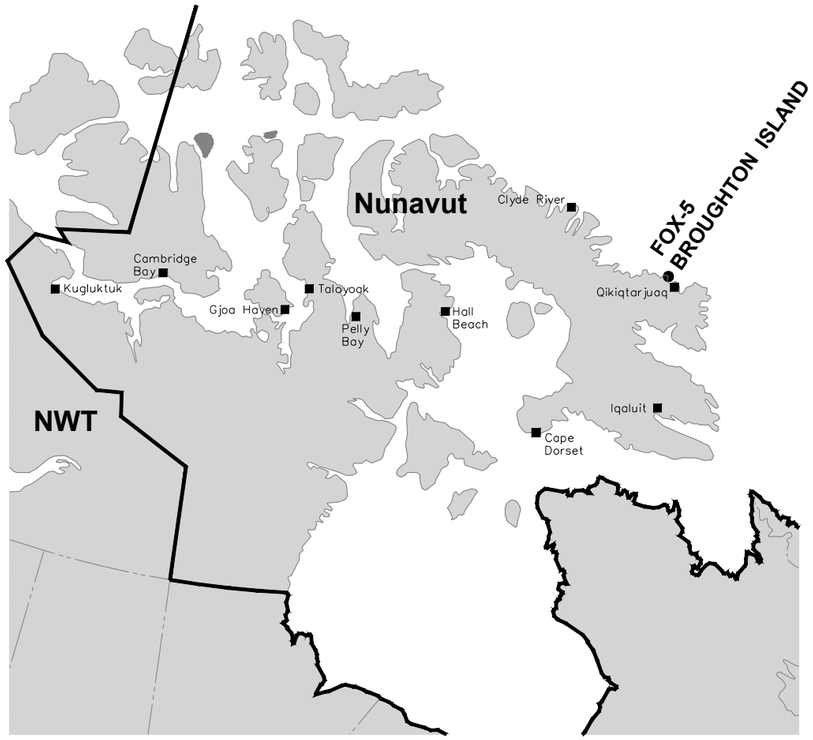
- The Middle Site Non-Hazardous Waste Landfill Tier II Disposal Facility, located in the Middle Site Area, immediately west of the access road and approximately 5,500 m east of Qikiqtarjuaq;
- The Main Landfill located in the Station Area, approximately 900 m northwest of the station; and,
- The Station Area Non-Hazardous Waste Landfill located approximately 300 m north of the station.

PERMANENT BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM–1	5 599.643	4 498.140	514.934	25mm DIA. STEEL PIPE
BM–2	5 749.976	4 692.327	502.600	25mm DIA. STEEL PIPE

NOTE: THE STATION AREA IS ON A SEPARATE COORDINATE SYSTEM.
IT IS NOT TIED–IN TO THE SITE SURVEY AT THE MIDDLE SITE,
COMMUNITY BORROW, AIRSTRIP AND BEACH AREAS.

PERMANENT BENCHMARKS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
BM–3	9 700.063	15 599.940	314.770	25mm DIA. STEEL PIPE
BM–4	9 900.067	15 600.081	309.963	25mm DIA. STEEL PIPE

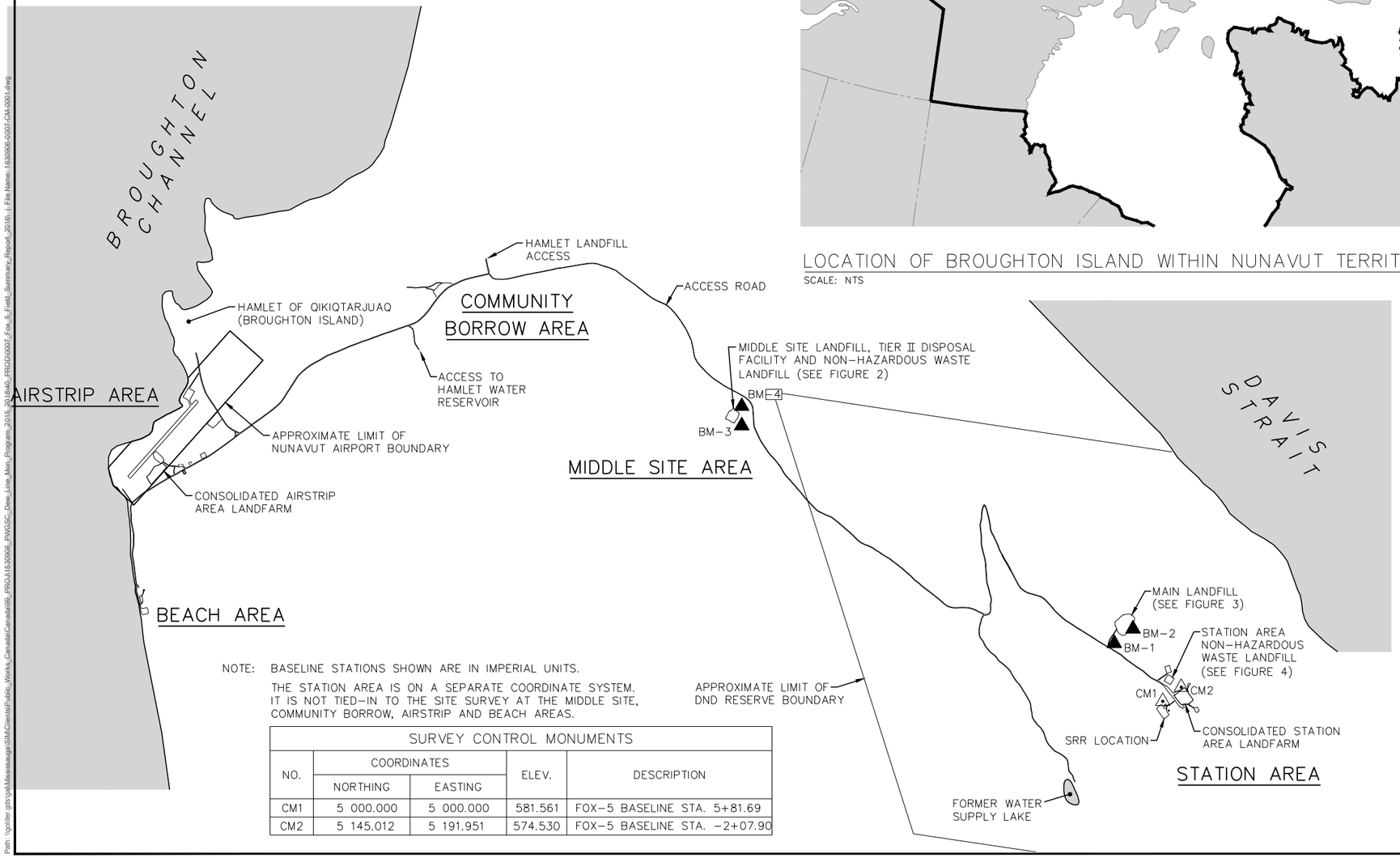
NOTE: THE MIDDLE SITE, COMMUNITY BORROW, AIRSTRIP AND BEACH AREAS ARE
ON A SEPARATE COORDINATE SYSTEM.
THEY ARE NOT TIED–IN TO THE SITE SURVEY AT THE STATION AREA.



LOCATION OF BROUGHTON ISLAND WITHIN NUNAVUT TERRITORY
SCALE: NTS

LEGEND:

- CM1 — SURVEY CONTROL MONUMENT (2)
- BM–1 — PERMANENT BENCHMARK LOCATION (4)
- APPROXIMATE LOCATION OF PROPERTY BOUNDARY
- BODY OF WATER



NOTE: BASELINE STATIONS SHOWN ARE IN IMPERIAL UNITS.

THE STATION AREA IS ON A SEPARATE COORDINATE SYSTEM.
IT IS NOT TIED–IN TO THE SITE SURVEY AT THE MIDDLE SITE,
COMMUNITY BORROW, AIRSTRIP AND BEACH AREAS.

SURVEY CONTROL MONUMENTS				
NO.	COORDINATES		ELEV.	DESCRIPTION
	NORTHING	EASTING		
CM1	5 000.000	5 000.000	581.561	FOX–5 BASELINE STA. 5+81.69
CM2	5 145.012	5 191.951	574.530	FOX–5 BASELINE STA. –2+07.90

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-5 MONITORING REPORT

TITLE
OVERALL SITE PLAN

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-10-06
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO. 1530908 | PHASE 2000 | REV. A | FIGURE FOX-5.1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada\99_PROJ\1530908_PWGSC_Dew_Line_Mon_Program_2015_2018\40_PROD\0007_Fox_5_Field_Summary_Report_2016\ | File Name: i1530908-0007-CM-0001.dwg

2.2 Site Geology, Hydrogeology and Hydrology

The terrain is characterized by rolling hills on a high central plateau. A few small lakes are present on the island and small braided streams are found in the gentler grades of the valley bottoms. The surficial materials include marine sediments in lower-lying coastal regions, glacial till deposits in broad U-shaped valleys in the island interior, and boulder covered uplands in the Station Area.

The groundwater flow processes at the site are expected to be significantly influenced by the presence of continuous permafrost. Annual active thaw layers are typically limited to a few metres below ground surface, depending on ground cover, soil materials and surface water features. Shallow groundwater representing meltwater (both surficial and within the active layer) and infiltration from precipitation during the summer thaw is perched within the active layer during the short summer season. Movement of the groundwater is dictated by soil type, presence of shallow permafrost and hydraulic pressures resulting from topographic differences and distribution (elevation) of the water within the soils. Water elevations are only measured at some wells, and therefore the use of terms upgradient or downgradient may not be truly reflective of the actual flow direction. Nevertheless, for the purposes of this report, the terms upgradient and downgradient as they refer to the locations of the monitoring locations are used to maintain consistency with previous monitoring reports.

The peak elevation in the area of the Station Area Non-Hazardous Waste Landfill is approximately 572 masl; the elevation in the area of the Main Landfill is approximately 510 masl. These landfills are both located near the top of a ridge leading to a steep slope which extends to Davis Strait. The Main Landfill is notably located immediately adjacent to the ridge.

Based on the local topography, surface water at the Middle Site Landfill is expected to drain to the southwest towards a small stream located approximately 2.5 km from the landfill, and then west into Broughton Channel. Surface water at the Main and Station Area Non-Hazardous Landfills drains to the northeast into Davis Strait. It is noted that a number of erosion channels are present in the area of the Main Landfill, leading directly onto the nearby slope.

2.3 Land-Use Description

In the 1950s, DEW Line sites were constructed across a number of locations in the northern parts of Alaska, Canada and Greenland, between latitudes 65 and 70 degrees to maintain surveillance of the North American Airspace. In 1963, improvements in surveillance technology led to the closure of most of the DEW Line sites and their replacement with the NWS. Since the 1990s, investigations, decommissioning, and clean-up activities have been undertaken at the DEW line sites. Clean-up and decommissioning activities involved the demolition of surplus buildings and structures, excavation of contaminated soils, and the regrading of existing landfills. New engineered landfills were also constructed for the disposal of excavated soils and building materials.

Landfills at DEW Line sites can be categorized as follows:

- **Re-graded:** Existing landfills that were re-graded and capped with gravel;
- **Leachate Contained:** Existing landfills that were capped with gravel and provided with an impermeable membrane keyed into the permafrost (either only on the sides or over the entire surface), to contain leachate;
- **New NH:** New non-hazardous waste landfills; and,

- **New Tier II:** New Tier II disposal facilities (used for the disposal of Tier II soils as described by the DEW Line Cleanup Criteria) have impermeable liners below and above the contaminated soil to encapsulate the contents and contain the leachate. Tier II landfills are designed with a saturated granular perimeter berm keyed into the permafrost and sufficient cover of granular material to promote permafrost aggradation into the landfilled materials.

The three landfills in the monitoring program at FOX-5 fall into the following categories:

- Middle Site Non-Hazardous Waste Landfill Tier II Disposal Facility (new NH and Tier II);
- Main Landfill (leachate contained); and,
- Station Area Non-Hazardous Waste Landfill (new NH).

There is an airstrip and beach landing area both located adjacent to the Hamlet of Qikiqtarjuaq that provide air transportation and marine shipping access for ongoing NWS operations and long-term monitoring.

2.4 Field Program Staff and Schedule

Table 2-1 presents a list of field personnel, roles, responsibilities and dates for the FOX-5 2016 monitoring program.

Table 2-1: Field Personnel and Roles

Name (Affiliation)	Role / Responsibility	Site	Date
Darrin Johnson (Golder)	Field Geotechnical Lead / Inspections	FOX-5	August 6-8, 2016
Kevin Rattray (Golder)	Field Environmental Lead / Soil and Water Sampling	FOX-5	August 6-8, 2016
JoAnne Bisson (Golder)	Environmental Field Technician / Soil and Water Sampling	FOX-5	August 6-8, 2016
Jaypootie Moesesie (Inuit Subcontractor)	Wildlife Monitor	FOX-5	August 6-8, 2016
Jeremiah Toomasie (Inuit Subcontractor)	Wildlife Monitor	FOX-5	August 6-8, 2016
Tony Atsanik (Inuit Subcontractor)	Environmental Assistant/ Soil and Water Sampling	FOX-5	August 8, 2016
Ricky Nookiguak (Inuit Subcontractor)	Environmental Assistant/ Soil and Water Sampling	FOX-5	August 6-8, 2016

2.5 Weather Conditions

Table 2-2 presents a summary of weather conditions on each day of the FOX-5 monitoring program.

Table 2-2: Summary of Weather Conditions

Date	Weather
August 6	Cloudy, 4-9 degrees Celsius
August 7	Cloudy, 3-5 degrees Celsius
August 8	Cloudy, 2-4 degrees Celsius

2.6 Project References

Canadian Council of Ministers of the Environment (CCME, 1993). "*Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites – Volumes I and II, Main Report and Analytical Methods*".

Department of National Defence (DND, 2015). "*Terms of Reference, DEW Line Monitoring Program CAM-5, FOX-M, 2, 3, 4, 5, DYE-M*", QIKIQ15 Contract, April 2015.

Golder Associates Ltd. (Golder, 2015), "Solicitation No. W6837-151002/A Baffin Region Dew Line Sites Monitoring Program", Report P1530908, dated June 16, 2015.

Golder Associates Ltd. (Golder, 2016a). "*Baffin Region DEW Line Site Monitoring Health Safety and Environment Plan*", Report 1530908-2000-V2, dated July 25, 2016.

Golder Associates Ltd. (Golder, 2016b), "*2016 Landfill Monitoring Program for QIKIQ15 Contract: Logistics and Work Plan*", Report 1530908-2000-R1-V2, dated July 25, 2016.

Golder Associates Ltd. (Golder, 2016c). "*2016 Baffin Region DEW Line Site Landfill Monitoring Field Work Progress Report*", Report 1530908-2000-R2-V2, dated October 7, 2016.

2.7 Report Structure

This report describes the monitoring program carried out in August 2016 at FOX-5. Results from visual inspection activities, thermal monitoring, soil sampling and groundwater sampling are presented in accordance with the TOR.

Each of the landfills is described in separate sub-sections (Sections 4.1 to 4.3). Each section contains the following 2016 monitoring information:

- Scope deviations summary;
- Visual Inspection Checklist;
- Preliminary Stability Assessment Table;
- Table of visual inspection photographs;
- Landfill plan with photograph locations and observed features;
- Summary of thermal monitoring (if applicable for landfill);
- Summary of soil sampling analytical results;
- Summary of groundwater sampling analytical results (if applicable for landfill); and,
- Discussion of overall landfill performance based on available monitoring data.

Appendix A provides a Limitation of Responsibilities and forms part of the report. Thermal and groundwater monitoring field record sheets are included in Appendix B. Laboratory certificates of analysis, historical landfill monitoring results and QA/QC Reports are included in Appendix C. A photographic log is included in Appendix D. An electronic version of the report, tables, figures, full resolution photos and laboratory certificates of analysis is saved on a DVD-ROM, which is appended to the hardcopy of the report.

3.0 APPROACH & METHODOLOGY (GENERAL)

3.1 Summary of Work

3.1.1 Health and Safety

Golder developed a Health, Safety and Environment Plan (Golder, 2016b) for the QIKIQ15 field program, which describes potential hazards, risks and proposed mitigation measures. Unique health and safety risks included the potential for wildlife encounters, travel by air in light planes and on ATVs, long distances to the nearest emergency health care facilities and variable weather conditions. In addition, Golder developed a Logistics and Work Plan (Golder, 2016c) for the field program that contained the detailed schedule and travel plans, contact information, accommodation details, transportation, communications, field equipment and sampling protocols.

3.1.2 Field Program

Table 3-1 provides a summary of the monitoring schedule for the seven DEW Line sites that are part of the QIKIQ15 Project. FOX-5 was last monitored in 2014 (Year 8 post-remediation) and is not scheduled to be monitored again until 2021 (Year 15 post-remediation). The 2016 field monitoring program consisted of the following activities:

- Visual inspection (of three landfills) including photographic documentation of observed conditions;
- Thermal monitoring (i.e., datalogger downloading at landfills with thermistors) and datalogger reprogramming;
- Soil sampling; and,
- Groundwater sampling (at landfills with monitoring wells).

Table 3-2 provides a summary of monitoring activities by landfill.

Table 3-1: Summary of QIKIQ15 Project Monitoring Schedule

DEW Line Site	Year			
	2015	2016	2017	2018
CAM-5 Mackar Inlet	Year 5		Year 7	
FOX-M Hall Beach			Year 10	
FOX-2 Longstaff Bluff	Year 4	Year 5		Year 7
FOX-3 Dewar Lakes	Year 4[a]	Year 5[a]		Year 7
FOX-4 Cape Hooper		Year 18		Year 20
FOX-5 Broughton Island		Year 10		
DYE-M Cape Dyer	Year 2	Year 3	Year 4	Year 5

Legend	
	Phase I Monitoring
	Phase II Monitoring

Note:

a) At FOX-3 in 2015 and 2016 (Years 4 and 5) – Complete a geotechnical inspection of the thermokarst regrade.

Table 3-2: Summary of Monitoring Requirements for Landfills at FOX-5

Landfill Designation	Type of Landfill	Visual Inspection	Soil Sampling[(a)]	Groundwater Sampling	Thermal Monitoring	
		✓ = yes	Locations x Samples	# of Monitoring Wells	# of Thermistors	Change batteries & re-program[(c)]
FOX-5 Broughton Island						
Middle Site Non-Hazardous Waste Landfill & Tier II Disposal Facility	New NH and Tier II	✓	5 X 2	5	4 [see note (b)]	Yr. 10 re-program datalogger
Main Landfill	Leachate contained	✓	5 X 2	5	8	Yr. 10 re-program datalogger
Station Area Non-Hazardous Waste Landfill	New NH	✓	5 X 2	5	-	-
	TOTAL	***3***	***30***	***15***	***12***	-

Notes:

a) (# x #) Indicates the number of sampling points at each landfill. Samples are collected from two depths at each sampling point; from 0-15 cm and from 40-50 cm (or at refusal).

b) Reinstall datalogger VT-12 at FOX-5 Middle Site in 2016.

c) Re-program dataloggers at FOX-5 in 2016.

3.1.3 Visual Inspection

At each of the FOX-5 landfill locations, a visual inspection was conducted to observe whether there were any visual signs of erosion, cracking, seepage, ponded water, stressed vegetation (potentially caused by the landfill) and for physical stability. Photographic records of the landfills were taken to document the observed conditions and other notable features. Northing and Easting coordinates were recorded for all photograph and feature locations using a Garmin GLO portable GPS receiver (2-5 m accuracy) with Bluetooth connection to a field tablet. It should be noted that there are some minor discrepancies between previously reported feature locations (that were referenced with a local coordinate system) and the 2016 visual inspection feature locations reported herein (that were referenced with UTM coordinates).

Visual inspection information was used to complete a Preliminary Stability Assessment for each landfill. Each observed feature was assigned a Severity Rating (Acceptable, Marginal, Significant or Unacceptable) and Extent (Isolated, Occasional, Numerous or Extensive) and then the landfill was assigned an overall Performance Rating (Acceptable, Marginal, Significant or Unacceptable). If a type of feature was not observed during the inspection, then the Severity Rating was reported as “Not Observed” in the Preliminary Stability Assessment. Definitions of these terms are as follows:

Feature Severity Rating / Landfill Performance Rating	Description
Not Observed	This type of feature was not observed at the landfill during the inspection.
Acceptable	Noted features are of little consequence. The landfill is performing as designed. Minor deviations in environmental or physical performance may be observed, such as isolated areas of erosion, settlement.
Marginal	Physical/environmental performance appears to be deteriorating with time. Observations may include an increase in size or number of features of note, such as differential settlement, erosion or cracking. No significant impact on landfill stability to date, but potential for failure is assessed as low or moderate.
Significant	Significant or potentially significant changes affecting landfill stability, such as significant changes in slope geometry, significant erosion or differential settlement; scarp development. The potential for failure is assessed as imminent.
Unacceptable	Stability of landfill is compromised to the extent that ability to contain waste materials is compromised. Examples may include: • Debris exposed in erosion channels or areas of differential settlement. • Liner exposed. • Slope failure.

Extent	Description
Isolated	Singular feature
Occasional	Features of note occurring at irregular intervals/locations
Numerous	Many features of note, impacting less than 50% of the surface area of the landfill
Extensive	Impacting greater than 50% of the surface area of the landfill

3.1.4 Thermal Monitoring

The landfills that require leachate containment (e.g., Tier II Disposal Facility and Leachate Contained) and rely on permafrost aggradation incorporate ground temperature monitoring systems with vertical thermistor strings that measure temperature at various depths and automated dataloggers that allow for data collection. The data recorded on the dataloggers was downloaded using a laptop computer and Prolog software from Lakewood Systems Ltd. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

At the FOX-5 site, thermistors and data loggers are installed at the Middle Site NHWL/Tier II Disposal Facility and the Main Landfill. All thermistor dataloggers were downloaded and then reprogrammed according to the instructions received from DND. The dataloggers were programmed with a 24 hour sampling frequency because we were unable to program the dataloggers with a 48 hour sampling rate as requested. Datalogger memory was approximately 80% full prior to reprogramming and reset to 0% (i.e., empty memory) after

reprogramming providing memory capacity for ongoing data collection. The VT-12 datalogger was reinstalled at the Middle Site NHWL/Tier II Disposal Facility with new ULB1 and ULB15 batteries.

3.1.5 Soil Sampling

Soil samples were collected in accordance with the TOR, the Golder Proposal, Logistics and Work Plan and Canadian Council of Ministers of the Environment (CCME) Guidance Manual on Sampling, Analysis and Data Management for Contaminated Sites – Volumes I and II, Main Report and Analytical Methods (CCME, 1993). Soil sampling procedures of note are as follows (deviations from the TOR are noted *in italics*):

- Soil samples were collected within 2 to 4 metres of monitoring wells (where applicable). Where there was no corresponding monitoring well soil samples were collected within 2 to 4 metres of previous sample locations. Previous consultants left pins and tags in the ground to indicate where they sampled soil. Golder sampled away from those locations and did not leave pins in the ground.
- Coordinates of the 2016 soil sampling locations were recorded using a field tablet equipped with a Garmin GPS and confirmed to be consistent with previous/required sampling locations prior to sampling.
- Test pits were dug with a shovel that was washed between sample locations. The shovel was decontaminated with soap and water, methyl hydrate and rinsed with distilled water before each use. Soil samples were collected by hand using a single-use disposable nitrile glove and placed into new/clean glass sample jars provided by the laboratory that were labelled with the sample location ID and depth.
- Soil samples were generally collected at 0 to 15 centimetres (cm) depth and at 40 to 50 cm depth at the locations in accordance with the TOR. *At some locations, the sample collection depth was adjusted where soil was frozen or refusal on rock was encountered. Where refusal on a large rock(s) was encountered near surface, the sampling location was moved slightly to avoid the large rock(s). When rocks were encountered prior to reaching the target sampling depth, the test pit was enlarged and the rock(s) were excavated if possible. If the specified sampling depth could not be reached after expending reasonable effort to enlarge the hole in an attempt to remove rock(s), a sample was collected at or near the zone of refusal (in accordance with the TOR). If refusal was encountered after the shallow soil sample depth and even with additional effort it was not possible to remove the rock(s) causing refusal, then only one soil sample was collected at that location (noted as "refusal" in summary tables below).*
- *At locations where the ground was covered with snow and ice, excavation of the snow was attempted but, in general, it was impossible to dig through the ice and frozen ground beneath the snow and soil samples were not collected (noted as "frozen" in summary tables below).*
- Inter-lab field duplicates were collected for approximately 10% of the total soil samples collected. The field duplicates were collected from relatively homogenous soil material *in the test pit*, such that the composition of the samples was the same and to minimize escape of volatile compounds.
- In order to assess the effectiveness of decontamination of the shovel used for soil sampling, an equipment rinsate (equipment blank) sample was completed following a typical decontamination procedure. This was conducted during sampling of the FOX-4 landfill, by pouring distilled water over the decontaminated shovel and capturing it in water sample bottles.

3.1.6 Groundwater Sampling

Groundwater samples were collected in accordance with the TOR, the Golder Proposal, Logistics and Work Plan and CCME (1993). Groundwater sampling procedures of note are as follows (*deviations in italics*):

- Water levels in the wells were measured with an interface probe that was decontaminated with soap and water, methyl hydrate and rinsed with distilled water before each use.
- *At monitoring well locations where there was snow on the ground surrounding the well and no measurable water level or water that could be pumped with the peristaltic pump, water samples were not collected (noted as "frozen" in the summary tables below).*
- *At monitoring well locations that had no measurable water level or water that could be pumped with the peristaltic pump, water samples were not collected (noted as "dry" in summary tables below).*
- *In wells with limited water depth and/or slow recharge, purging was only carried out until the field parameters were observed to stabilize* and then sampling was commenced in the priority order outlined in the TOR. *The number of water sample bottles collected and parameters that could not be analysed are listed in footnotes following the respective summary tables below.*
- Purging and sampling was carried out using a peristaltic pump and a low-flow purge rate of less than 100 mL/min was maintained. Peristaltic pump flexible tubing and nylon tubing extending down the well was single-use and disposed after use at each well (not reused). Sample tubing was removed from the wells after completion of the sampling event and disposed.
- Groundwater samples were pumped directly from the well into analysis-specific bottles provided by the laboratory that were labelled with the sample location ID. Groundwater samples were not field filtered and were not field-acidified or preserved (in accordance with the TOR).
- Where groundwater was insufficient, sampling was prioritized in the following order:
  - Petroleum hydrocarbons: F1 fraction;
  - Inorganic elements – total concentrations: arsenic, cadmium, chromium, cobalt, copper, lead, nickel, zinc and mercury. Samples were not filtered (which is why low turbidity is so important) or preserved;
  - Petroleum hydrocarbons: F2, F3 and F4 fractions; and,
  - PCBs (polychlorinated biphenyls – Total Aroclor analysis).
- Inter-lab duplicates were collected for 10% of the total groundwater samples collected.
- A field blank was filled in the field with distilled water and analyzed for all parameters.
- A travel blank of laboratory prepared water accompanied the sampling containers for the whole duration of the program, and analyzed for the entire suite of parameters.
- In order to assess the effectiveness of decontamination of the groundwater level / interface probe, an equipment rinsate (equipment blank) sample was completed following a typical decontamination procedure. This was conducted during sampling of the FOX-2 landfill, by pouring distilled water over the decontaminated probe and capturing it in water sample bottles.
- No equipment blanks were required for the sample collection tubing as new tubing was used at each sampling location.

3.2 Field Notes and Data

Visual inspection photographs, features, locations and notes were recorded in the field with a tablet computer equipped with a camera and Global Positioning System (GPS). Field data and photographs from the tablet were uploaded to an online Geographic Information System (GIS) database that was used to generate the photograph log and figures presented in this report.

Thermistor inspection and monitoring data was recorded on field record sheets included in Appendix B. Thermistor locations were recorded with either the field tablet or a hand-held GPS. The angle of inclined thermistor protective casings above ground surface at the Main Landfill were measured and recorded.

Soil sampling locations were photographed before test pit excavation, at the maximum depth of the test pit excavation and after backfilling. Soil sampling locations were recorded with either the field tablet or a hand-held GPS.

Groundwater monitoring data was recorded on field record sheets included in Appendix B. Monitoring well locations were recorded with either the field tablet or a hand-held GPS.

3.3 QA/QC

Quality Assurance (QA) is the system of validation checks performed to measure quality in order to determine if the quality objectives have been met. Quality control (QC) is the set of procedures which are incorporated into the project's standard operating procedures to ensure that it achieves its quality objectives.

The QC procedures incorporated into the monitoring program carried out at FOX-5 included:

- Using only ISO 17025 certified environmental labs to perform the soil and groundwater analyses. Golder used Paracel Laboratories Ltd. (Paracel) of Ottawa as the primary lab and AGAT Environmental (AGAT) of Mississauga for the duplicate samples. Both of these laboratories are ISO 17025 certified for the analyses performed. The laboratories also exchanged their "Standard Methods" for the analyses in the program to harmonize their procedures for the duplicate analysis;
- The field sampling for soil and groundwater was completed by a two-person team, which helped to ensure that all of the sampling and field identification procedures were followed in order;
- Duplicate soil samples were collected from relatively homogenous soil material *in the test pit*, such that the composition of the samples was the same and to minimize escape of petroleum hydrocarbon (F1 fraction) compounds;
- Duplicate groundwater samples were prepared by alternately filling bottles for each lab for each parameter type; the yield of the wells in some cases prevented filling the whole suite of sample bottles;
- To minimize the possibility of cross contamination, soil samples were collected directly from the test pits with nitrile gloved hands, at the designated depth intervals, and placed into lab-supplied sample jars leaving no headspace. New gloves were used for each sample. The shovel and trowel used to open the test pits were cleaned manually then rinsed with methyl-hydrate and distilled water;

- To minimize the risk of cross-contamination, groundwater samples were pumped from the monitoring wells using dedicated tubing inserted into the well and another dedicated length of tubing between the rollers in the peristaltic pump. Staff holding the sample bottles wore nitrile gloves. Samples were labelled at the monitoring well with identification, time and date;
- Groundwater samples were neither filtered nor preserved in the field. The low-flow sampling technique was employed to minimize the presence of sediment in the water sample;
- Soil samples were not preserved in the field;
- To minimize the time delay from actual sample collection to receipt at the lab, Golder sent coolers from the site to the staging point every time a resupply flight occurred. From the staging point communities, the coolers were sent via First Air to Ottawa Airport where Golder picked them up and took them to Golder's office in Ottawa, where they were checked for breakage, legibility of the labels and accuracy and completeness of the chain of custody. After being checked in Ottawa, the samples were dispatched to the primary and duplicate labs. The maximum allowable hold times for samples were largely met; where they were exceeded, it was due to the logistical limitations of flying in and out of the sites and the long chain of transport from the staging points to the labs.

QA was measured by the duplicate analysis and review of the QA/QC data contained in each laboratory certificate of results. In addition to the duplicate analyses, a field blank (consisting of bottles filled with distilled water in the field) was submitted to Paracel for analysis of all specified parameters. Trip blanks consisted of bottles filled with distilled water and sealed at the laboratory. A trip blank was brought to the field for the overall 2016 program and back, then submitted to Paracel for analysis of all specified parameters.

The soil samples and groundwater samples were collected with only dedicated single-use equipment. The water sampling tubing was single-use from the well to sample bottle, and soil samples were collected from the test pits into sample jars using single-use gloves. This was possible because the texture of the soil samples was generally loose sandy soil. Nevertheless, equipment blanks were prepared for each type of sample. For groundwater sampling, the equipment blank was a sample of water poured over the water level probe, after it had been washed off, and for soil sampling it was a sample of water poured over the trowel after it had been washed between samples.

A discussion of the QA/QC results is provided in Section 5.

4.0 2016 MONITORING PROGRAM RESULTS

Photographs 1 through 159 (in Appendix D) document the observed conditions during the visual inspection including features on the cover/toe of the landfills, the groundwater monitoring wells, soil sample locations before excavation, after excavation and after backfilling as well as the condition of thermistors. The photographs taken at each of the landfill sites to document the observed conditions are organized as follows:

- **Middle Site Non-Hazardous Waste Landfill and Tier II Disposal Facility –** Photographs 1 through 63;
- **Main Landfill** – Photographs 64 through 109; and,
- **Station Area Non-Hazardous Waste Landfill –** Photographs 110 through 159.

A complete log of all photographs is included in Appendix D. Copies of all digital photograph files are included on a DVD attached to this report. Visual inspection photographs are identified by an "ATT number" in the file name which are noted in brackets in the visual inspection photograph log tables.

Many of the acceptable features observed during the inspection do not appear to be related to landfill performance. For example, shallow depressions that appear to be unchanged since construction of the landfill (i.e., as-built condition) or minor hydrocarbon staining from post-construction anthropogenic activities (e.g., ATV use). These acceptable features that do not appear to be related to landfill performance have been reported as "*not a concern*". Self-armouring erosion, minor water ponding and seepage without staining have also been reported as "*not a concern*" because they are not indicative of deteriorating landfill performance and/or may be weather related. In addition, some minor cracking that appears to be related to thaw creep does not indicate slope instability and is not considered to be a concern at the present time. Significant features that are related to landfill performance have been photographed and described in detail.

The monitoring program results are listed for each landfill in the sections below. In the tables, data which exceed the arithmetic mean background data and baseline arithmetic mean are identified by <u>underlined</u> and **bold** fonts, respectively. The background arithmetic mean limits for each landfill have been previously established using the arithmetic mean concentrations for soil samples collected outside of area of the landfills in 1984 and 1990. The baseline arithmetic mean limits were calculated were based on the concentrations for soil samples collected at each of the current soil sampling locations of area adjacent to the landfills, between 1998 and 2006. Soil and groundwater quality data are also compared to the baseline concentration plus three standard deviations (3σ) and exceedances are shaded. This limit is based on the "three-sigma rule of thumb", wherein it is expected that nearly all values lie within three standard deviations of the arithmetic mean.

A modified total petroleum hydrocarbons (TPH) value, calculated as the sum of the PHC F1, F2 and F3 fractions, is discussed throughout this report to allow for comparison to TPH baseline data.

Historical soil and groundwater results and charts are included in Appendix C. It should be noted that there are discrepancies in the highlighting of baseline and background arithmetic mean exceedances between the 2016 soil and groundwater data summary tables within the body of the report and the historical chemistry tables in Appendix C; exceedances noted in the data tables within the body of the report are considered the correct interpretation of the 2016 results. Discussion of the 2016 data in this report focused on identifying trends, as well as identifying data results for locations where concentrations significantly different (typically greater) than previous years are observed, or locations where concentrations exceeded the baseline concentration plus 3σ.

Duplicate soil samples were collected at two locations at FOX-5. This included the deep MW-7 (40-50 cm) and shallow MW-18 (0-15 cm) sample locations at the Middle Site NHWL and Tier II Disposal Facility and Station Area Main Landfill, respectively. A duplicate groundwater sample was also collected at monitoring well MW-5 located at the Middle Site NHWL and Tier II Disposal Facility. For these duplicate sample locations, the average of the two concentrations are presented in the tables and used to discuss in the results in Section 4. The reproducibility of the duplicate sample results is discussed in Section 5.

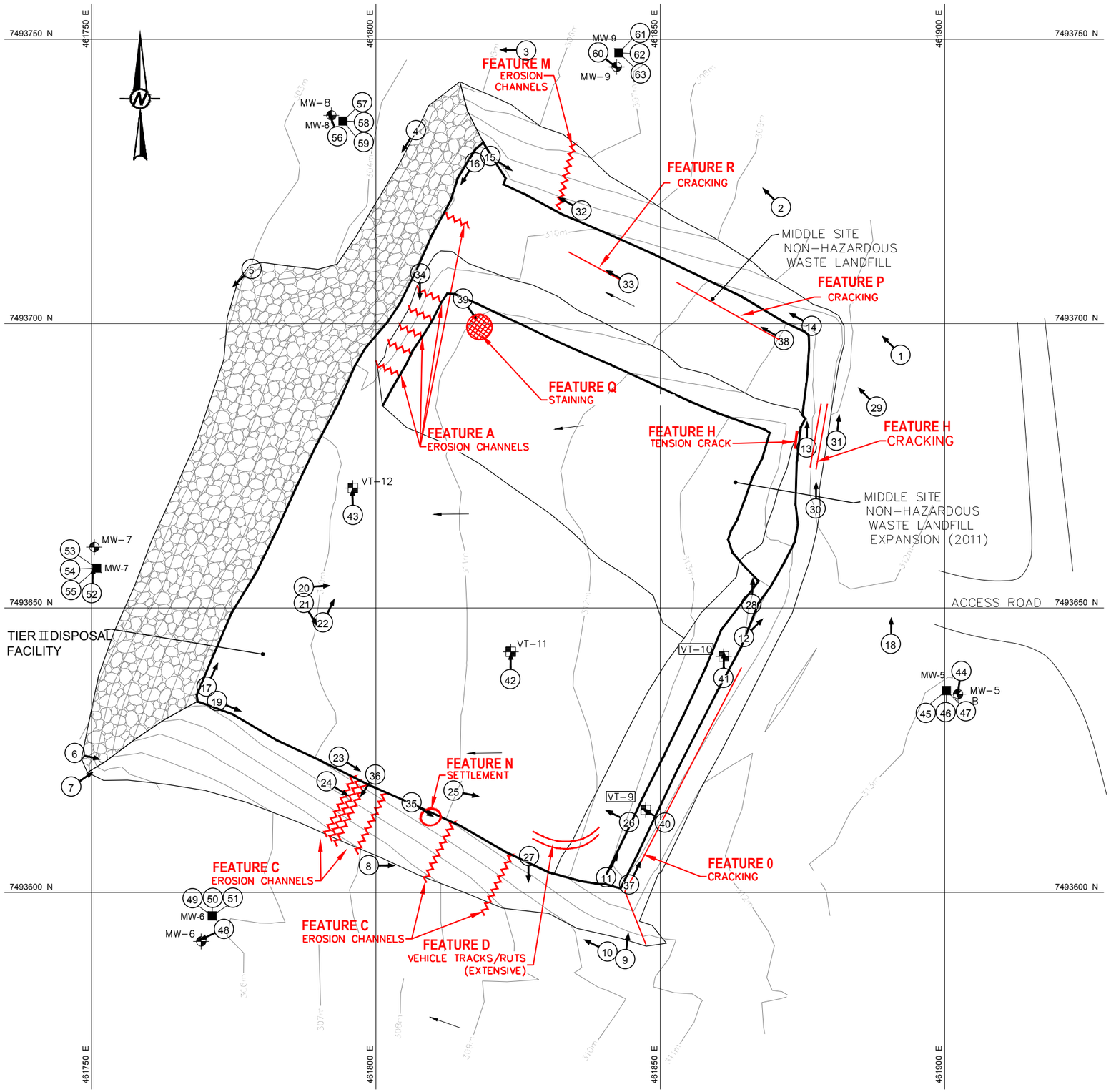
4.1 Middle Site Non-Hazardous Waste Landfill and Tier II Disposal Facility

4.1.1 Landfill Description

The Middle Site Non-Hazardous Waste Landfill (NHWL) and Tier II Disposal Facility is located west of the road between the station and the community of Qikiqtarjuaq, at a distance of approximately 5.5 km from the community of Qikiqtarjuaq. The landfill is located approximately 40 m from the road, as illustrated on Figure FOX-5.2. Local grades range from 312 masl to the east near the road, to 303 masl to the northwest, at the toe of the landfill slope. Surface water drainage from the area is generally to the northeast.

The conjoined facility was constructed to contain non-hazardous waste derived from demolition and surface debris pickup and also to dispose of Tier II contaminated soil. The landfill was constructed with two separate cells, based on differing containment requirements. The non-hazardous landfill is located to the northeast, whereas the Tier II landfill is located to the southwest. The non-hazardous waste cell construction included compacted perimeter berms and the placement of a compacted granular fill cover over the landfilled material. The Tier II cell construction consisted of the placement of saturated and compacted low-permeability soil berms, the installation of a liner system over the berms and along the landfill base and the placement of a surface liner system over the landfill contents, followed by the placement of overlying sufficient granular fill to promote freeze-back of the landfilled waste. The combined landfill cells have an area of approximately 12,750 m^2, including the side slopes. Five groundwater monitoring wells were installed around the landfill perimeter (MW-5 through MW-9), and four thermistors were installed within the Tier II Disposal Facility (VT-9 through VT-12).

The long term monitoring plan at this landfill site consists of visual monitoring, the collection of soil and groundwater samples, and monitoring of subsurface ground temperatures of the landfill. There are five soil and groundwater monitoring locations, MW-5 through MW-9 at this landfill. Approximate locations for the collection of soil and groundwater samples, and thermistor installation locations are identified on Figure FOX-5.2.



LEGEND:

- TIRE TRACKS (NTS)
- CRACKING
- EROSION (NTS)
- STAINING (NTS)
- SETTLEMENT
- SOIL SAMPLE LOCATION
- PHOTOGRAPH VIEWPOINT
- MONITORING WELL LOCATION
- VERTICAL GROUND TEMPERATURE CABLE LOCATION
- RIP RAP
- CONTOURS IN 0.5m INTERVALS
- OVERLAND FLOW DIRECTION

NOTES:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 20N. PREVIOUS INSPECTION FIGURES PROVIDED BY SENES WERE IN A LOCAL COORDINATE SYSTEM AND HAVE BEEN MOVED TO NAD83 (CSRS), UTM ZONE 19N BASED ON GPS POSITIONING OF FEATURES LOCATED BY GOLDER IN 2016.
2. ALL ELEVATIONS REFER TO LOCAL DATUM.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE

PREVIOUS INSPECTION FIGURES FROM SENES CONSULTANTS, PROJECT NO. 350600-515-2, 2014 DEW LINE MONITORING PROGRAM, DATED FEB. 2015

0 12.5 25
1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-5 MONITORING REPORT

TITLE
MIDDLE SITE AREA
NON-HAZARDOUS WASTE LANDFILL
AND TIER II DISPOSAL FACILITY

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-11-07
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-5.2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada\99_PRO\1530908_PWGSC_Dew_Line_Mon_Program_2015_2018\40_PROD\0007_Fox_5_Field_Summary_Report_2016\ | File Name: 1530908-0007-CM-0002.dwg

4.1.2 Visual Inspection

The Middle Site NHWL and Tier II Disposal Facility has exhibited some minor settlement, erosion, cracking and staining features. The landfill does not exhibit any observed exposed waste or indications of slope instability. Table 4-1 presents a summary of observed visual inspection features and Table 4-2 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable.” Table 4-3 is a log of photographs taken during the 2016 visual inspection.

Cracking has been observed on the northeast slope, north crest and southeast slope. Previously observed cracking on the northeast slope (previous Feature H) consists of many small parallel cracks that are likely caused by thaw creep. The observed tension cracks along the north crest edge (new Feature R and new Feature P) are both quite weathered and there are no other indications of slope movement so they are not considered to be of concern. Previously observed tension crack (Feature L) on the north slope was not observed in 2016. The thin tension cracks observed on the southeast crest and slope (new Feature O) are likely caused by thaw creep and there are no other indications of slope movement so they are not considered a concern. All of the observed cracking is assessed as “Acceptable” and not considered to be of concern.

Some previously observed minor self-armouring erosion is still evident on the west, south and north slopes (Features A, C and M) that does not appear to have changed from the last inspection in 2014 and is not considered to be of concern. Previously reported settlement on the southeast slope (Feature E) was observed to be an area of rough grading during the 2016 visual inspection and is not considered settlement. The other previously observed area of minor settlement on the south crest surface (Feature N) is shallow and not considered to be a concern.

There is a small hydrocarbon stain on the northwest crest surface (Feature Q) that appears to be caused by a post-construction motorized vehicle fuel spill and is not related to landfill performance. Previously observed tire tracks on the majority of the landfill crest and slopes (Feature D) have not caused any erosion of the granular cover material. Previously observed ponded water on the crest surface (Feature B) was not observed during the 2016 visual inspection.

Previously observed erosion channels (Features F and I) and the minor settlement (Feature E) on the east slope were not observed in 2016. Previously observed natural staining (Feature G) was not observed in 2016 and may have been moisture (Photo 28). Previously observed minor settlement (Features J and K) on the north slope were not observed in 2016.

Table 4-1: Visual Inspection Checklist – Middle Site

SITE NAME: FOX-5 Broughton Island
LANDFILL DESIGNATION: Middle Site Non-Hazardous Waste Landfill and Tier II Disposal Facility
DATE OF INSPECTION: August 7, 2016
DATE OF PREVIOUS INSPECTION: August 9, 2014
INSPECTED BY: Darrin Johnson
REPORT PREPARED BY: Darrin Johnson
MONITORING EVENT NUMBER: 7
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-1: Visual Inspection Checklist – Middle Site NHWL and Tier II Disposal Facility

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description	Comparison to Historical Observations	Photos
Settlement	Y	E	Southeast slope	-	-	-	-	-	-	Rough grading previously described as settlement	Not observed in 2016	9
		N	South crest	461802.3	7493620.0	0.5	0.5	0.1	0.002%	Minor settlement (Acceptable)	Previously observed, no change	35
Erosion	Y	A	West slope	461807.8	7493708.8	20	10	0.10	1.6%	Self- armouring erosion channels (Acceptable)	Previously observed, no change	34
		C	South slope	461774.2	7493633.6	10	30	0.1	2.3%	Self- armouring erosion channels (Acceptable)	Previously observed, no change	23, 24, 36
		M	North slope	461836.1	7493719.9	10	5	0.1	0.4%	Self- armouring erosion (Acceptable)	Previously observed, no change	32
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	Y	H	Northeast slope	461877.3	7493667.5	10	5	0.05	0.4%	Parallel cracking (Acceptable)	Previously observed, no change	30
		R	North crest 5 m from edge	461844.4	7493707.1	10	0.05	0.02	0.004%	Weathered tension crack (Acceptable)	New	33
		O	Southeast slope at corner and along crest edge	461844.5	7493601.4	50	0.01	0.01	0.004%	Thin tension crack (Acceptable)	New	37
		P	Northeast crest 4 m from edge	461871.7	7493697.1	20	0.01	0.01	0.002%	Weathered tension crack (Acceptable)	New	38

Table 4-1: Visual Inspection Checklist – Middle Site NHWL and Tier II Disposal Facility

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description	Comparison to Historical Observations	Photos
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	N	-	-	-	-	-	-	-	-	-	-	-
Staining	Y	Q	Northwest crest surface	461815.3	7493704.4	1	0.30	-	0.002%	Hydrocarbon staining from fuel spill (Acceptable)	New	39
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-
Seepage or Ponded Water	N	B	Crest surface	461799.1	7493634.5	-	-	-	-	Ponded water	Not observed in 2016	20
Debris and/or Liner Exposed	N	-	-	-	-	-	-	-	-	-	-	-
Presence / Condition of Monitoring Instruments	Y	VT-9 to 12 MW-5 to 9	-	-	-	-	-	-	-	Thermistor and monitoring well casings intact	-	40-44, 48, 52, 56, 60
Features of Note / Other Observations	Y	D	Crest and slope surfaces	461813.6	7493617.9	100	50	0.01	39%	Tire tracks from trucks, quads, and dirt bikes (Acceptable)	Previously observed, no change	25

Landfill Area = 12,750 m^2

Table 4-2: Preliminary Stability Assessment – Middle Site NHWL and Tier II Disposal Facility

Feature	Severity Rating	Extent
Settlement	Acceptable	Isolated
Erosion	Acceptable	Occasional
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Acceptable	Occasional
Animal Burrows	Not observed	-
Vegetation Establishment	Not observed	-
Staining	Acceptable	Isolated
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Not observed	-
Other	Acceptable	Numerous
Overall Landfill Performance	**Acceptable**	

Table 4-3: Summary Table of Photographic Log – Middle Site NHWL and Tier II Disposal Facility

Photo	Description (file name)	Easting	Northing	Date
1	FOX 5 – Middle Site NHWL / Tier II DF – East corner facing northwest (ATT3_Photo3.jpg)	461892.2	7493694.5	7-Aug-2016
2	FOX 5 – Middle Site NHWL / Tier II DF - North toe facing northwest (ATT4_Photo4.jpg)	461871.2	7493720.5	7-Aug-2016
3	FOX 5 – Middle Site NHWL / Tier II DF - North toe facing west (ATT5_Photo5.jpg)	461826.4	7493748.0	7-Aug-2016
4	FOX 5 – Middle Site NHWL / Tier II DF - Northwest toe facing southwest (ATT6_Photo6.jpg)	461807.0	7493734.0	7-Aug-2016
5	FOX 5 – Middle Site NHWL / Tier II DF - West toe facing southwest (ATT7_Photo7.jpg)	461778.1	7493709.6	7-Aug-2016
6	FOX 5 – Middle Site NHWL / Tier II DF - Southwest toe facing east (ATT8_Photo8.jpg)	461747.0	7493624.5	7-Aug-2016
7	FOX 5 – Middle Site NHWL / Tier II DF - Southwest toe facing northeast (ATT9_Photo9.jpg)	461746.4	7493618.6	7-Aug-2016
8	FOX 5 – Middle Site NHWL / Tier II DF - South toe facing east (ATT10_Photo10.jpg)	461798.7	7493604.8	7-Aug-2016
9	FOX 5 – Middle Site NHWL / Tier II DF - Southeast toe facing north – Previously observed settlement (Feature E) likely just rough grading (ATT11_Photo11.jpg)	461843.8	7493588.3	7-Aug-2016

Table 4-3: Summary Table of Photographic Log – Middle Site NHWL and Tier II Disposal Facility

Photo	Description (file name)	Easting	Northing	Date
10	FOX 5 – Middle Site NHWL / Tier II DF - Southeast toe facing northwest (ATT12_Photo12.jpg)	461843.8	7493588.3	7-Aug-2016
11	FOX 5 – Middle Site NHWL / Tier II DF – Crest facing northeast towards VT-9 (ATT13_Photo13.jpg)	461843.8	7493601.5	7-Aug-2016
12	FOX 5 – Middle Site NHWL / Tier II DF - Crest facing northeast – Previously observed erosion channels (Feature F) were not observed in 2016 and could have been early self-armouring, north end of thin minor crack along crest edge (Feature O) (ATT14_Photo14.jpg)	461864.7	7493644.9	7-Aug-2016
13	FOX 5 – Middle Site NHWL / Tier II DF - Crest facing north – Previously observed natural staining (Feature G) was not observed in 2016 and could have been moisture (ATT15_Photo15.jpg)	461875.7	7493678.2	7-Aug-2016
14	FOX 5 – Middle Site NHWL / Tier II DF - Crest edge facing northwest – Previously observed settlement (Feature J) considered rough grading (ATT16_Photo16.jpg)	461876.6	7493699.6	7-Aug-2016
15	FOX 5 – Middle Site NHWL / Tier II DF - Crest edge facing southeast (ATT17_Photo17.jpg)	461820.0	7493729.9	7-Aug-2016
16	FOX 5 – Middle Site NHWL / Tier II DF - Crest edge facing southwest (ATT18_Photo18.jpg)	461820.0	7493730.0	7-Aug-2016
17	FOX 5 – Middle Site NHWL / Tier II DF - West crest edge facing northeast (ATT19_Photo19.jpg)	461771.0	7493635.4	7-Aug-2016
18	FOX 5 – Middle Site NHWL / Tier II DF – East toe facing north (ATT2_Photo2.jpg)	461890.5	7493643.7	7-Aug-2016
19	FOX 5 – Middle Site NHWL / Tier II DF - South crest edge facing southeast (ATT20_Photo20.jpg)	461770.9	7493635.6	7-Aug-2016
20	FOX 5 – Middle Site NHWL / Tier II DF - Crest surface facing east towards VT-11 - Previously ponded water (Feature B) not observed in 2016 (ATT21_Photo21.jpg)	461787.3	7493653.7	7-Aug-2016
21	FOX 5 – Middle Site NHWL / Tier II DF - Crest surface facing southeast towards VT-9 (ATT22_Photo22.jpg)	461787.3	7493653.7	7-Aug-2016
22	FOX 5 – Middle Site NHWL / Tier II DF - Crest surface facing northeast towards VT-12 (ATT23_Photo23.jpg)	461787.3	7493653.7	7-Aug-2016
23	FOX 5 – Middle Site NHWL / Tier II DF – South slope facing southeast – Feature C – Self-armouring erosion, multiple channels (Acceptable) (ATT43_Photo43.jpg)	461799.1	7493634.5	7-Aug-2016
24	FOX 5 – Middle Site NHWL / Tier II DF – South slope facing southeast – Feature C – Self-armouring erosion (Acceptable) (ATT42_Photo42.jpg)	461774.2	7493633.6	7-Aug-2016
25	FOX 5 – Middle Site NHWL / Tier II DF – Southeast crest surface facing southeast – Feature D – Vehicle tracks from trucks, quads and dirt bikes are present over most of the landfill surfaces (Acceptable) (ATT45_Photo45.jpg)	461813.6	7493617.9	7-Aug-2016

Table 4-3: Summary Table of Photographic Log – Middle Site NHWL and Tier II Disposal Facility

Photo	Description (file name)	Easting	Northing	Date
26	FOX 5 – Middle Site NHWL / Tier II DF – Crest surface facing northwest towards VT-11 (ATT48_Photo48.jpg)	461844.5	7493612.4	7-Aug-2016
27	FOX 5 – Middle Site NHWL / Tier II DF – Southeast corner facing southeast (ATT47_Photo47.jpg)	461826.9	7493606.4	7-Aug-2016
28	FOX 5 – Middle Site NHWL / Tier II DF – Northeast corner facing north – Previously observed natural staining (Feature G) not observed in 2016 may have been moisture (ATT50_Photo50.jpg)	461866.0	7493650.7	7-Aug-2016
29	FOX 5 – Middle Site NHWL / Tier II DF – Northeast toe facing northwest – Moist ground but no ponded water at toe (ATT53_Photo53.jpg)	461888.0	7493685.4	7-Aug-2016
30	FOX 5 – Middle Site NHWL / Tier II DF – Northeast slope facing north – Feature H – Parallel cracking on slope (Acceptable) (ATT52_Photo52.jpg)	461877.3	7493667.5	7-Aug-2016
31	FOX 5 – Middle Site NHWL / Tier II DF – Northeast slope facing north (ATT51_Photo51.jpg)	461880.9	7493679.4	7-Aug-2016
32	FOX 5 – Middle Site NHWL / Tier II DF – North slope facing northwest – Previously observed Feature M erosion channels have self-armoured (Acceptable) (ATT56_Photo56.jpg)	461836.1	7493719.9	7-Aug-2016
33	FOX 5 – Middle Site NHWL / Tier II DF – North end crest surface facing northwest – Feature R – weathered tension crack about 5 m from crest edge (Acceptable) (ATT55_Photo55.jpg)	461844.4	7493707.1	7-Aug-2016
34	FOX 5 – Middle Site NHWL / Tier II DF – Northwest slope facing south – Feature A - self armouring erosion channels (Acceptable) (ATT57_Photo57.jpg)	461807.8	7493708.8	7-Aug-2016
35	FOX 5 – Middle Site NHWL / Tier II DF – South crest edge facing southeast – Feature N – minor settlement at crest edge (Acceptable) (ATT44_Photo44.jpg)	461802.3	7493620.0	7-Aug-2016
36	FOX 5 – Middle Site NHWL / Tier II DF – South slope facing southwest – Feature C – self armouring erosion channels (Acceptable) (ATT46_Photo46.jpg)	461802.9	7493619.4	7-Aug-2016
37	FOX 5 – Middle Site NHWL / Tier II DF – Southeast slope facing northeast – Feature O – tension crack with sharp edges extending from toe to crest at corner of landfill and along crest edge (Acceptable) (ATT49_Photo49.jpg)	461844.5	7493601.4	7-Aug-2016
38	FOX 5 – Middle Site NHWL / Tier II DF – Northeast crest facing northwest – Feature P – weathered tension crack about 4 m from crest edge (Acceptable) (ATT54_Photo54.jpg)	461871.7	7493697.1	7-Aug-2016
39	FOX 5 – Middle Site NHWL / Tier II DF – Northwest crest surface facing southeast – Feature Q – hydrocarbon staining not related to landfill performance (Acceptable) (ATT58_Photo58.jpg)	461815.3	7493704.4	7-Aug-2016

Table 4-3: Summary Table of Photographic Log – Middle Site NHWL and Tier II Disposal Facility

Photo	Description (file name)	Easting	Northing	Date
40	FOX 5 – Middle Site NHWL / Tier II DF – VT-9 (ATT61_Photo61.jpg)	461848.5	7493614.7	7-Aug-2016
41	FOX 5 – Middle Site NHWL / Tier II DF – VT-10 (ATT62_Photo62.jpg)	461861.7	7493640.7	7-Aug-2016
42	FOX 5 – Middle Site NHWL / Tier II DF – VT-11 (ATT60_Photo60.jpg)	461823.7	7493642.3	7-Aug-2016
43	FOX 5 – Middle Site NHWL / Tier II DF – VT-12 (ATT59_Photo59.jpg)	461796.5	7493670.3	7-Aug-2016
44	FOX 5 – Middle Site NHWL / Tier II DF – MW-5 – monitoring well (ATT63_Photo63.jpg)	461902.7	7493636.2	7-Aug-2016
45	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 before excavation (ATT68_Photo68.jpg)	461900.3	7493635.5	7-Aug-2016
46	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 after excavation (ATT69_Photo69.jpg)	461900.3	7493635.5	7-Aug-2016
47	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 after backfilling (ATT70_Photo70.jpg)	461900.3	7493635.5	7-Aug-2016
48	FOX 5 – Middle Site NHWL / Tier II DF – MW-6 – monitoring well (ATT64_Photo64.jpg)	461771.9	7493595.4	7-Aug-2016
49	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 before excavation (ATT71_Photo71.jpg)	461771.2	7493595.9	7-Aug-2016
50	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 after excavation (ATT72_Photo72.jpg)	461771.2	7493595.9	7-Aug-2016
51	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 after backfilling (ATT73_Photo73.jpg)	461771.2	7493595.9	7-Aug-2016
52	FOX 5 – Middle Site NHWL / Tier II DF – MW-7 – monitoring well (ATT65_Photo65.jpg)	461750.0	7493652.6	7-Aug-2016
53	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 before excavation (ATT74_Photo74.jpg)	461750.9	7493657.0	7-Aug-2016
54	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 after excavation (ATT75_Photo75.jpg)	461750.9	7493657.0	7-Aug-2016
55	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 after backfilling (ATT76_Photo76.jpg)	461750.9	7493657.0	7-Aug-2016
56	FOX 5 – Middle Site NHWL / Tier II DF – MW-8 – monitoring well (ATT66_Photo66.jpg)	461793.2	7493732.9	7-Aug-2016
57	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 before excavation (ATT77_Photo77.jpg)	461794.2	7493735.6	7-Aug-2016
58	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 after excavation (ATT78_Photo78.jpg)	461794.2	7493735.6	7-Aug-2016
59	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 after backfilling (ATT79_Photo79.jpg)	461794.2	7493735.6	7-Aug-2016
60	FOX 5 – Middle Site NHWL / Tier II DF – MW-9 – monitoring well (ATT67_Photo67.jpg)	461839.8	7493747.6	7-Aug-2016

Table 4-3: Summary Table of Photographic Log – Middle Site NHWL and Tier II Disposal Facility

Photo	Description (file name)	Easting	Northing	Date
61	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 before excavation (ATT80_Photo80.jpg)	461842.7	7493747.6	7-Aug-2016
62	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 after excavation (ATT81_Photo81.jpg)	461842.7	7493747.6	7-Aug-2016
63	FOX 5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 after backfilling (ATT82_Photo82.jpg)	461842.7	7493747.6	7-Aug-2016

4.1.3 Thermal Monitoring

The data recorded on the thermistor dataloggers located at the Middle Site NHWL and Tier II Disposal Facility (VT-9 through VT-12) was downloaded using a laptop computer and Prolog software from Lakewood Systems Ltd. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B.

4.1.4 Summary of Sampling Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil sample at MW-9 could not be collected due to refusal on rock;
- PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-6 due to insufficient recovery of water; and,
- The groundwater sample at MW-7 could not be collected because the well was dry.

4.1.5 Soil Sampling

Table 4-4 presents a summary of analytical results for soil samples collected at the Middle Site Non-Hazardous Waste Landfill. MW-5 represents an upgradient sampling location, whereas MW-6, MW-7, MW-8 and MW-9 represent downgradient or cross-gradient sampling locations, based on topography.

Table 4-4 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. The background arithmetic means for copper, nickel, zinc and mercury for this landfill are greater than the baseline arithmetic means.

MW-5

Sampling location MW-5 is located upgradient of the landfill, approximately 32 m east of the toe. The estimated elevation of this sampling point is 313 masl. As shown in Photos 45 and 46, the area consists of boulders and rocks, infilled with sand and gravel and established vegetation. The soils consisted of a brown sand, gravel and stone.

For the shallow sample at MW-5 (0-15 cm), the concentrations of most metals were between the range of concentrations observed in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-5 (30-40 cm), the concentrations of most metals were between the range of concentrations observed in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-6

Sampling location MW-6 is located downgradient (cross-gradient) of the landfill, approximately 20 m south of the toe. The estimated elevation of this sampling point is 306 masl. As shown in Photos 49 and 50, the area consists of boulders and rocks, infilled with sand and gravel and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-6 (0-15 cm), the concentrations of most metals were less than those observed in 2014 and continued a general decreasing trend observed at this location since 2008. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-6 (40-50 cm), the concentrations of many metals (i.e. copper, nickel, lead, zinc and chromium) represent new historical minimum concentrations. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-7

Sampling location MW-7 is located downgradient of the landfill, approximately 7 m west of the toe. The estimated elevation of this sampling point is 302 masl. As shown in Photos 53 and 54, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand with gravel and stone.

For the shallow sample at MW-7 (0-15 cm), the concentrations of most metals were similar to those reported in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep samples at MW-7 (40-50 cm, duplicate location), the average concentrations of most metals were between the range of concentrations observed in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-8

Sampling location MW-8 is located downgradient of the landfill, approximately 11 m west of the toe. The estimated elevation of this sampling point is 303.5 masl. As shown in Photos 57 and 58, the area consists of boulders and rocks, infilled with sand and gravel and sparse vegetation. The soils consisted of brown sand, gravel and stone.

For the shallow sample at MW-8 (0-15 cm), the concentrations of most metals were similar to those reported in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-8 (40-50 cm), the concentrations of most metals were between the range of concentrations observed in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-9

Sampling location MW-9 is located downgradient (cross-gradient) of the landfill, approximately 15 m north of the toe. The estimated elevation of this sampling point is 306.5 masl. As shown in Photos 61 and 62, the area consists of boulders and rocks, infilled with sand and gravel and sparse vegetation. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-9 (0-15 cm), the concentrations of most metals were less than or similar to those reported in 2012 and 2014 and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

As noted above, the deep sample at MW-9 was not collected due to refusal on rock.

Table 4-4: Soil Chemical Analysis Results – Middle Site NHWL and Tier II Disposal Facility

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCBs (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		10	5.3	4.0	1.0	5.0	46	19	1.93	0.5	0.001	NA	NA	NA	NA
Baseline Mean		**7.6**	**5.2**	**5.0**	**1.0**	**10.0**	**31.7**	**20.0**	**2.0**	**0.1**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		11.8	10.6	9.8	1.0	10.0	50.6	20.0	3.8	0.1	0.003	NA	NA	NA	NA
Upgradient															
MW-5b	0-15	6.8	**6.2**	4.0	<0.5	7.6	**32.8**	14.3	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-5a	30-40	6.9	**6.2**	4.1	<0.5	6.9	**33**	14.1	<1.0	<0.1	<0.05	<7	<4	<8	<6
Downgradient															
MW-6b	0-15	5.5	4.9	3.5	<0.5	6.6	27.6	12.2	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-6a	40-50	5.5	**5.3**	3.5	<0.5	6.4	27.4	12.1	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-7b	0-15	6.7	**5.6**	3.9	<0.5	7.2	**32.4**	13.4	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-7a	40-50	**7.8**	**6.9**	4.6	<0.5	7.4	**39.3**	16.1	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-7a dup	40-50	**9**	**7**	4.2	<0.5	7	**41**	15	2	<0.10	<0.05	<5	<10	<50	<50
MW-7a (Dup Avg)	40-50	**8**	**7**	4.4	<0.5	7	**40**	16	1.5	<0.1	<0.05	<6	<7	<29	<28
MW-8b	0-15	5.5	5.2	3.4	<0.5	6	26.4	12.4	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-8a	40-50	5.9	**5.6**	3.4	<0.5	5.8	27	12.6	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-9a	0-15	7.2	5	3.3	<0.5	6.6	25.8	11.3	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-9 (deep) [1]															

Notes:
NA: Not available
ID: Soil sample location ID.
Underlined values: Results exceed Background arithmetic mean.
Bold Values: Results exceed Baseline arithmetic mean.
1: The deep soil sample at MW-9 could not be collected due to refusal.

4.1.6 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-5 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Non-Hazardous Waste Landfill.

MW-5

The depth to groundwater measured at MW-5 (duplicate location) in 2016 was 1.48 m below grade. The concentration of zinc, the only metal detected at MW-5, was less than those observed in previous years. No PHC or PCB were detected at this location in 2016.

MW-6

The depth to groundwater measured at MW-6 in 2016 was 1.92 m below grade. No metals or PHC F1 were detected at this location in 2016. PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-6 due to insufficient recovery of water.

MW-8

The depth to groundwater measured at MW-8 in 2016 was 1.37 m below grade. The concentration of zinc, the only metal detected at MW-8, was less than those observed in previous years. No PHC or PCB were detected at this location in 2016.

MW-9

The depth to groundwater measured at MW-9 in 2016 was 1.69 m below grade. No metals, PHC or PCB were detected at this location in 2016.

None of the reported values in any of the groundwater samples exceeded their respective baseline mean concentrations plus 3σ.

Table 4-5: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results - Middle Site NHWL and Tier II Disposal Facility

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.012**	**0.043**	**0.003**	**0.001**	**0.01**	**0.063**	**0.084**	**0.003**	**0.0004**	**0.00002**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.039	0.187	0.006	0.001	0.01	0.357	0.36	0.003	0.0004	0.00002	NA	NA	NA	NA
Upgradient															
MW-5	1.48	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-5 dup	1.48	<0.005	<0.005	<0.0005	<0.0001	<0.0001	0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	<0.1
MW-5 (Dup Avg)	1.48	<0.003	<0.003	<0.0005	<0.0001	<0.0001	0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	<0.1
Downgradient															
MW-6	1.92	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	NA [1]	<0.025	NA [1]	NA [1]	NA [1]
MW-7 [2]															
MW-8	1.37	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.006	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-9	1.69	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100

Notes:
ID: Monitoring well location ID.
GW: Groundwater.
BGS: Below ground surface.
NA: Not available
Bold Values: Results exceed Baseline arithmetic mean.
Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.
1: PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-6 due to insufficient recovery of water.
2: The groundwater sample at MW-7 could not be collected because the well was dry.

4.1.7 Conclusions and Overall Performance of the Middle Site NHWL and Tier II Disposal Facility

The Middle Site NHWL and Tier II Disposal Facility has exhibited some observed minor settlement, self-armouring erosion, cracking, tire tracks and a small hydrocarbon stain on the top of the northwest corner of the landfill. The landfill does not have any observed exposed waste or indications of slope instability. Observed cracking is either very weathered or likely caused by thaw creep and not considered to be of concern. All previously observed erosion appears to be self-armouring and has not changed from the last inspection in 2014 and therefore is not considered to be of concern. The small hydrocarbon stain appears to be from a fuel spill and the tire tracks are not causing erosion. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”.

Samples were collected from nine of the ten designated locations; the deep sample at MW-9 was not collected due to refusal on rock. At all five locations, the concentrations of most metals were similar to or less than those observed in previous years. No detectable concentrations of cadmium, mercury, PHC or PCB were noted in any of the soil samples in 2016. Concentrations of metal parameters in soil were highest overall at the deep MW-7 sample location. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

In 2016, groundwater samples were collected from four of five monitoring wells adjacent to the landfill; no sample was collected at MW-7 because the well was dry. Zinc was detected at MW-5 and MW-8, at concentrations less than those observed in previous years. No detectable concentrations of other metals, PHC or PCB were noted in any of the groundwater samples in 2016.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater was highest at MW-5, and lowest towards the south at MW-8, which follows the topography in the area.

The historical graphs in Appendix C show concentration trends at the Middle Site NHWL and Tier II Disposal Facility. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at all five monitoring locations. There is no evident ongoing impact of the Middle Site NHWL and Tier II Disposal Facility on soil or groundwater quality.

4.1.8 Recommendations for the Middle Site NHWL and Tier II Disposal Facility

No modifications to the ongoing monitoring program at this landfill are recommended.

4.2 Main Landfill

4.2.1 Landfill Description

The Main Landfill is located approximately 900 km northwest of the Station Area, on the northeast side of the Station Area access road.

The landfill is located within a broad valley and immediately adjacent to a steep slope leading to the northeast. Local elevations range from approximately 510 masl to the west of the landfill, to less than 480 masl at the northeast toe of the landfill. The natural slope is moderate (5%) in the western part of the site but steepens to the northeast, near MW-11 and MW-14, to a grade of approximately 15%. Surface water drainage runs around both sides of the landfill commencing in the southwest corner and extending to the northeast toe.

The landfill originally covered an area about 10,000 m^2 with a depth of waste estimated to be on average 1.5 to 2 m thick. Migration of contamination from the landfill was detected prior to remediation. The remediation of the Main Landfill consisted of the construction of a leachate containment system, consisting of perimeter berms with a synthetic liner and placement of sufficient granular fill at surface to cause aggradation of permafrost through the landfill contents. Existing drainage channels for surface water were backfilled and drainage was re-routed around the landfill. The current Main Landfill is approximately 29,900 m^2 in area, including the side slopes. Five groundwater monitoring wells were installed around the landfill perimeter, and eight thermistors were installed within the landfill footprint to monitor freeze-back conditions. Four of these thermistors are located in the northeast slope of the landfill.

The long term monitoring plan consists of visual monitoring, collection of soil and groundwater samples, and monitoring of subsurface ground temperatures. There are five soil and groundwater monitoring locations, MW-10 through MW-14 at the landfill. Approximate locations for the collection of soil samples, thermistors and monitoring well installations are identified on Figure FOX-5.3.

LEGEND:

- TIRE TRACKS (NTS)
- CRACKING
- EROSION (NTS)
- AREA POTENTIALLY EXPERIENCING DOWNHILL CREEP
- DEBRIS
- SOIL SAMPLE LOCATION
- PHOTOGRAPH VIEWPOINT
- MONITORING WELL LOCATION
- VERTICAL GROUND TEMPERATURE CABLE LOCATION
- RIP RAP
- CONTOURS IN 0.5m INTERVALS
- OVERLAND FLOW DIRECTION
- PERMANENT BENCHMARK LOCATION

NOTES:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 20N. PREVIOUS INSPECTION FIGURES PROVIDED BY SENES WERE IN A LOCAL COORDINATE SYSTEM AND HAVE BEEN MOVED TO NAD83 (CSRS), UTM ZONE 19N BASED ON GPS POSITIONING OF FEATURES LOCATED BY GOLDER IN 2016.
2. ALL ELEVATIONS REFER TO LOCAL DATUM.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE

PREVIOUS INSPECTION FIGURES FROM SENES CONSULTANTS, PROJECT NO. 350600-515-2, 2014 DEW LINE MONITORING PROGRAM, DATED FEB. 2015

0 25 50
1:1,250 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-5 MONITORING REPORT

TITLE
MAIN LANDFILL

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-11-07
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-5.3

4.2.2 Visual Inspection

The Main Landfill exhibits observed erosion, debris and potential slope creep. No settlement, ponded water, cracking, sloughing or exposed waste were observed. Table 4-6 presents a summary of observed visual inspection features and Table 4-7 presents the Preliminary Stability Assessment results. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable.” Table 4-8 is a log of photographs taken during the 2016 visual inspection.

There is previously observed erosion along the northeast toe of the landfill (Feature D) that has been caused by upstream runoff draining down the steep slope around the toe of the landfill. It appears that vehicle or ATV tracks/ruts may have initially contributed to creating the erosion (see two parallel ruts/channels visible in Photo 80 in Appendix D). However, gravel and cobble sized rock appears to be helping to self-armour the erosion. At the time of 2016 visual inspection, the erosion along the northeast toe had not started to undermine the rip-rap protected landfill slope or cause slope instability. This erosion feature (D) was assessed as “Acceptable” and no immediate action is recommended based on conditions observed during the 2016 visual inspection. The existing rip-rap on the landfill slope is quite large and is currently stable based on the absence of any other visual evidence such as tension cracks. We note, however, that should continued erosion be observed, for example deep channel cutting resulting in the risk of undermining the rip-rap landfill slope, some placement of erosion protection in the channel along the northeast toe of the landfill may be required. Other previously observed erosion along the south, east and west toe of the landfill (Features F and H) does not appear to have changed significantly from the last inspection in 2014 and is not considered to be of concern.

The observed inclination of the thermistor casings installed in the northeast slope of the landfill has been previously reported to potentially indicate slope creep (Feature A). It is considered possible that the instrumentation was drilled perpendicular to ground surface and recorded as "vertical" in as-built report. However, the ground surface slopes 10-20 degrees which would have resulted in the thermistors being inclined approximately the same from vertical. Previous 2009 and 2010 inspection reports noted that the thermistors were observed to be inclined consistent with 2008. Since the inclination angles for each thermistor have not previously been measured there is no way to confirm if the inclination is an as-built condition or is related to slope creep. The inclination angles of the thermistor casings were measured during the 2016 visual inspection for future reference. No other indications of slope instability were observed at the Main Landfill during the 2016 visual inspection. Previously observed cracking (Feature G) is minor thaw cracking beyond the toe of the landfill that is not related to landfill performance or indicative of slope instability.

There are several locations where metal construction debris around the toe of the landfill has been previously observed (Features B and E), but it is not exposed buried waste. Some new metal debris was observed along the west toe that appears to have become exposed by erosion (new Feature I), but the metal debris is not exposed buried waste. Many pieces of partially buried shredded plastic were observed in the south toe area (new Feature K), but the shredded plastic is not exposed buried waste.

Previously observed exposed debris (Features C and J) were not observed in 2016.

Table 4-6: Visual Inspection Checklist – Main Landfill

SITE NAME: FOX-5 Broughton Island
LANDFILL DESIGNATION: Main Landfill
DATE OF INSPECTION: August 6, 2016
DATE OF PREVIOUS INSPECTION: August 20, 2014
INSPECTED BY: Darrin Johnson
REPORT PREPARED BY: Darrin Johnson
MONITORING EVENT NUMBER: 7
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-6: Visual Inspection Checklist – Main Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	N	-	-	-	-	-	-	-	-	-	-	-
Erosion	Y	D	Northeast toe	466033.0	7492267.2	100	5	0.2	1.7%	Erosion along toe (Acceptable)	Previously observed, no change	76, 80
		F	Southeast toe	466020.2	7492153.9	100	5	0.2	1.7%	Erosion along toe (Acceptable)	Previously observed, no change	69
		H	South and west toe	465879.3	7492106.0	400	2	0.1	2.7%	Erosion along toe (Acceptable)	Previously observed, no change	64, 66, 78
Lateral Movement	Y (Potential)	A	North slope in vicinity of thermistors VT-1 to -4	-	-	80	50	-	13.4%	Inclined thermistors may indicate potential slope creep (Acceptable)	Previously observed, measured angles in 2016 for future reference	82-85
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	N	G	South toe	465959.6	7492067.8	0.5	0.02	0.01	<0.1%	Minor thaw cracking beyond rip-rap at toe	Previously observed, no change	77
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	N	-	-	-	-	-	-	-	-	-	-	-
Staining	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-

Table 4-6: Visual Inspection Checklist – Main Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Seepage or Ponded Water	N	-	-	-	-	-	-	-	-	-	-	-
Debris and/or Liner Exposed	Y	B	East toe near MW-12	466055.8	7492259.2	3	1	-	0.010%	Steel cable and construction debris (Acceptable)	Previously observed but not exposed waste	73
		E	East toe near MW-14	466047.0	7492168.9	2	1	-	0.007%			75
		I	West toe	465866.7	7492127.1	10	5	-	0.17%	Metal debris exposed by erosion, not exposed buried waste (Acceptable)	New	79
		K	South toe near MW-10	465863.4	7492053.1	50	50	-	8.4%	Shredded plastic debris, not exposed buried waste (Acceptable)	New	81
Presence / Condition of Monitoring Instruments	Y	A	VT-1 to -8	-	-	-	-	-	-	Inclined thermistors may indicate potential slope creep (Acceptable)	Previously observed, measured angles in 2016 for future reference	82-89
		-	MW-10 to -14	-	-	-	-	-	-	Monitoring wells intact	-	90, 94, 98, 102, 106
Features of Note/Other Observations	N	-	-	-	-	-	-	-	-	-	-	-

Landfill Area = 29,900 m^2

Table 4-7: Preliminary Stability Assessment – Main Landfill

Feature	Severity Rating	Extent
Settlement	Not observed	-
Erosion	Acceptable	Occasional
Lateral Movement	Acceptable	Occasional
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Not observed	-
Animal Burrows	Not observed	-
Vegetation Establishment	Not observed	-
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Acceptable	Occasional
Other	Not observed	-
Overall Landfill Performance	**Acceptable**	

Table 4-8: Summary Table of Photographic Log – Main Landfill

Photo	Description (file name)	Easting	Northing	Date
64	FOX 5 – Main Landfill – Drainage ditch, west of landfill, facing north – Feature H – erosion channel (ATT34_Photo34.jpg)	465868.4	7492069.5	6-Aug-2016
65	FOX 5 – Main Landfill – Boulder rip rap on west slope facing southeast (ATT35_Photo35.jpg)	465846.3	7492200.7	6-Aug-2016
66	FOX 5 – Main Landfill – North toe facing southwest – Figure H – erosion channel along toe (ATT36_Photo36.jpg)	465921.2	7492279.2	6-Aug-2016
67	FOX 5 – Main Landfill – Northeast slope with inclined thermistors facing south (ATT37_Photo37.jpg)	465993.5	7492312.7	6-Aug-2016
68	FOX 5 – Main Landfill – East crest surface facing southwest with boulder rip rap (ATT38_Photo38.jpg)	466004.0	7492217.3	6-Aug-2016
69	FOX 5 – Main Landfill – Southeast toe facing northwest with boulder rip rap slope in background – Feature F erosion channel along toe in foreground (ATT39_Photo39.jpg)	466004.6	7492088.2	6-Aug-2016
70	FOX 5 – Main Landfill – South crest surface facing north with boulder rip rap (ATT40_Photo40.jpg)	465940.7	7492081.9	6-Aug-2016
71	FOX 5 – Main Landfill – Crest surface facing west, boulder rip rap with sand and gravel on top (ATT41_Photo41.jpg)	465994.3	7492182.1	6-Aug-2016
72	FOX 5 – Main Landfill – Feature A – Inclined thermistors facing VT-3 (ATT107_Photo107.jpg)	466029.5	7492235.0	6-Aug-2016

Table 4-8: Summary Table of Photographic Log – Main Landfill

Photo	Description (file name)	Easting	Northing	Date
73	FOX 5 – Main Landfill – Steel rebar at east toe near MW-12 – Previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT109_Photo109.jpg)	466055.8	7492259.2	6-Aug-2016
74	FOX 5 – Main Landfill – Scattered metal debris at northeast toe near MW-11 - Previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT106_Photo106.jpg)	466016.6	7492279.7	6-Aug-2016
75	FOX 5 – Main Landfill – Steel cable at east toe - Example of previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT111_Photo111.jpg)	466047.0	7492168.9	6-Aug-2016
76	FOX 5 – Main Landfill – East toe facing northeast – Feature D – south end of erosion channel along north east toe (Acceptable) (ATT110_Photo110.jpg)	466020.2	7492153.9	6-Aug-2016
77	FOX 5 – Main Landfill – South toe facing northeast – Previously observed cracking (Feature G) beyond rip rap at toe is not related to landfill performance (ATT112_Photo112.jpg)	465959.6	7492067.8	6-Aug-2016
78	FOX 5 – Main Landfill – Southwest toe facing northwest – Previously observed erosion (Feature H) around toe of landfill (Acceptable) (ATT104_Photo104.jpg)	465879.3	7492106.0	6-Aug-2016
79	FOX 5 – Main Landfill – West toe facing northwest – Feature I – metal debris exposed by erosion around toe of landfill (Acceptable) (ATT105_Photo105.jpg)	465866.7	7492127.1	6-Aug-2016
80	FOX 5 – Main Landfill – Northeast toe facing south – Feature D – north end of erosion channel along toe (Acceptable) (ATT108_Photo108.jpg)	466062.5	7492237.6	6-Aug-2016
81	FOX 5 – Main Landfill – South toe facing southeast – Feature K – exposed shredded plastic debris around MW-10 (Acceptable) (ATT103_Photo103.jpg)	465863.4	7492053.1	6-Aug-2016
82	FOX 5 – Main Landfill – VT-1 – inclined 76 degrees to northeast (ATT117_Photo117.jpg)	466017.8	7492251.5	6-Aug-2016
83	FOX 5 – Main Landfill – VT-2 inclined 77 degrees to northeast (ATT118_Photo118.jpg)	466005.8	7492245.2	6-Aug-2016
84	FOX 5 – Main Landfill – VT-3 – inclined 70 degrees to northeast (ATT116_Photo116.jpg)	466027.8	7492235.8	6-Aug-2016
85	FOX 5 – Main Landfill – VT-4 – inclined 63 degrees to northeast (ATT119_Photo119.jpg)	466016.5	7492231.4	6-Aug-2016
86	FOX 5 – Main Landfill – VT-5 – inclined 84 degrees (ATT120_Photo120.jpg)	465998.9	7492218.6	6-Aug-2016
87	FOX 5 – Main Landfill – VT-6 – inclined 84 degrees (ATT115_Photo115.jpg)	465905.2	7492193.6	6-Aug-2016

Table 4-8: Summary Table of Photographic Log – Main Landfill

Photo	Description (file name)	Easting	Northing	Date
88	FOX 5 – Main Landfill – VT-7 – inclined 85 degrees (ATT113_Photo113.jpg)	465948.0	7492128.2	6-Aug-2016
89	FOX 5 – Main Landfill – VT-8 – inclined 87 degrees (ATT114_Photo114.jpg)	465962.2	7492103.8	6-Aug-2016
90	FOX 5 – Main Landfill – MW-10 – monitoring well (ATT22_Photo22.jpg)	465856.4	7492042.8	6-Aug-2016
91	FOX 5 – Main Landfill – Soil sampling location MW-10 before excavation (ATT23_Photo23.jpg)	465855.4	7492045.2	6-Aug-2016
92	FOX 5 – Main Landfill – Soil sampling location MW-10 after excavation (ATT24_Photo24.jpg)	465855.4	7492045.2	6-Aug-2016
93	FOX 5 – Main Landfill – Soil sampling location MW-10 after backfilling (ATT25_Photo25.jpg)	465855.4	7492045.2	6-Aug-2016
94	FOX 5 – Main Landfill – MW-11 – monitoring well (ATT38_Photo38.jpg)	466015.0	7492284.1	6-Aug-2016
95	FOX 5 – Main Landfill – Soil sampling location MW-11 before excavation (ATT39_Photo39.jpg)	466013.2	7492278.3	6-Aug-2016
96	FOX 5 – Main Landfill – Soil sampling location MW-11 after excavation (ATT40_Photo40.jpg)	466013.2	7492278.3	6-Aug-2016
97	FOX 5 – Main Landfill – Soil sampling location MW-11 after backfilling (ATT41_Photo41.jpg)	466013.2	7492278.3	6-Aug-2016
98	FOX 5 – Main Landfill – MW-12 – monitoring well (ATT34_Photo34.jpg)	466046.3	7492270.2	6-Aug-2016
99	FOX 5 – Main Landfill – Soil sampling location MW-12 before excavation (ATT35_Photo35.jpg)	466046.6	7492269.7	6-Aug-2016
100	FOX 5 – Main Landfill – Soil sampling location MW-12 after excavation (ATT36_Photo36.jpg)	466046.6	7492269.7	6-Aug-2016
101	FOX 5 – Main Landfill – Soil sampling location MW-12 after backfilling (ATT37_Photo37.jpg)	466046.6	7492269.7	6-Aug-2016
102	FOX 5 – Main Landfill – MW-13 – monitoring well (ATT30_Photo30.jpg)	466071.6	7492239.6	6-Aug-2016
103	FOX 5 – Main Landfill – Soil sampling location MW-13 before excavation (ATT31_Photo31.jpg)	466063.9	7492239.4	6-Aug-2016
104	FOX 5 – Main Landfill – Soil sampling location MW-13 after excavation (ATT32_Photo32.jpg)	466063.9	7492239.4	6-Aug-2016
105	FOX 5 – Main Landfill – Soil sampling location MW-13 after backfilling (ATT33_Photo33.jpg)	466063.9	7492239.4	6-Aug-2016
106	FOX 5 – Main Landfill – MW-14 – monitoring well with previously observed wood debris (Feature E) that is not exposed waste (ATT26_Photo26.jpg)	466052.9	7492180.6	6-Aug-2016
107	FOX 5 – Main Landfill – Soil sampling location MW-14 before excavation (ATT27_Photo27.jpg)	466051.6	7492178.5	6-Aug-2016
108	FOX 5 – Main Landfill – Soil sampling location MW-14 after excavation (ATT28_Photo28.jpg)	466051.6	7492178.5	6-Aug-2016

Table 4-8: Summary Table of Photographic Log – Main Landfill

Photo	Description (file name)	Easting	Northing	Date
109	FOX 5 – Main Landfill – Soil sampling location MW-14 after backfilling (ATT29_Photo29.jpg)	466051.6	7492178.5	6-Aug-2016

4.2.3 Thermal Monitoring

The data recorded on the thermistor dataloggers located at the Main Landfill (VT-1 through VT-8) was downloaded using a laptop computer and Prolog software from Lakewood Systems Ltd. Thermistor inspection and data downloading details were recorded on field record sheets included in Appendix B. The inclination angles of thermistors are listed in the table below.

Thermistor	Inclination Angle (degrees)
VT-1	76
VT-2	77
VT-3	70
VT-4	63
VT-5	84
VT-6	84
VT-7	85
VT-8	87

4.2.4 Summary of Sampling Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil samples at MW-11, MW-12, MW-13 and MW-14 could not be collected due to refusal on rock;
- The groundwater samples at MW-10, MW-11 and MW-12 could not be collected because the wells were dry;
- PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water; and,
- The groundwater sample at MW-14 could not be collected because the groundwater in the well was frozen.

4.2.5 Soil Sampling

Table 4-9 presents a summary of analytical results for soil samples collected at the Main Landfill. MW-10 represents an upgradient sampling location, whereas MW-11, MW-12, MW-13 and MW-14 represent downgradient sampling locations.

Table 4-9 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. The background arithmetic means for copper, nickel, zinc and mercury at this landfill are greater than the baseline arithmetic means.

MW-10

Sampling location MW-10 is located upgradient of the landfill, approximately 50 m southwest of the toe. The estimated elevation of this sampling point is 511 masl. As shown in Photos 91 and 92, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-10 (0-15 cm), the concentrations of most metals were less than or similar to those reported in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-10 (40-50 cm), the concentrations of all detected metals were less than the concentrations reported 2014, and generally less than those reported in previous years. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-11

Sampling location MW-11 is located downgradient of the landfill, immediately northeast of the toe. The estimated elevation of this sampling point is 485 masl. As shown in Photos 95 and 96, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand, gravel and stone.

For the shallow sample at MW-11 (0-15 cm), the concentrations of all detected metals were less than the concentrations reported 2014, and generally less than those reported in previous years. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-12

Sampling location MW-12 is located downgradient of the landfill, approximately 10 m northeast of the toe. The estimated elevation of this sampling point is 480 masl. As shown in Photos 98 and 100, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-12 (0-15 cm), the concentrations of all detected metals were greater than the concentrations reported 2014 but less than those reported between 2008 and 2012. A modified TPH concentration of 40.5 mg/kg was reported in 2016, which remains below the range of concentrations reported from 2009 to 2012 (49 mg/kg to 91 mg/kg). Concentrations of PHC F3 and F4 fractions were 35 mg/kg and 18 mg/kg, respectively. No cadmium, arsenic, mercury or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ. It is noted that PCB concentrations between 0.013 mg/kg and 0.43 mg/kg were reported at this location from 2010 to 2014, and therefore the 2016 result represents a decline from this recent trend.

MW-13

Sampling location MW-13 is located downgradient of the landfill, approximately 8 m east of the toe. The estimated elevation of this sampling point is 481 masl. As shown in Photos 103 and 104, the area consists of sand and gravel with some rocks and boulders and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-13 (0-15 cm), the concentrations of most metals were similar to those reported in 2012 and 2014, and less than the concentrations observed from 2008 to 2010. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-14

Sampling location MW-14 is located downgradient of the landfill, approximately 12 m east of the toe. The estimated elevation of this sampling point is 493.5 masl. As shown in Photos 107 and 108, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand, gravel and stone.

For the shallow sample at MW-14 (0-15 cm), the concentrations of all metals were less than or similar to those reported in previous years. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-9: Soil Chemical Analysis Results – Main Landfill

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCBs (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		11	5.3	5.0	1.0	10	46	20	1.9	0.5	0.010	NA	NA	NA	NA
Baseline Mean		**8.5**	**5.0**	**5.0**	**1.0**	**10**	**38**	**20**	**2**	**0.10**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		19.7	11.9	6.8	1.3	29.5	119.0	25.1	6.2	0.10	0.303	NA	NA	NA	NA
Upgradient															
MW-10b	0-15	6.3	**5.2**	3.6	<0.5	7	31.7	11.7	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-10a	40-50	6.3	**5.5**	3.6	<0.5	7.9	32.3	12.6	<1.0	<0.1	<0.05	<7	<4	<8	<6
Downgradient															
MW-11a	0-15	6.8	**5.4**	3.7	<0.5	**13**	29.8	13.3	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-11 (deep) [1]															
MW-12a	0-15	5.5	3.8	2.7	<0.5	9.6	**40.6**	8.5	<1.0	<0.1	<0.05	<7	<4	35	18
MW-12 (deep) [1]															
MW-13a	0-15	5.7	3.9	2.9	<0.5	9.2	30.8	9	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-13 (deep) [1]															
MW-14a	0-15	4.2	3.5	2.8	<0.5	8.7	25.5	7.3	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-14 (deep) [1]															

Notes:

NA: Not available.

ID: Soil sample location ID.

Underlined values: Results exceed Background arithmetic mean.

Bold Values: Results exceed Baseline arithmetic mean.

Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.

1: The deep soil samples at MW-11, MW-12, MW-13 and MW-14 could not be collected due to refusal on rock.

4.2.6 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-10 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Tier II Disposal Facility.

MW-13

The depth to groundwater measured at MW-13 in 2016 was 1.52 m below grade. No metals, PHC F1 fraction or PCB were detected at this location in 2016. PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water.

As noted above, groundwater samples could not be collected from the other wells at this site.

Table 4-10: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results - Main Landfill

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.062**	**0.047**	**0.003**	**0.001**	**0.01**	**0.11**	**0.084**	**0.003**	**0.0004**	**0.00002**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.27	0.16	0.048	0.001	0.01	0.52	0.39	0.017	0.0004	0.00002	NA	NA	NA	NA
Upgradient															
MW-10 [1]															
Downgradient															
MW-11 [1]															
MW-12 [1]															
MW-13	1.52	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	NA [2]	<0.025	NA [2]	NA [2]	NA [2]
MW-14 [3]															

Notes:

ID: Monitoring well location ID.

GW: Groundwater.

BGS: Below ground surface.

NA: Not available

Bold Values: Results exceed Baseline arithmetic mean.

1: The groundwater samples at MW-10, MW-11 and MW-12 could not be collected because the well was dry.

2: PHC F2-F4 and PCB could not be analyzed from the groundwater sample at MW-13 due to insufficient recovery of water.

3: The groundwater sample at MW-14 could not be collected because the groundwater in the well was dry or frozen.

4.2.7 Conclusions and Overall Performance of the Main Landfill

The Main Landfill has exhibited observed erosion, debris and potential slope creep. No settlement, ponded water, cracking, sloughing or exposed waste were observed. This landfill was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”. There is some previously observed erosion along the northeast toe of the landfill (Feature D) that has been caused by upstream runoff draining down the steep slope around the toe of the landfill. At the time of 2016 visual inspection, the erosion along the northeast toe had not started to undermine the rip-rap protected landfill slope or cause other evident visual features associated with slope instability (e.g., tension cracks on the slope or near the crest, bulging). The existing rip-rap on the landfill slope is quite large and appears to currently be stable. Other previously observed erosion along the south, east and west toe of the landfill (Features F and H) does not appear to have changed significantly from the last inspection in 2014 and is not considered to be of concern. Inclination of the thermistor casings installed in the northeast slope of the landfill has been previously reported to potentially indicate slope creep (Feature A), however as the inclination angles have not previously been measured, it is not possible to determine if the inclination is an as-built condition or related to ongoing slope creep. The inclination angles of the thermistor casings were measured during the 2016 visual inspection for future reference. No other indications of slope instability were observed at the Main Landfill during the 2016 visual inspection. Observed metal and plastic debris around the toe of the landfill appears to be construction debris and is not exposed buried waste.

In 2016, soil samples were collected from six of the ten designated locations. At all sampling locations, the concentrations of most metals were less than or similar to those reported in previous years. PHC were only detected at the MW-12 sampling location; the modified TPH concentration of 40.5 mg/kg remained below the range of concentrations reported from 2009 to 2012 (49 mg/kg to 91 mg/kg). The concentrations of most metals in soil were highest at the MW-11 sampling location, located immediately downgradient of the eastern toe. No detectable concentrations of cadmium, arsenic, mercury or PCB were noted in any of the soil samples in 2016. None of the reported soil values exceeded their respective baseline mean concentrations plus 3σ.

In 2016, groundwater samples were collected from only one of the five monitoring wells adjacent to the landfill, MW-13. No metals, PHC F1 fraction or PCB were detected at this location in 2016.

The historical graphs in Appendix C show concentration trends at the Main Landfill. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at all four monitoring locations. There is no evident ongoing impact of the Middle Site Non-Hazardous Waste Landfill on soil or groundwater quality.

4.2.8 Recommendations for the Main Landfill

It is recommended that the inclination of all eight thermistors installed at the Main Landfill be measured on an annual basis until the next scheduled monitoring event in 2021 to help identify if there is any movement of the northeast slope. If this recommendation is put into effect, we also recommend that the erosion channels along the northeast toe of the landfill should be monitored at the same time to evaluate the risk of undermining the rip-rap landfill slope due to potential erosion (e.g., deep channel cutting). Consideration should also be given to setting up benchmarks (i.e., survey monuments) around the perimeter of the Main Landfill that could be surveyed on an annual basis along with the thermistors to determine if there is any ongoing slope movement.

No other modifications to the ongoing soil and water monitoring program at this landfill are recommended.

4.3 Station Area Non-Hazardous Waste Landfill

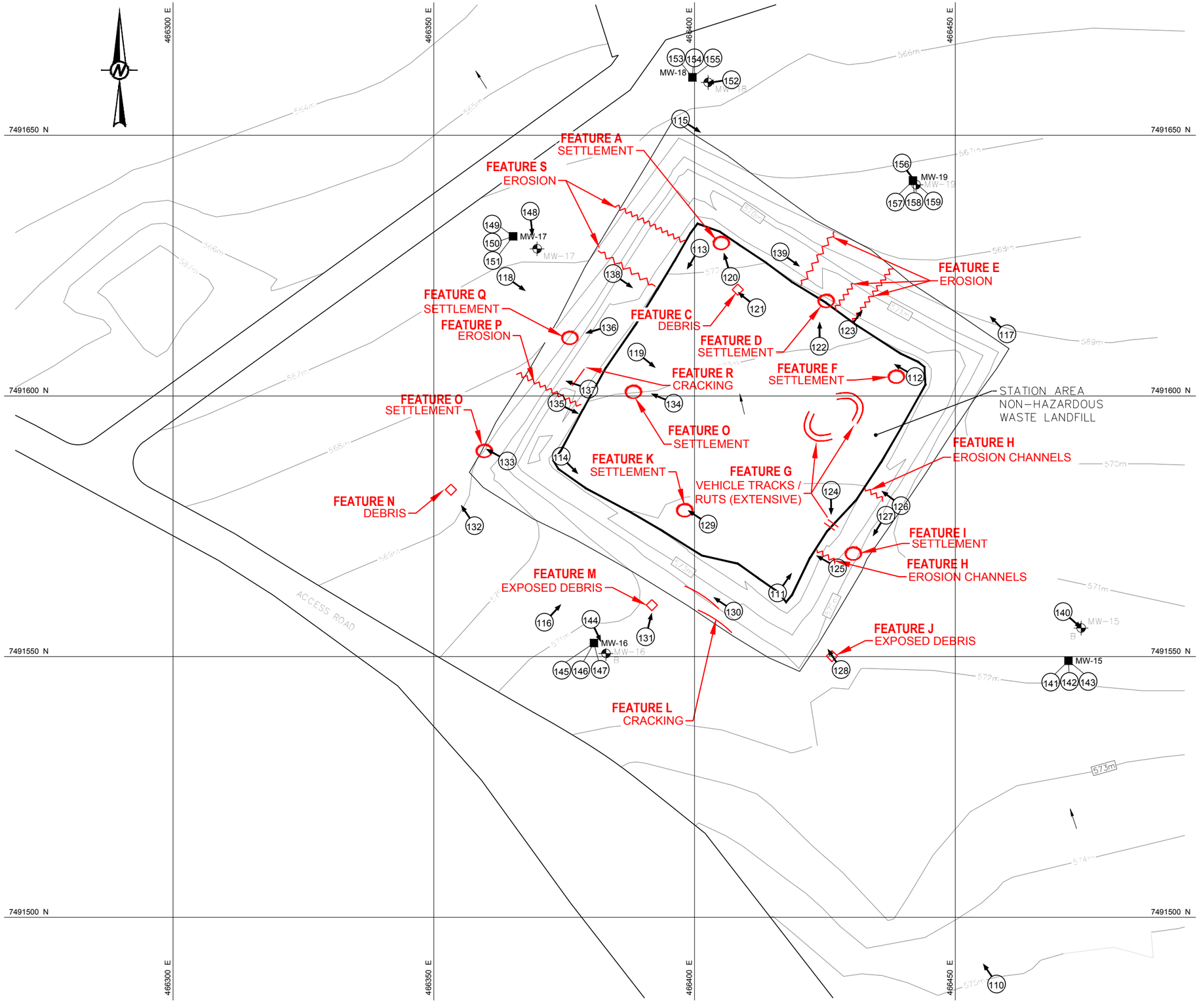
4.3.1 Landfill Description

The Station Area Non-Hazardous Waste Landfill (NHWL) was constructed during remediation of the FOX-5 Broughton Island site. It is located in the Station Area, northeast of the main access road.

The Station Area is near the peak of this local headland, approximately 350 m from the top of a slope leading to the northeast, and a sharp slope located approximately 700 m to the northeast. Local elevations range from approximately 572 masl southeast of the landfill, to less than 566 masl at the northwest toe of the landfill. Drainage in the area of the landfill is generally to the northeast to east, ultimately leading to the shores of Davis Strait, located approximately 1,300 m to the northeast.

The Station Area NHWL was constructed to contain non-hazardous waste materials generated during demolition of facilities not required for the operation of the SRR, site debris collected during the cleanup and for Tier I contaminated soil. The design of the Station Area NHWL includes compacted perimeter berms and placement of a compacted granular fill cover over the landfilled material. The Station Area Non-Hazardous Waste Landfill is approximately 5,800 m^2 in area, including the side slopes.

Five groundwater monitoring wells were installed around the landfill perimeter (MW-15 through MW-19). The long-term monitoring plan for this landfill consists of visual monitoring, and the collection of soil and groundwater samples. Approximate locations for the collection of soil and groundwater samples are identified on Figure FOX -5.4.



LEGEND:

- TIRE TRACKS (NTS)
- CRACKING
- EROSION (NTS)
- SETTLEMENT (NTS)
- DEBRIS
- SOIL SAMPLE LOCATION
- PHOTOGRAPH VIEWPOINT
- MONITORING WELL LOCATION
- CONTOURS IN 0.5m INTERVALS
- OVERLAND FLOW DIRECTION

NOTES:

1. ALL COORDINATES ARE REFERENCED TO NAD83 (CSRS), UTM ZONE 20N. PREVIOUS INSPECTION FIGURES PROVIDED BY SENES WERE IN A LOCAL COORDINATE SYSTEM AND HAVE BEEN MOVED TO NAD83 (CSRS), UTM ZONE 19N BASED ON GPS POSITIONING OF FEATURES LOCATED BY GOLDER IN 2016.
2. ALL ELEVATIONS REFER TO LOCAL DATUM.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCE

PREVIOUS INSPECTION FIGURES FROM SENES CONSULTANTS, PROJECT NO. 350600-515-2, 2014 DEW LINE MONITORING PROGRAM, DATED FEB. 2015

0 12.5 25
1:750 METRES

CLIENT
DEPARTMENT OF NATIONAL DEFENCE CANADA

PROJECT
2016 FOX-5 MONITORING REPORT

TITLE
STATION AREA
NON-HAZARDOUS WASTE LANDFILL

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-11-07
DESIGNED	RM
PREPARED	TDR
REVIEWED	DCJ
APPROVED	DP

PROJECT NO.	PHASE	REV.	FIGURE
1530908	2000	A	FOX-5.4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

0

Path: \\golder.gds\gal\Mississauga\SIM\Clients\Public_Works_Canada\Canada99_PROJ\1530908_PWGSC_Dew_Line_Mon_Program_2015_2018\40_PROD\0007_Fox_5_Field_Summary_Report_2016\ | File Name: 1530908-0007-CM-0004.dwg

4.3.2 Visual Inspection

The Station Area Non-Hazardous Waste Landfill has some observed minor settlement, minor self-armouring erosion, cracking, tire tracks and debris. No ponded water, exposed waste or indications of slope instability were observed during the visual inspection. Table 4-11 presents a summary of observed visual inspection features and Table 4-12 presents the Preliminary Stability Assessment results. This landfill was assessed to have an "Acceptable" overall performance because all observed features were assessed as "Acceptable." Table 4-13 is a log of photographs taken during the 2016 visual inspection.

None of the previously observed minor settlement areas (Features A, D, F, I, K, O and Q) appear to have changed from the last inspection in 2014 and they are not considered to be of concern. Previously observed erosion (Features E, H, P and S) is self-armouring and is not considered to be of concern. Previously observed cracking (Features L and R) is weathered, does not appear to have changed since the last inspection and is not considered of concern. Previously observed steel cable and metal debris (Features C, J, M and N) are not exposed buried waste. Previously observed tire tracks on the landfill surface (Feature G) do not appear to have changed since the last inspection and are not considered of concern.

It should be noted that at the FOX-5 site there are some minor discrepancies between previously reported feature locations (that were referenced with a local coordinate system) and the 2016 visual inspection feature locations reported herein (that were referenced with UTM coordinates). In some cases, where previously observed minor settlement (e.g., Feature A) and/or debris (e.g., Feature C) was observed to be insignificant the 2016 visual inspection photographs documented similar nearby features to illustrate the range of conditions at the landfill (i.e., for features not considered of concern). Feature B was not observed during the 2016 visual inspection.

Table 4-11: Visual Inspection Checklist - Station Area Non-Hazardous Waste Landfill

SITE NAME: FOX-5 Broughton Island
LANDFILL DESIGNATION: Station Area NHWL
DATE OF INSPECTION: August 6, 2016
DATE OF PREVIOUS INSPECTION: August 19 and 20, 2014
INSPECTED BY: Darrin Johnson
REPORT PREPARED BY: Darrin Johnson
MONITORING EVENT NUMBER: 7
The inspector/reporter represents to the best of his/her knowledge that the following statements and observations are true and correct and to the best of the preparer's actual knowledge, no material facts have been suppressed or misstated.

Table 4-11: Visual Inspection Checklist - Station Area Non-Hazardous Waste Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Settlement	Y	A	Northeast crest	466402.1	7491622.9	5	5	0.3	0.43%	Minor settlement and/or possible rough grading (Acceptable)	Previously observed, not considered a concern	120
		D	Northeast crest and slope	466423.9	7491609.5	3	3	0.1	0.000%			122
		F	Northeast crest	466432.5	7491602.0	5	5	0.3	0.43%			112
		I	Southeast slope near toe	466436.7	7491577.1	1	1	0.3	0.02%			127
		K	Southwest crest	466402.6	7491575.4	3	3	0.2	0.16%			129
		O	Northwest crest and slope	466364.1	7491587.5	15	15	0.3	3.9%			133, 134
		Q	Northwest slope	466383.6	7491613.3	2	2	0.2	0.07%			136
Erosion	Y	E	Northeast slope	466429.4	7491612.7	12	10	0.2	2.1%	Minor self-armouring erosion (Acceptable)	Previously observed, no change	123, 139
		H	Southeast slope	466427.4	7491567.0	10	5	0.1	0.86%			125, 126
		P	Northwest slope	466373.6	7491598.7	10	2	0.2	0.35%			135
		S	Northwest slope	466390.3	7491619.9	15	10	0.2	2.6%			138
Lateral Movement	N	-	-	-	-	-	-	-	-	-	-	-
Frost Action	N	-	-	-	-	-	-	-	-	-	-	-
Sloughing	N	-	-	-	-	-	-	-	-	-	-	-
Cracking	Y	L	Southwest slope	466407.5	7491558.7	5	0.05	0.01	<0.01%	Minor weathered cracking (Acceptable)	Previously observed, no change	130
		R	Northwest slope	466379.7	7491601.3	5	0.01	0.01	<0.01%	Minor weathered thaw creep cracking (Acceptable)	Previously observed, not considered significant	137

Table 4-11: Visual Inspection Checklist - Station Area Non-Hazardous Waste Landfill

Checklist Item	Present (Y/N)	Feature ID (A, B, etc.)	Location Description	Easting	Northing	Length (m)	Width (m)	Depth (m)	Extent of Landfill Area (%)	Description (Severity Rating)	Comparison to Historical Observations	Photos
Animal Burrows	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation	N	-	-	-	-	-	-	-	-	-	-	-
Staining	N	-	-	-	-	-	-	-	-	-	-	-
Vegetation Stress	N	-	-	-	-	-	-	-	-	-	-	-
Seepage or Ponded Water	N	-	-	-	-	-	-	-	-	-	-	-
Debris and/or Liner Exposed	Y	C	Northeast crest surface	466406.9	7491622.9	-	-	-	-	Metal debris on surface (Acceptable)	Previously observed, not exposed waste	121
		J	Southeast toe	466428.1	7491547.5	-	-	-	-			128
		M	Southeast toe	466390.6	7491553.8	-	-	-	-			131
		N	Southwest toe	466357.8	7491575.1	-	-	-	-	Steel cable and bits of metal (Acceptable)		132
Presence / Condition of Monitoring Instruments	Y	-	MW-15 to -19	-	-	-	-	-	-	Monitoring wells intact	-	140, 144, 148, 152, 156
Features of Note/Other Observations	N	G	Southeast crest surface	466426.2	7491581.9	30	20	0.1	10.4%	Tire tracks (Acceptable)	Previously observed, no change	124

Landfill Area = 5,800 m^2

Table 4-12: Preliminary Stability Assessment - Station Area Non-Hazardous Waste Landfill

Feature	Severity Rating	Extent
Settlement	Acceptable	Occasional
Erosion	Acceptable	Occasional
Lateral Movement	Not observed	-
Frost Action	Not observed	-
Sloughing	Not observed	-
Cracking	Acceptable	Occasional
Animal Burrows	Not observed	-
Vegetation Establishment	Not observed	-
Staining	Not observed	-
Vegetation Stress	Not observed	-
Seepage/Ponded Water	Not observed	-
Debris and/or Liner Exposure	Acceptable	Occasional
Other	Acceptable	Occasional
Overall Landfill Performance	**Acceptable**	

Table 4-13: Summary Table of Photographic Log – Station Area Non-Hazardous Waste Landfill

Photo	Description (file name)	Easting	Northing	Date
110	FOX 5 – Station Area NHWL – Overview photo, southeast of landfill, facing northwest (ATT24_Photo24.jpg)	466469.3	7491464.4	6-Aug-2016
111	FOX 5 – Station Area NHWL – Crest edge, south corner, facing northeast (ATT25_Photo25.jpg)	466415.9	7491562.2	6-Aug-2016
112	FOX 5 – Station Area NHWL – Crest edge, east corner, facing northwest – previously observed settlement (Feature F) considered rough grading (ATT26_Photo26.jpg)	466442.3	7491603.7	6-Aug-2016
113	FOX 5 – Station Area NHWL – Crest edge, north corner, facing southwest (ATT27_Photo27.jpg)	466401.0	7491628.3	6-Aug-2016
114	FOX 5 – Station Area NHWL – Crest edge, west corner, facing southeast (ATT28_Photo28.jpg)	466374.4	7491588.4	6-Aug-2016
115	FOX 5 – Station Area NHWL – Northeast slope from north toe facing southeast (ATT29_Photo29.jpg)	466397.3	7491653.1	6-Aug-2016
116	FOX 5 – Station Area NHWL – Southwest slope from toe facing northeast (ATT30_Photo30.jpg)	466371.2	7491556.6	6-Aug-2016
117	FOX 5 – Station Area NHWL – Northeast slope from toe facing northwest (ATT31_Photo31.jpg)	466459.9	7491611.9	6-Aug-2016

Table 4-13: Summary Table of Photographic Log – Station Area Non-Hazardous Waste Landfill

Photo	Description (file name)	Easting	Northing	Date
118	FOX 5 – Station Area NHWL – Northwest slope facing southeast - Motorbike tracks on slope – Previously observed settlement (Feature Q) is likely rough grading and not significant (Acceptable) (ATT32_Photo32.jpg)	466363.8	7491622.9	6-Aug-2016
119	FOX 5 – Station Area NHWL – Crest surface facing southeast – Previously observed vehicle tracks (Feature G) cover most of landfill surface and are not considered significant (Acceptable) (ATT33_Photo33.jpg)	466388.9	7491608.4	6-Aug-2016
120	FOX 5 – Station Area NHWL – Crest in north corner facing northwest – Previously observed settlement (Feature A) may just be rough grading (Acceptable) (ATT86_Photo86.jpg)	466402.1	7491622.9	6-Aug-2016
121	FOX 5 – Station Area NHWL – Crest surface facing northwest – Feature C – steel bolt (Acceptable) (ATT90_Photo90.jpg)	466406.9	7491622.9	6-Aug-2016
122	FOX 5 – Station Area NHWL – Northeast crest facing north – Previously observed settlement (Feature D) is very shallow and not considered significant (Acceptable) (ATT89_Photo89.jpg)	466423.9	7491609.5	6-Aug-2016
123	FOX 5 – Station Area NHWL – Northeast slope facing northeast – Feature E – self armouring erosion (Acceptable) (ATT88_Photo88.jpg)	466429.4	7491612.7	6-Aug-2016
124	FOX 5 – Station Area NHWL – Crest surface facing south – Feature G – tire tracks (Acceptable) (ATT84_Photo84.jpg)	466426.2	7491581.9	6-Aug-2016
125	FOX 5 – Station Area NHWL – Southeast slope facing northwest – Feature H – minor self armouring erosion with fines washed down slope (Acceptable) (ATT94_Photo94.jpg)	466427.4	7491567.0	6-Aug-2016
126	FOX 5 – Station Area NHWL – Southeast slope facing northwest – Feature H – minor self armouring erosion (Acceptable) (ATT96_Photo96.jpg)	466437.2	7491586.7	6-Aug-2016
127	FOX 5 – Station Area NHWL – Southeast slope near toe facing southwest – Feature I – minor settlement (ATT95_Photo95.jpg)	466436.7	7491577.1	6-Aug-2016
128	FOX 5 – Station Area NHWL – Southeast toe facing northwest – Feature J – metal debris (Acceptable) (ATT83_Photo83.jpg)	466428.1	7491547.5	6-Aug-2016
129	FOX 5 – Station Area NHWL – Southwest crest surface facing northwest – Feature K – minor settlement (Acceptable) (ATT92_Photo92.jpg)	466402.6	7491575.4	6-Aug-2016
130	FOX 5 – Station Area NHWL – Southwest slope facing northwest – Feature L – minor weathered cracking (Acceptable) (ATT93_Photo93.jpg)	466407.5	7491558.7	6-Aug-2016

Table 4-13: Summary Table of Photographic Log – Station Area Non-Hazardous Waste Landfill

Photo	Description (file name)	Easting	Northing	Date
131	FOX 5 – Station Area NHWL – Southwest toe facing north – Feature M – bits of metal debris (Acceptable) (ATT91_Photo91.jpg)	466390.6	7491553.8	6-Aug-2016
132	FOX 5 – Station Area NHWL – Southwest toe facing northwest – Feature N – steel cable and bits of metal debris (Acceptable) (ATT102_Photo102.jpg)	466357.8	7491575.1	6-Aug-2016
133	FOX 5 – Station Area NHWL – Northwest slope northwest – Feature O – minor settlement (Acceptable) (ATT101_Photo101.jpg)	466364.1	7491587.5	6-Aug-2016
134	FOX 5 – Station Area NHWL – North crest surface facing northwest – Previously observed settlement (Feature O) area on crest are very shallow depressions and not considered significant (Acceptable) (ATT85_Photo85.jpg)	466396.0	7491598.6	6-Aug-2016
135	FOX 5 – Station Area NHWL – Northwest slope facing southeast – Feature P – minor self armouring erosion (Acceptable) (ATT100_Photo100.jpg)	466373.6	7491598.7	6-Aug-2016
136	FOX 5 – Station Area NHWL – Northwest slope facing southwest– Feature Q – minor settlement (Acceptable) (ATT98_Photo98.jpg)	466383.6	7491613.3	6-Aug-2016
137	FOX 5 – Station Area NHWL – Northwest slope facing northwest – Feature R – minor weathered cracking (Acceptable) (ATT99_Photo99.jpg)	466379.7	7491601.3	6-Aug-2016
138	FOX 5 – Station Area NHWL – Northwest slope facing southeast – Feature S – self armouring erosion channels (Acceptable) (ATT87_Photo87.jpg)	466390.3	7491619.9	6-Aug-2016
139	FOX 5 – Station Area NHWL – Northeast slope facing southeast – Feature E – self armouring erosion channels (Acceptable) (ATT97_Photo97.jpg)	466416.4	7491627.6	6-Aug-2016
140	FOX 5 – Station Area NHWL – MW-15 – monitoring well (ATT2_Photo2.jpg)	466472.3	7491556.4	6-Aug-2016
141	FOX 5 – Station Area NHWL – Soil sampling location MW-15 before excavation (ATT3_Photo3.jpg)	466471.7	7491549.2	6-Aug-2016
142	FOX 5 – Station Area NHWL – Soil sampling location MW-15 after excavation (ATT4_Photo4.jpg)	466471.7	7491549.2	6-Aug-2016
143	FOX 5 – Station Area NHWL – Soil sampling location MW-15 after backfilling (ATT5_Photo5.jpg)	466471.7	7491549.2	6-Aug-2016
144	FOX 5 – Station Area NHWL – MW-16 – monitoring well (ATT7_Photo7.jpg)	466380.2	7491554.4	6-Aug-2016
145	FOX 5 – Station Area NHWL – Soil sampling location MW-16 before excavation (ATT6_Photo6.jpg)	466380.7	7491552.6	6-Aug-2016
146	FOX 5 – Station Area NHWL – Soil sampling location MW-16 after excavation (ATT8_Photo8.jpg)	466380.7	7491552.6	6-Aug-2016

Table 4-13: Summary Table of Photographic Log – Station Area Non-Hazardous Waste Landfill

Photo	Description (file name)	Easting	Northing	Date
147	FOX 5 – Station Area NHWL – Soil sampling location MW-16 after backfilling (ATT9_Photo9.jpg)	466380.7	7491552.6	6-Aug-2016
148	FOX 5 – Station Area NHWL – MW-17 – monitoring well (ATT10_Photo10.jpg)	466365.2	7491630.6	6-Aug-2016
149	FOX 5 – Station Area NHWL – Soil sampling location MW-17 before excavation (ATT11_Photo11.jpg)	466365.2	7491630.6	6-Aug-2016
150	FOX 5 – Station Area NHWL – Soil sampling location MW-17 after excavation (ATT12_Photo12.jpg)	466365.2	7491630.6	6-Aug-2016
151	FOX 5 – Station Area NHWL – Soil sampling location MW-17 after backfilling (ATT13_Photo13.jpg)	466365.2	7491630.6	6-Aug-2016
152	FOX 5 – Station Area NHWL – MW-18 – monitoring well (ATT15_Photo15.jpg)	466402.6	7491660.1	6-Aug-2016
153	FOX 5 – Station Area NHWL – Soil sampling location MW-18 before excavation (ATT14_Photo14.jpg)	466399.6	7491661.1	6-Aug-2016
154	FOX 5 – Station Area NHWL – Soil sampling location MW-18 after excavation (ATT16_Photo16.jpg)	466399.6	7491661.1	6-Aug-2016
155	FOX 5 – Station Area NHWL – Soil sampling location MW-18 after backfilling (ATT17_Photo17.jpg)	466399.6	7491661.1	6-Aug-2016
156	FOX 5 – Station Area NHWL – MW-19 – monitoring well (ATT19_Photo19.jpg)	466440.8	7491642.0	6-Aug-2016
157	FOX 5 – Station Area NHWL – Soil sampling location MW-19 before excavation (ATT18_Photo18.jpg)	466441.9	7491641.3	6-Aug-2016
158	FOX 5 – Station Area NHWL – Soil sampling location MW-19 after excavation (ATT20_Photo20.jpg)	466441.9	7491641.3	6-Aug-2016
159	FOX 5 – Station Area NHWL – Soil sampling location MW-19 after backfilling (ATT21_Photo21.jpg)	466441.9	7491641.3	6-Aug-2016

4.3.3 Summary of Sampling Deviations

The field work was conducted as per the TOR with the following exceptions:

- The deep soil sample at MW-16 could not be collected due to refusal on rock;
- PCB could not be analyzed from the groundwater sample at MW-17 due to insufficient recovery of water; and,
- The groundwater sample at MW-18 could not be collected because the well was dry.

4.3.4 Soil Sampling

Table 4-14 presents a summary of analytical results for soil samples collected at the Station Area Non-Hazardous Waste Landfill. MW-15 and MW-16 represent upgradient sampling locations, whereas MW-17, MW-18 and MW-19 represent downgradient sampling locations.

Table 4-14 also lists the arithmetic mean background and baseline values for the landfill, in addition to the baseline mean plus 3σ limits. The background arithmetic means for copper, nickel, zinc, arsenic and mercury at this landfill are greater than the baseline arithmetic means. The background arithmetic mean for mercury also exceeds the baseline mean plus 3σ limit.

MW-15

Sampling location MW-15 is located upgradient (cross-gradient) of the landfill, approximately 46 m east of the toe. The estimated elevation of this sampling point is 571.5 masl. As shown in Photos 141 and 142, the area consists of boulders and rocks, infilled with sand and gravel and is not vegetated. The soils consisted of a brown sand, gravel and stone.

For the shallow sample at MW-15 (0-15 cm), the concentrations of all metals were less than those reported between 2009 and 2014. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-15 (30-40 cm), the concentrations of all metals were less than or similar to those reported between 2009 and 2014. The concentration of chromium (33.2 mg/kg) marginally exceeded the baseline mean concentration plus 3σ (32 mg/kg), but remained slightly less than the historical maximum concentration reported in 2009 (35 mg/kg); none of the other reported values exceeded their respective baseline mean concentrations plus 3σ. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016.

MW-16

Sampling location MW-16 is located upgradient of the landfill, approximately 16 m southwest of the toe. The estimated elevation of this sampling point is 571 masl. As shown in Photos 145 and 146, the area consists of sand and gravel with some rocks and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-16 (0-15 cm), the concentrations of most metals were similar to those reported in previous years, with the exception of zinc (103 mg/kg), which exceeded the baseline mean concentration plus 3σ (80.0 mg/kg) and represents a new historical maximum concentration. The concentration of copper (19.4 mg/kg) approached the baseline mean concentration plus 3σ (19.5 mg/kg), but remained less than the historical maximum concentration reported in 2009 (39 mg/kg); none of the other reported values exceeded their respective baseline mean concentrations plus 3σ. The modified TPH concentration of 80.5 mg/kg was similar to the range of concentrations reported in previous years (21 mg/kg to 264 mg/kg). No cadmium, arsenic, mercury, or PCB were detected at this location in 2016. It is noted that PCB concentrations of 0.03 mg/kg and 0.022 mg/kg were reported at this location in 2012 and 2014, respectively.

MW-17

Sampling location MW-17 is located downgradient of the landfill, approximately 14 m northwest of the toe. The estimated elevation of this sampling point is 567 masl. As shown in Photos 149 and 150, the area consists of sand and gravel with some boulders and rocks and is sparsely vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow sample at MW-17 (0-15 cm), the concentrations of all metals were within the range of concentrations reported in previous years. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-17 (30-40 cm), the average concentrations of most metals were less than or similar to those reported in previous years. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-18

Sampling location MW-18 is located downgradient of the landfill, approximately 10 m north of the toe. The estimated elevation of this sampling point is 566.5 masl. As shown in Photos 153 and 154, the area consists of boulders and rocks, infilled with sand and gravel and is not vegetated. The soils consisted of brown sand with some gravel and stone.

For the shallow samples at MW-18 (0-15 cm, duplicate location), the calculated RPD values indicated the original and duplicate results differ by greater than 30% for copper, zinc and chromium and these results should therefore be interpreted with caution. The average concentrations of all metals, with the exception of arsenic were less than those reported in 2014. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-18 (40-50 cm), the concentrations of all metals, with the exception of lead, were less than those reported in 2014. All metals concentrations are less than or similar to those reported from 2007 to 2012. No cadmium, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

MW-19

Sampling location MW-19 is located downgradient of the landfill, approximately 16 m north of the toe. The estimated elevation of this sampling point is 567 masl. As shown in Photos 157 and 158, the area consists of boulders and rocks, infilled with sand and gravel and is not vegetated. The soils consisted of brown sand with some gravel.

For the shallow sample at MW-19 (0-15 cm), the concentrations of all metals, with the exception of lead, were less than or similar to those reported in previous years. The slight increase in the concentration of lead represents the maximum concentration detected at this location, but remains below the baseline concentration. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

For the deep sample at MW-19 (40-50 cm), the concentrations of most metals were similar to those reported in 2012 and 2014 but less than those in 2009. Similar to the shallow sample, the slight increase in the concentration of lead represents the maximum concentration detected at this location, but remained below the baseline concentration. No cadmium, arsenic, mercury, PHC or PCB were detected at this location in 2016. None of the reported values exceeded their respective baseline mean concentrations plus 3σ.

Table 4-14: Soil Chemical Analysis Results – Station Area Non-Hazardous Waste Landfill

ID	Depth (cm)	Cu (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Cr (mg/kg)	As (mg/kg)	Hg (mg/kg)	Total PCBs (mg/kg)	F1 (mg/kg)	F2 (mg/kg)	F3 (mg/kg)	F4 (mg/kg)
Background Mean		10	5.3	4.0	1.0	5.0	46	19	1.93	0.5	0.001	NA	NA	NA	NA
Baseline Mean		**8.6**	**5.0**	**5.0**	**1.0**	**10**	**35**	**20**	**1.8**	**0.10**	**0.003**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		19.5	12.8	10.1	1.0	70.0	80.0	32.0	3.6	0.10	0.60	NA	NA	NA	NA
Upgradient															
MW-15b	0-15	**14.6**	**10.9**	**6.3**	<0.5	4.4	**37.1**	**30.8**	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-15a	30-40	**17**	**12.4**	**7**	<0.5	5.6	**41.1**	**33.2**	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-16a	0-15	**19.4**	**7.7**	**6.3**	<0.5	**19.8**	**103**	19.7	<1.0	<0.1	<0.05	<7	18	59	33
MW-16 (deep) [1]															
Downgradient															
MW-17b	0-15	**8.9**	**7.5**	**5.2**	<0.5	8.1	**46.4**	17.1	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-17a	30-40	7.0	**5.7**	4.2	<0.5	6.0	**40.1**	14.3	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-18b	0-15	5.3	4.2	3.1	<0.5	5.3	28.6	10.5	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-18b dup	0-15	**9**	**6**	4	<0.5	6	**45**	15	**3**	<0.10	<0.05	<5	<10	<50	<50
MW-18b (Dup Avg)	0-15	7	5.1	3.6	<0.5	5.7	**37**	13	**2**	<0.1	<0.05	<6	<7	<29	<28
MW-18a	40-50	5.5	4.3	3.3	<0.5	6.8	29.7	10.7	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-19b	0-15	**8.7**	**6**	4.1	<0.5	7.2	33.4	15.1	<1.0	<0.1	<0.05	<7	<4	<8	<6
MW-19a	40-50	7.3	**5.8**	3.8	<0.5	6	33.2	14.1	<1.0	<0.1	<0.05	<7	<4	<8	<6

Notes:

NA: Not available; ID: Soil sample location ID.

Underlined values: Results exceed Background arithmetic mean.

Bold Values: Results exceed Baseline arithmetic mean.

Shaded Values: Results exceed the Baseline arithmetic mean plus 3σ.

1: The deep soil sample at MW-16 could not be collected due to refusal.

4.3.5 Groundwater Sampling

Groundwater sampling and monitoring well inspection field records are included in Appendix B. Table 4-15 presents a summary of groundwater levels and analytical results for groundwater samples collected at the Station Area Non-Hazardous Waste Landfill.

MW-15

The depth to groundwater measured at MW-15 in 2016 was 0.78 m below grade. No metals, PHC or PCB were detected at this location in 2016.

MW-16

The depth to groundwater measured at MW-16 in 2016 was 1.32 m below grade. The concentration of zinc, the only metal detected at MW-16, was less than those observed in previous years and was well below the baseline mean concentration plus 3σ. No PHC or PCB were detected at this location in 2016.

MW-17

The depth to groundwater measured at MW-17 in 2016 was 1.20 m below grade. No metals or PHC were detected at this location in 2016. PCB could not be analyzed from the groundwater sample at MW-17 due to insufficient recovery of water. It was noted on the groundwater sampling field sheets in Appendix B that a PCB sample was collected at MW-17 but no PCB sample could be collected at MW-19 due to insufficient recovery of water. Therefore the reported PCB lab result for MW-19 may be for MW-17, however it was decided to report the results as recorded on the laboratory chain of custody sheets and bottles. No PCB were detected in the MW-19 sample.

MW-19

The depth to groundwater measured at MW-19 in 2016 was 1.19 m below grade. No metals, PHC or PCB were detected at this location in 2016.

Table 4-15: Monitoring Well Groundwater Levels and Groundwater Chemical Analysis Results - Station Area Non-Hazardous Waste Landfill

ID	GW Depth BGS (m)	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCBs (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Baseline Mean		**0.036**	**0.075**	**0.010**	**0.001**	**0.01**	**0.097**	**0.116**	**0.003**	**0.004**	**0.00002**	**NA**	**NA**	**NA**	**NA**
Baseline + 3σ		0.093	0.186	0.040	0.001	0.01	0.322	0.368	0.009	0.004	0.00002	NA	NA	NA	NA
Upgradient															
MW-15	0.78	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
MW-16	1.32	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.01	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
Downgradient															
MW-17	1.20	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	NA [1]	<0.025	<0.100	<0.100	<0.100
MW-18 [2]															
MW-19	1.19	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.0005	<0.025	<0.100	<0.100	<0.100

Notes:
ID: Monitoring well location ID.
GW: Groundwater.
BGS: Below ground surface.
NA: Not available
Bold Values: Results exceed Baseline arithmetic mean.
1: PCB could not be analyzed from the groundwater sample at MW-17 due to insufficient recovery of water.
2: The groundwater sample at MW-18 could not be collected because the well was dry.

4.3.6 Conclusions and Overall Performance of the Station Area Non-Hazardous Waste Landfill

The Station Area NHWL exhibited some observed minor settlement, self-armouring erosion, cracking, tire tracks and debris. No ponded water, exposed waste or indications of slope instability were observed during the 2016 visual inspection. The previously observed minor settlement and self-armouring erosion does not appear to have changed since the last inspection and is not considered to be of concern. Previously observed cracking is weathered, does not appear to have changed since the last inspection and is not considered of concern. Previously observed steel cable and metal debris are not exposed buried waste. Previously observed tire tracks on the landfill surface do not appear to have changed since the last inspection and are not considered of concern. The Station Area NHWL was assessed to have an “Acceptable” overall performance because all observed features were assessed as “Acceptable”.

In 2016, soil samples were collected from 11 of the 12 scheduled locations. At upgradient location MW-16, the concentrations of most metals were similar to those reported in previous years, with the exception of zinc, which exceeded the baseline mean concentration plus 3σ and represents a new historical maximum concentration. The concentration of chromium at the deep upgradient (cross-gradient) MW-15 sample location also marginally exceeded the baseline mean concentration plus 3σ, but remained less than the historical maximum concentration reported in previous years. PHC were only detected at the MW-16 sampling location; the modified TPH concentration of 80.5 mg/kg was similar to the range of concentrations reported in previous years (21 mg/kg to 264 mg/kg). The concentrations of most metals in soil were highest overall at the deep MW-15 sampling location, located upgradient of the eastern toe and at the shallow MW-16 sampling location, located upgradient of the western toe. No detectable concentrations of cadmium, mercury or PCB were noted in any of the soil samples in 2016.

In 2016, groundwater samples were collected from four of five monitoring wells adjacent to the landfill. The concentration of zinc at MW-16, the only parameter detected at any of the four locations sampled, was less than those observed in previous years.

Comparison of groundwater elevations based on estimated grade elevation and the measured water depth in the wells indicates that groundwater in was highest at MW-15, and lowest towards the south at MW-18, which follows the topography in the area.

The historical graphs in Appendix C show concentration trends at the Main Landfill. The graphs indicate that relatively stable or slight decreasing trends are observed for most parameters at downgradient monitoring locations MW-17, MW-18 and MW-19. Slight increasing trends are observed for a number of metals (i.e. nickel, cobalt, lead, zinc and chromium) at the upgradient monitoring locations, which are largely attributed to increases at MW-16. Given that the environmental sampling results are largely the same as the previous sampling sessions, there is no evident impact of the landfill on soil quality. Similarly, there does not appear to be significant impact to groundwater quality from the landfill at the monitoring wells adjacent to the landfill.

4.3.7 Recommendations for the Station Area Non-Hazardous Waste Landfill

No modifications to the ongoing monitoring program at this landfill are recommended.

5.0 QA/QC RESULTS

The results of the QA/QC program described in Section 3.3 are discussed herein. The results are described in terms of accuracy, reliability (blank analysis) and reproducibility (duplicate analysis).

The five DEW Line sites visited in 2016 were executed as a single field program using standard operating procedures which were consistent for all sites in the field program. The QA/QC analysis below contains both program-level (applicable to all five sites) and site-level discussions, which focus on the FOX-5 site. The laboratory reports related to the QA/QC discussion are contained in Appendix C.

5.1 Sample Hold Times

The generally accepted hold times for the parameters analyzed in this program are:

- Metals in soil: 180 days, metals in water: 60 days;
- Mercury in soil and water: 28 days;
- PCB in soil: 365 days, PCB in water: 14 days;
- PHC-F1 in soil: 48 hours (if unpreserved), PHC-F1 in water: 7 days; and,
- PHC F2-F4 in soil: 14 days, PHC F2-F4 in water: 7 days.

At FOX-5, the soil sampling was carried out on August 6-7, 2016. The soil samples were all received at Paracel and AGAT on August 16, 2016 and analysis commenced the following day, which was eleven days post sampling for those collected on August 6th.

Maximum hold times were exceeded for PHC-F1 (soil) due to its very short hold time of 48 hours. The very short hold time for unpreserved PHC-F1 in soil is a known issue but it has been decided to not preserve this parameter in order to maintain consistency with earlier years and data in the program. The hold times for PHC F2-F4 were all met for soil.

The groundwater sampling was carried out on August 6-7, 2016. The groundwater samples were received at Paracel and AGAT on August 16, 2016 and analysis commenced that day, which was ten days post sampling for those collected on August 6th. The maximum hold times were exceeded for PHC F1-F4 for the groundwater samples collected at FOX-5

5.2 Accuracy

Accuracy is a measure of how close a measured value is to the true value. The accuracy of the laboratory data is generally evaluated by the laboratory through the use of matrix spikes or surrogate recoveries. For the FOX-5 samples, Paracel performed two spike analyses on water and one on soil. The spike recoveries for soil met the acceptable data quality objectives. The spike recoveries for groundwater were well within the acceptable range and therefore met the acceptable data quality objectives. AGAT also performed matrix spikes on the batch that included FOX-5 soil and water samples and all of their results were within their own data quality objectives.

Paracel performed lab blanks for soil and water, and all were all non-detect. AGAT also performed lab blanks in the batch that included FOX-5 soil and water samples and all of their results were non-detect. All spike recoveries for the monitoring program are within the acceptable limits and the accuracy of the results is considered acceptable on this basis.

5.3 Reliability

Reliability is a measure of certainty that the concentrations reported by the labs are reliable indicators of field conditions and have not been affected other sources of contamination such as ambient air or cross-contamination from other samples. The analysis of blanks provides a measure of reliability. A set of bottles of deionized water from Paracel accompanied the team on the entire 2016 monitoring program as a Trip Blank. These bottles were not opened at the sites. The analytical reports from Paracel indicate that no parameters were detected in the Trip Blank. One Field Blank was prepared on the 2016 program. Sample bottles were filled with distilled water in the field at FOX-2. No parameter was detected in the Field Blank.

Two Equipment Blanks were prepared for the 2016 program: one to test the decontamination of the groundwater probe, and the other to test the decontamination of the soil sample trowel. No parameters were detected in the Shovel Blank. Zinc was the only parameter detected in the Probe Blank, at a concentration (0.006 mg/L) marginally above the MDL of 0.005 mg/L. The Trip Blank, Field Blank and two Equipment Blank sample results are summarized in the table below.

Blank Samples

ID	Cu (mg/L)	Ni (mg/L)	Co (mg/L)	Cd (mg/L)	Pb (mg/L)	Zn (mg/L)	Cr (mg/L)	As (mg/L)	Hg (mg/L)	Total PCB (mg/L)	F1 (mg/L)	F2 (mg/L)	F3 (mg/L)	F4 (mg/L)
Trip Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
Field Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	NA	NA	NA
Shovel Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100
Probe Blank	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.006	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	<0.100

Note: NA – Not analyzed.

The Trip Blank, Field Blank and two Equipment Blank sample results indicate that the laboratory results from the 2016 monitoring program were not affected by external influences associated with sampling, storage and transport.

5.4 Reproducibility (Duplicate Analysis)

The reproducibility of lab results was measured through the testing of field duplicate samples. Duplicate soil samples were prepared in the field by mixing up a homogeneous batch of soil in the test pit being sampled, and taking portions of soil and alternately filling the sample jars for the two labs. Duplicate groundwater samples were prepared by alternately filling bottles for each lab for each parameter type.

The labs also performed internal duplicate analysis. Paracel performed a duplicate analysis of soil, which indicated all duplicate pairs met the program's targets and a maximum RPD of 13.5% was achieved. Paracel also completed a duplicate analysis for groundwater and all duplicate pairs met the program's targets, with the exception of arsenic which had an RPD of 22.7%, however the results of both original and duplicate analysis were less than five times the MDL and RPD is less meaningful when both sets of results are less than five times the MDL. AGAT performed a duplicate analysis of parameters in soil; a maximum RPD of 11.8% was achieved. AGAT also performed a duplicate analysis of parameters in groundwater, however no parameters were detected and therefore no RPD were calculated, and thus their duplicates met the program requirements.

The total number of original soil samples collected for the 2016 program was 213, for which 21 duplicate soil samples were prepared and analyzed, providing a duplicate ratio of approximately 10%. A total of 41 groundwater samples were collected and six duplicates were analyzed, which is a duplicate ratio of greater than 10% for each site and for the program. The distribution of duplicate soil and groundwater samples over the five sites is provided in the table below.

Two soil duplicates and one groundwater duplicate were prepared at FOX-5.

Soil Samples and Duplicates

	DEW Line Site					Totals
	DYE-M	FOX-2	FOX-3	FOX-4	FOX-5	
Soil Samples Collected	93	31	31	34	24	213
Duplicate Soil Samples	7	4	4	4	2	21
Percent	8%	13%	13%	12%	8%	10%

Groundwater Samples and Duplicates

	DEW Line Site					Totals
	DYE-M	FOX-2	FOX-3	FOX-4	FOX-5	
Monitoring Well Sampled	9	9	7	7	9	41
Duplicate Groundwater Samples	2	1	1	1	1	6
Percent	22%	11%	14%	14%	11%	15%

To determine the reproducibility of the original and duplicate sample results, the RPD was calculated according to the following equation:

$$RPD = \frac{|x_2 - x_1|}{\left(\frac{x_1 + x_2}{2}\right)} \times 100\%$$

Where, x_1 and x_2 are the original and duplicate concentrations of a given parameter in a pair. RPD can only be calculated if concentrations of given parameters are greater than the analytical method detection limits (MDL) in both the duplicate and original samples of the pair. Additionally, the RPD calculation is less meaningful when the reported concentrations are less than five (5) times the MDL. RPD have been calculated wherever the concentrations of a parameter were five (5) times greater than the MDL in both the original and duplicate samples. Sample RPD were calculated by taking the average of the parameter RPD for a given sample-duplicate pair, and a program-level RPD was calculated by taking the average of all sample RPD to arrive at a program-wide indication of repeatability.

The TOR sets a data quality objective (DQO) for the RPD in soil and groundwater between a sample and its blind field duplicate of 30%. A discussion or the RPD for the program and at FOX-5 is provided below.

5.4.1 Soil Samples

Organics and PCB

Program Level Interpretation

The PCB concentrations were below the detection limit for all of the duplicate pairs of soil samples in the program.

PHC F3 was detected in five samples in the program and PHC F2 was detected in one of those five samples. In each case, it was the sample analyzed by Paracel, whereas the duplicate sample analyzed by AGAT did not. Paracel's MDL was equal to the program's requirement whereas AGAT's MDL was higher and they showed no exceedance of their MDL. . None of the above are at concentrations that are greater than five times the program MDL therefore RPD were not calculated.

Metals

Program Level Interpretation

Mercury and cadmium concentrations were below detection limits for all 21 original and duplicate pairs in the program.

RPD calculations were undertaken for the seven remaining metals (copper, nickel, cobalt, lead, zinc, chromium and arsenic) for the 21 pairs of duplicate soil samples. The program-level average RPD for the soil sample duplicate analysis was 18%, which met the specified data quality objective for field duplicates for inorganics of 30%.

Two of the 21 soil sample pairs in the program had a sample average RPD of over 30%; one of which was collected at FOX-5. Fifteen parameter pairs exhibited an RPD of over 30%; three of them were at FOX-5. Overall, the most frequent metals to have an RPD over 30% were zinc, copper and nickel. The results for the samples analyzed by AGAT exhibited generally higher metals concentrations in 15 cases; Paracel's overall concentrations were higher in four cases, and in two cases it was evenly spilt. There appears to be a bias, in that results from AGAT were generally higher than those of Paracel but this does not impact interpretation of the results.

Site Level Interpretation

From the two soil sample duplicates taken at FOX-5 there were 14 potential parameter pairs for RPD analysis (7 metals for a total of 2 samples). Cadmium and mercury were not detectable in any of the samples. As shown in the table below, 9 of the 14 potential metal parameter pairs exhibited concentrations greater than five times the MDL in both the original and duplicate, and therefore nine individual RPD were calculated. The individual RPD ranged from 1% to 52%. Three RPD exceeded 30% (copper, zinc and chromium at MW-18b). Copper exhibited the highest RPD, from 14% to 52% and nickel was the lowest, at 1%. The average of the nine RPD calculations from the two samples was just 20%, which was on the low side of the range of RPD in the program and met the field data quality objective of less than 30%. The table below summarizes the metals results and RPD calculations for FOX-5.

Six of the nine individual RPD at FOX-5 were below 30%, and three were over 30% (copper, zinc and chromium at MW-18b (52%, 45% and 35%, respectively). The average RPD for FOX-5 was 20%. In light of the relatively low average RPD, it concluded that the reproducibility of the soil sample results at FOX-5 was acceptable, however the affected results from MW-18b should be interpreted with caution.

Relative Percent Difference Analysis of Soil Data at FOX-5

		Parameter Concentrations (mg/kg)								
Sample ID	**Lab**	**Cu**	**Ni**	**Co**	**Pb**	**Zn**	**Cr**	**As**	**Sample Average RPD**	**Any Over 30%?**
MDL		<1	<1	<1	<1	<1	<1	<1		
MW-7a	Paracel	7.8	6.9	**4.6**	7.4	39.3	16.1	**<1.0**	7%	no
MW-7a (duplicate)	AGAT	9	7	**4.2**	7	41	15	**2**		
RPD		14%	1%		6%	4%	7%			
MW-18b	Paracel	5.3	**4.2**	**3.1**	5.3	28.6	10.5	**<1.0**	36%	3 (Cu, Zn, Cr)
MW-18b (duplicate)	AGAT	9	6	**4**	6	45	15	**3**		
RPD		**52%**			12%	**45%**	**35%**			
									20%	3

Note: Parameters with concentrations <5 x MDL are **bold and highlighted yellow**.

5.4.2 Groundwater Samples

Organics and PCB

The PHC F1-F4 results for all six of the duplicate pairs of groundwater samples in the program were below the detection limit and all PCB concentrations were below the detection limit. The reliability of these results is therefore considered acceptable.

Metals

Program Level Interpretation

Mercury was not detected in any original-duplicate groundwater pair; the reproducibility of the results is therefore considered acceptable. Six groundwater duplicate samples for a total of eight metals detected at greater than the MDL in one or more samples, resulted in 48 potential parameter pairs for duplicate analysis via RPD calculation. The metals concentrations were very low overall; in fact 33 of the possible 48 pairs exhibited one or both values less than five times the MDL and therefore, in addition to analyzing the QC by RPD analysis it is noted that of the 48 parameter pairs, there were:

- 22 pairs where both labs reported non-detect for the same metals in the parameter pair (good repeatability);
- 10 pairs where one lab reported non-detect and the other lab reported a value less than five times the MDL for the pair (good repeatability);
- 1 pair where both labs reported values that were less than five times the MDL (good repeatability);
- 10 pairs where both labs reported values that were greater than five times the MDL, so an RPD could be calculated. Of those:
    - 6 were under 30% (good repeatability)
    - 4 were over 30% (poor repeatability); and,
- 5 pairs where one lab reported a value less than five times the MDL and the other lab reported a value over five times the MDL and the RPD was over 30% (poor repeatability).

The average of the 10 RPD calculated for analysis of metals in water was 50%, which exceeds the data quality objective of 30%. This however omits the 38 other parameter pairs. A broader representation of program level RPD can be achieved by including all parameter pairs which either had values reported or were non-detect in both parameters. This leaves out only the 10 pairs where one member was non-detect. An RPD of zero has been assigned to pairs for which both members were non-detect. Using this metric, the program level RPD is 26%.

Site Level Interpretation

At FOX-5, the duplicate groundwater sample was collected at MW-5, located at the Middle Site Area landfills. Copper, nickel, cobalt, cadmium, lead, chromium, arsenic and mercury were non-detect in both samples collected at this monitoring location, therefore they were excluded from the RPD calculations. As shown in the table below, there were no groundwater parameter pairs for which the concentrations in the original and duplicate were over five times the MDL. The reproducibility of the groundwater data at FOX-5 is not of concern.

Relative Percent Difference Analysis of Groundwater Data at FOX-5

		Parameter Concentrations (mg/L)		
Sample ID	**Lab**	**Zn**	**Average RPD**	**Any Over 30%?**
MDL		<0.005		
MW-5	Paracel	**<0.005**	-	-
MW-5 (Duplicate)	AGAT	**0.005**		
RPD				

Note: Parameters with concentrations <5 x MDL are **bold and highlighted yellow**.

5.4.3 Overall Lab Data Reproducibility

Based on a sample average of the field RPD for soil of 20% and considering that only three individual soil parameter pairs exhibited an RPD slightly over 30%, it is concluded that that the lab data is acceptable. For the duplicate groundwater sample taken at FOX-5, there were no groundwater parameter pairs for which the concentrations in the original and duplicate were over five times the MDL. It is noted that the concentrations of cadmium, lead, chromium, arsenic and mercury arsenic were non-detect in both samples at the two groundwater duplicate locations, which suggests the lab data is acceptable.

5.5 QA/QC Conclusions

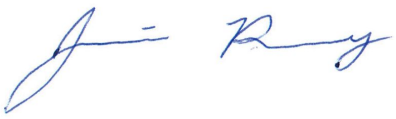
The QA/QC analysis has shown that:

- Achieving maximum hold times of PHC F1 in soil and PHC F1-F4 are often not possible given the logistics of transport from the remote site location unless samples are field preserved (for PHC F1);
- With the exception of zinc detected marginally over the MDL in the Probe Blank, the concentrations of parameters in the two Equipment Blanks and one Field Blank were non-detect, as they should be to indicate that no spurious contaminates were biasing the samples while in transit;
- The duplicate analyses for soil met the program field data quality objectives; and,
- The duplicate analyses for water met the program field data quality objectives.

Report Signature Page

We trust that this Monitoring Report meets the Project requirements of DND. Please direct any questions to the undersigned.

GOLDER ASSOCIATES LTD.



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APPENDIX A

Report Limitations

REPORT LIMITATIONS

This report has been prepared as an assessment of the environmental condition and visual inspection of the subject site. The monitoring program described in this report was conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practising under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. The scope of work was carried out in accordance with the agreement between Golder Associates Ltd. and the client.

The assessment of environmental conditions at this Site has been made using the results of chemical analysis of soil and groundwater from a limited number of locations. The Site conditions between sampling locations have been inferred based on conditions observed at sampling locations. Subsurface conditions may vary from those encountered at the sample locations. Additional study, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of study. However, it is never possible, even with exhaustive sampling and testing, to dismiss the possibility that part of a Site may be contaminated and remain undetected. Visual inspection comments are based on observed conditions at the time of the inspection and may change with time.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibility of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on the information contained in this report.

The content of this report is based on information collected during our monitoring program, our present understanding of the Site conditions, and our professional judgement in light of such information at the time of writing this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

APPENDIX B

Field Records

Thermistor Inspection Record Sheets

Monitoring Well Sampling Logs

Soil Sampling Record Sheets

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-1**	Inclination:	76 degrees		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **466017.8**	E **7492251**	Elev	
Length of Cable (m)		Cable Lead Above Ground (m)			
Datalogger Serial #	**2020264**	Nodal Points	12		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Beads 2 and 3 appear damaged
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main	11.34	Aux 13.50

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	1.44	16.60	9	0.82	-4.04
2	-	-	10	0.80	-4.50
3	-	-	11	0.78	-5.20
4	0.97	0.84	12	0.78	-5.50
5	0.92	-0.88			
6	0.88	-1.80			
7	0.86	-2.60			
8	0.84	-3.40			

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-2**	Inclination:	77 degrees		
Datalogger model no:		Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **466005.8**	E **7492245**	Elev	
Length of Cable (m)	**5**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020228**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.67	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.34	13.14
2	1.21	9.01
3	1.05	3.60
4	0.95	0.30
5	0.91	-0.82
6	0.88	-1.80
7	0.86	-2.70
8	0.84	-3.35

Bead	ohms	Degrees C
9	0.83	-3.90
10	0.81	-4.50
11	0.79	-5.20

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-3**	Inclination:	70 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **466027.8**	E **7492236**	Elev	
Length of Cable (m)	**6.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020255**	Nodal Points	15		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.68	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	1.44	16.70	9	0.91	-1.10
2	1.38	14.80	10	0.88	-2.00
3	1.44	16.60	11	0.86	-2.90
4	1.50	18.70	12	0.84	-3.60
5	1.44	16.70	13	0.82	-4.20
6	1.22	8.90	14	0.80	-4.70
7	1.06	4.10	15	0.79	-4.9000
8	0.95	0.12			

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-4**	Inclination:	63 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **466016.5**	E **7492231**	Elev	
Length of Cable (m)	**6.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020265**	Nodal Points	13		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Bead 3 not working
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.63	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	1.42	15.88	9	0.87	-2.45
2	1.41	15.71	10	0.73	7.02
3	-	-	11	0.84	-3.50
4	1.31	12.25	12	0.81	-4.50
5	1.18	8.10	13	0.78	-5.30
6	1.02	2.86			
7	0.93	-0.25			
8	0.90	-1.32			

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-5**	Inclination:	84 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **465998.9**	E **7492219**	Elev	
Length of Cable (m)	**6.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020265**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Beads 1-3 not working
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.75	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	-	-
2	-	-
3	-	-
4	1.02	2.50
5	0.93	-0.30
6	0.90	-1.30
7	0.87	-2.30
8	0.85	-2.80

Bead	ohms	Degrees C
9	0.83	-3.70
10	0.80	-4.70
11	0.78	-5.20

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 6 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-6**	Inclination:	84 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **465905.2**	E **7492194**	Elev	
Length of Cable (m)	**4.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020256**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Beads 1-2 not working
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.99	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	-	-	9	0.80	-4.66
2	-	-	10	0.78	-5.36
3	1.05	3.43	11	0.78	-5.54
4	0.95	0.06			
5	0.91	-0.94			
6	0.88	-2.06			
7	0.85	-2.88			
8	0.83	-3.87			

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

Memory used 78% before reprograming

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 6 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-7**	Inclination:	85 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **465948**	E **7492128**	Elev	
Length of Cable (m)	**4.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020257**	Nodal Points	11		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.38	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.55	20.60
2	1.23	9.35
3	0.96	0.76
4	0.92	-0.61
5	0.90	-1.40
6	0.87	-2.30
7	0.85	-3.20
8	0.81	-4.35

Bead	ohms	Degrees C
9	0.80	-4.80
10	0.78	-5.50
11	0.77	-5.70

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Darrin Johnson	Inspection Date:	August 6 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-8**	Inclination:	87 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **465962.2**	E **7492104**	Elev	
Length of Cable (m)		Cable Lead Above Ground (m)			
Datalogger Serial #		Nodal Points	10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.75	

Manual Ground Temperature Readings

Bead	ohms	Degrees C	Bead	ohms	Degrees C
1	1.31	12.30	9	0.74	-5.27
2	1.08	4.60	10	0.78	-5.53
3	0.94	0.06			
4	0.91	-0.94			
5	0.88	-1.90			
6	0.86	-2.78			
7	0.83	-3.71			
8	0.82	-4.85			

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Kevin Rattray	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-9**	Inclination:	86 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **461848.5**	E **7493615**	Elev	
Length of Cable (m)	**4.4**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020261**	Nodal Points	10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Bead 4 not working
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.25	10.06
2	1.21	8.73
3	0.93	3.99
4	-	-
5	0.90	-0.58
6	0.86	-1.43
7	0.86	-2.78
8	0.84	-3.73

Bead	ohms	Degrees C
9	0.82	-4.14
10	0.81	-4.01

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Kevin Rattray	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-10**	Inclination:	86 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **461861.7**	E **7493641**	Elev	
Length of Cable (m)	**4.4**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020230**	Nodal Points	10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	☐	X	Beads 2 and 5 not working
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main	11.34	Aux 13.38

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.27	10.90
2	-	-
3	1.23	9.60
4	1.18	7.70
5	-	-
6	0.95	0.14
7	0.90	-1.50
8	-2.52	0.87

Bead	ohms	Degrees C
9	0.84	-3.30
10	0.83	-3.70

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Kevin Rattray	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-11**	Inclination:	90 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:			
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **461823.7**	E **7493642**	Elev	
Length of Cable (m)	**3.8**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020120**	Nodal Points	9		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.14	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.26	10.35
2	1.23	9.57
3	1.29	11.37
4	1.25	10.16
5	1.13	6.81
6	0.96	0.63
7	0.92	-0.67
8	0.87	-2.21

Bead	ohms	Degrees C
9	0.86	-2.75

Battery Information

Batteries changed ? Yes [ ] No [x] Monitoring Year:

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name:	Kevin Rattray	Inspection Date:	August 7 , 2016
Inspector Signature / Prepared By:			

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name:	**FOX-5**	Landfill:	Main Landfill		
Thermistor Number:	**VT-12**	Inclination:	90 degrees		
Datalogger model no:	**RX-16**	Datalogger cable download model:		USB	
*Install Date:	**Unknown**	First Date Event		Last Date Event	**7-Aug-16**
*Coordinates and Elevation		N **461796.5**	E **7493670**	Elev	
Length of Cable (m)	**7**	Cable Lead Above Ground (m)	3		
Datalogger Serial #	**2020270**	Nodal Points	**not recorded**		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	X	☐	
Cover	X	☐	
Data Logger	X	☐	
Cable	X	☐	
Beads	X	☐	
Lock condition	☐	X	Replaced with new one
Battery Installation Date	**2016**		
Battery Levels	Main 11.34	Aux 13.14	

Manual Ground Temperature Readings

Bead	ohms	Degrees C
not recorded in field		

Bead	ohms	Degrees C

Battery Information

Batteries changed ? Yes [x] No [ ] Monitoring Year: 2016

Battery model number installed: new ULB1 and ULB15

Expected battery life (years): 2023

Datalogger Programming (Describe programming completed; beads and frequency)

Reprogramed to 24hr sampling rate.

Observations and Proposed Maintenance

VT-12 reinstalled Aug 7, 2016

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-5 Middle Site
Sample Number(s) include dups.: All plus Dup
Bottles filled (by parameter type) All plus Dup
Date of Sampling Event: 7 August 2016 Time: 10:00
Weather Slight wind and fog, +5
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground.
Lock (condition, presence, model, manufacturer): Changed to crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			51
Static water level (cm) from top of pipe:			147.5
Static water level (cm) (below ground surface) calculated:			205.5
Measured well refusal depth (cm) (measured after sampling from top of pipe):			205
Thickness of water column (cm):	57.5	Static Volume of water in well (mL):	874
Free product thickness (mm):	-	Evidence of Sludge or siltation:	No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 3min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	7.14	7.05	6.81	6.56
Conductivity (mS/cm)	0.037	0.038	0.035	0.035
Turbidity (NTU)	0	0	0	0
Temperature (degC)	8.03	6.89	6.26	5.28

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Soap and water, decon interface
Number of washes: - Number of rinses: -

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-6 Middle Site
Sample Number(s) include dups.: -
Bottles filled (by parameter type) Partial
Date of Sampling Event: 7 August 2016 Time: 11:30
Weather Cloud over, fog, breeze from north, +5
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground and loose bolders.
Lock (condition, presence, model, manufacturer): Changed to crown (broke)

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 65
Static water level (cm) from top of pipe: 191.5
Static water level (cm) (below ground surface) calculated: 199
Measured well refusal depth (cm) (measured after sampling from top of pipe): 199
Thickness of water column (cm): 7.5 Static Volume of water in well (mL): 114
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 4min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	6.51	-	-	
Conductivity (mS/cm)	0.043	-	-	
Turbidity (NTU)	0	-	-	
Temperature (degC)	8.83	-	-	

Visual/olfactory observations:
-

Decontamination of sampling equipment

Type of decontamination fluid(s): Soap and water, decon interface
Number of washes: 1 Number of rinses: 1

Other relevant comments: Not recharging, not able to fill all bottles.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-7 Middle Site
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 7 August 2016 Time: 12:00
Weather North wind, cloudy, +5
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground.
Lock (condition, presence, model, manufacturer): Needs to be changed (crown lock installed)

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 70
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 111 dry
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
-

Decontamination of sampling equipment

Type of decontamination fluid(s): Soap and water, decon interface
Number of washes: 1 Number of rinses: 1

Other relevant comments: Dry well, sand on end of probe.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-8 Middle Site
Sample Number(s) include dups.: -
Bottles filled (by parameter type) All
Date of Sampling Event: 7 August 2016 Time: 12:40
Weather North wind, cloudy, +5
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground.
Lock (condition, presence, model, manufacturer): Replaced with crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 62
Static water level (cm) from top of pipe: 137
Static water level (cm) (below ground surface) calculated: 206
Measured well refusal depth (cm) (measured after sampling from top of pipe): 206
Thickness of water column (cm): 69 Static Volume of water in well (mL): 1049
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: 250ml / 3min
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	6.51	6.45	6.41	
Conductivity (mS/cm)	0.033	0.033	0.032	
Turbidity (NTU)	0	0	0	
Temperature (degC)	6.94	5.76	5.18	

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Soap and water, decon interface
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-9 Middle Site
Sample Number(s) include dups.: -
Bottles filled (by parameter type) All and half PBC bottle
Date of Sampling Event: 7 August 2016 Time: 1:05
Weather North wind, cloudy, +5
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Water ponded in well casing, dry ground.
Lock (condition, presence, model, manufacturer): Replaced with crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 62
Static water level (cm) from top of pipe: 169.3
Static water level (cm) (below ground surface) calculated: 197.3
Measured well refusal depth (cm) (measured after sampling from top of pipe): 197.3
Thickness of water column (cm): 28 Static Volume of water in well (mL): 426
Free product thickness (mm): - Evidence of Sludge or siltation: Siltation yes

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	6.55	6.38	-	
Conductivity (mS/cm)	0.021	0.021	-	
Turbidity (NTU)	0	0	-	
Temperature (degC)	6.1	5.44	-	

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Water and methyl soap, decon interface
Number of washes: 1 Number of rinses: 1

Other relevant comments: Well dry at large PCB bottle only half full. Floating siltation.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-10 Main
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 6 August 2016 Time: 15:00
Weather -
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Dry ground, well in good condition.
Lock (condition, presence, model, manufacturer): Changed lock to crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): -
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 154 dry well
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:

Decontamination of sampling equipment

Type of decontamination fluid(s): Water and soap, decon interface probe
Number of washes: 1 Number of rinses: 1

Other relevant comments: Dry well.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-11 Main
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 6 August 2016 Time: 13:50
Weather Sunny, +20
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry land.
Lock (condition, presence, model, manufacturer): Crown lock installed

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 103
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 230.5 dry
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: -

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
-

Decontamination of sampling equipment

Type of decontamination fluid(s): Water and soap, decon interface probe
Number of washes: 1 Number of rinses: 1

Other relevant comments: Water 1cm at bottom, not able to sample.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-12 Main
Sample Number(s) include dups.: -
Bottles filled (by parameter type) -
Date of Sampling Event: 6 August 2016 Time: 13:50
Weather Sunny, +20
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Well slightly inclined towards the east. Some ponding of water in casing.
Lock (condition, presence, model, manufacturer): Changed lock (crown)

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): -
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 136.5 dry well
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
-

Decontamination of sampling equipment

Type of decontamination fluid(s): Water and soap methyl, decon interface probe
Number of washes: 1 Number of rinses: 1

Other relevant comments: Dry well.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-13 Main
Sample Number(s) include dups.: -
Bottles filled (by parameter type) Partial
Date of Sampling Event: 6 August 2016 Time: 13:45
Weather Sunny, +20
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground, some ponding water in casing.
Lock (condition, presence, model, manufacturer): Changed lock to crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): -
Static water level (cm) from top of pipe: 151.5
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 162
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	6.85	6.74	-	
Conductivity (mS/cm)	0.026	0.025	-	
Turbidity (NTU)	28.8	7.8	-	
Temperature (degC)	14.29	10.99	-	

Visual/olfactory observations:
Slightly cloudy, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Water and soap, decon interface
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name:
Monitoring Well ID: MW-14 Main
Sample Number(s) include dups.: -
Bottles filled (by parameter type) No
Date of Sampling Event: 6 August 2016 Time: 15:30
Weather Sunny, +20
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Good, dry ground.
Lock (condition, presence, model, manufacturer): Added new lock (crown)

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 46
Static water level (cm) from top of pipe: -
Static water level (cm) (below ground surface) calculated: -
Measured well refusal depth (cm) (measured after sampling from top of pipe): 154 dry (ice or moisture only)
Thickness of water column (cm): - Static Volume of water in well (mL): -
Free product thickness (mm): - Evidence of Sludge or siltation: No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
Slightly cloudy, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): -
Number of washes: - Number of rinses: -

Other relevant comments: Dry well.

Annex J: Monitoring Wells Sampling Log

Site Name: FOX5 Landfill Name: Non Hazardous
Monitoring Well ID: MW-15
Sample Number(s) include dups.: -
Bottles filled (by parameter type) All
Date of Sampling Event: 6 August 2016 Time: 11:50
Weather Sunny, +20
Names of Samplers JB
Description of well condition and surrounding ground conditions (note ponding of water):
Well in good condition, dry ground with loose bolders.
Lock (condition, presence, model, manufacturer): Good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm): - Diameter of well (cm): 4.4
Depth to top of screen (cm): - Length of screened section (cm): -

Field Measurements

Measurement method (interface probe, tape, etc): Interface Probe
Well pipe height above ground (cm) (to top of pipe): 50
Static water level (cm) from top of pipe: 128.3
Static water level (cm) (below ground surface) calculated: 78.3
Measured well refusal depth (cm) (measured after sampling from top of pipe): 223
Thickness of water column (cm): 94.7 Static Volume of water in well (mL): 1440
Free product thickness (mm): - Evidence of Sludge or siltation: No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N): - Recharge Rate: -
Volume Purged (L) (note multiple purging events): -

Parameter	Initial	Stablized	Final	Notes
pH	7.98	7.92	7.69	7.35
Conductivity (mS/cm)	0.036	0.028	0.028	0.027
Turbidity (NTU)	0	0	0	0
Temperature (degC)	10.45	9.07	7.69	7.78

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s): Interface decon, soap and water
Number of washes: 1 Number of rinses: 1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX5	Landfill Name:	Non Hazardous
Monitoring Well ID:	MW-16		
Sample Number(s) include dups.:	-		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	6 August 2016		Time: 12:15
Weather	Light breeze, +20		
Names of Samplers	JB		

Description of well condition and surrounding ground conditions (note ponding of water):
Dry ground with loose bolders, ponded water in casing.

Lock (condition, presence, model, manufacturer): No lock, placed a new lock

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe
Well pipe height above ground (cm) (to top of pipe):	40
Static water level (cm) from top of pipe:	131.5
Static water level (cm) (below ground surface) calculated:	155.4
Measured well refusal depth (cm) (measured after sampling from top of pipe):	155.4

Thickness of water column (cm):	23.9	Static Volume of water in well (mL):	363
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	250ml / 5min
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.58	6.57	-	
Conductivity (mS/cm)	0.077	0.076	-	
Turbidity (NTU)	0	0	-	
Temperature (degC)	12.34	10.58	-	

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	Interface decon, soap and water		
Number of washes:	1	Number of rinses:	1

Other relevant comments:

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX5	Landfill Name:	Non Hazardous
Monitoring Well ID:	MW-17		
Sample Number(s) include dups.:	-		
Bottles filled (by parameter type)	All		
Date of Sampling Event:	6 August 2016	Time:	13:00
Weather	Sunny, +20		
Names of Samplers	JB		

Description of well condition and surrounding ground conditions (note ponding of water):
Good condition, dry ground.

Lock (condition, presence, model, manufacturer): In good condition

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			35
Static water level (cm) from top of pipe:			155
Static water level (cm) (below ground surface) calculated:			120
Measured well refusal depth (cm) (measured after sampling from top of pipe):			169
Thickness of water column (cm):	14	Static Volume of water in well (mL):	213
Free product thickness (mm):	-	Evidence of Sludge or siltation:	-

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	-
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.83	6.58	-	
Conductivity (mS/cm)	0.034	0.035	-	
Turbidity (NTU)	0	0	-	
Temperature (degC)	12.96	12.9	-	

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	-		
Number of washes:	-	Number of rinses:	-

Other relevant comments: Slow recovery, set up at next well. Unable to fill the last bottle.

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX5	Landfill Name:	Station Site Area
Monitoring Well ID:	MW-18		
Sample Number(s) include dups.:	-		
Bottles filled (by parameter type)	0		
Date of Sampling Event:	6 August 2016		Time: 13:30
Weather	Sunny, +20		
Names of Samplers	JB		

Description of well condition and surrounding ground conditions (note ponding of water):
Good condition, dry ground.

Lock (condition, presence, model, manufacturer): Changed lock to crown

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe
Well pipe height above ground (cm) (to top of pipe):	34
Static water level (cm) from top of pipe:	-
Static water level (cm) (below ground surface) calculated:	-
Measured well refusal depth (cm) (measured after sampling from top of pipe):	154.5 ice / dry well

Thickness of water column (cm):	-	Static Volume of water in well (mL):	-
Free product thickness (mm):	-	Evidence of Sludge or siltation:	No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	-
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	-	-	-	
Conductivity (mS/cm)	-	-	-	
Turbidity (NTU)	-	-	-	
Temperature (degC)	-	-	-	

Visual/olfactory observations:
-

Decontamination of sampling equipment

Type of decontamination fluid(s):	-		
Number of washes:	-	Number of rinses:	-

Other relevant comments: Dry, moisture at bottom of well.

Annex J: Monitoring Wells Sampling Log

Site Name:	FOX5	Landfill Name:	Non Hazardous
Monitoring Well ID:	MW-19		
Sample Number(s) include dups.:	-		
Bottles filled (by parameter type)	Partial, no PCB		
Date of Sampling Event:	6 August 2016	Time:	14:30
Weather	Sunny, +20		
Names of Samplers	JB		

Description of well condition and surrounding ground conditions (note ponding of water):
Good condition, dry ground.

Lock (condition, presence, model, manufacturer): Good

Pre-Measured Data (from water well record log)

Depth of well installation (cm):	-	Diameter of well (cm):	4.4
Depth to top of screen (cm):	-	Length of screened section (cm):	-

Field Measurements

Measurement method (interface probe, tape, etc):	Interface Probe		
Well pipe height above ground (cm) (to top of pipe):			34
Static water level (cm) from top of pipe:			152.5
Static water level (cm) (below ground surface) calculated:			118.5
Measured well refusal depth (cm) (measured after sampling from top of pipe):			162
Thickness of water column (cm):	9.5	Static Volume of water in well (mL):	144
Free product thickness (mm):	-	Evidence of Sludge or siltation:	No

Purge Information Summary

Purging/sampling equipment, sampling technique and equipment calibration information:
-

Well purged (Y/N):	-	Recharge Rate:	-
Volume Purged (L) (note multiple purging events):	-		

Parameter	Initial	Stablized	Final	Notes
pH	6.81	6.99	7	
Conductivity (mS/cm)	0.38	0.033	0.033	
Turbidity (NTU)	4.8	0	0	
Temperature (degC)	13.62	10.11	9.16	

Visual/olfactory observations:
Clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid(s):	-		
Number of washes:	-	Number of rinses:	-

Other relevant comments: Unable to fill large bottle, well dry.

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: AUG. 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some information can be pre-populated from thermistor logs)

Site Name: TEX-5		Landfill: MAIN LANDFILL	
Thermistor Number: VT-1		Inclination: -60	
Datalogger model no: RX-		Datalogger cable download model: WIN	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m)		Cable Lead Above Ground (m)	
Datalogger Serial # 021020264		Nodal Points 16	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	2,3,
Beads	☐	☐	BEADS 1 3-16 DAMAGED
Lock condition	☐	☐	CUT 1 REPLACED
Battery Installation Date			
Battery Levels	Main 11.34		Aux 13.50

Manual Ground Temperature Readings

Bead	ohms V	Degrees C
1	1.44	16.6
2	0.0005	-101
3	0.0005	-101
4	0.968	0.84
5	0.92	-0.86
6	0.88	-1.8
7	0.86	-2.6
8	0.84	-3.4

Bead	ohms V	Degrees C
9	0.82	-4.04
10	0.80	-4.5
11	0.78	-5.2
12	0.78	-5.5
13	0.005	-101
14	"	-101
15	"	-101
16	"	-101

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year:

Battery model number installed: LSLBIS

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

- DATE & TIME 08/07/16 10:56 @ 11:45AM
- REPROGRAMMED TO 24 HR SAMPLING

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: AUG. 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some information can be pre-populated from thermistor logs)

Site Name: Fox-5		Landfill: MAIN	
Thermistor Number: VT-4		Inclination: 77°	
Datalogger model no: TRX-16		Datalogger cable download model: USB	
*Install Date:	First Date Event		Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 5m	Cable Lead Above Ground (m) 3m		
Datalogger Serial # 02020228	Nodal Points 16		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☑	BEADS 12-16 DAMAGED
Lock condition	☐	☑	CUT & REPLACED
Battery Installation Date			
Battery Levels	Main 11.34		Aux 13.67

Manual Ground Temperature Readings

Bead	ohms ✓	Degrees C
1	1.34	13.14
2	1.21	9.01
3	1.05	3.6
4	0.95	0.3
5	0.91	-0.82
6	0.88	-1.8
7	0.86	-2.7
8	0.84	-3.35

Bead	ohms ✓	Degrees C
9	0.83	-3.9
10	0.81	-4.5
11	0.79	-5.2
12	0.0	—
13	0	—
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: LILB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

- REPROGRAMMED TO 24 HR SAMPLING

Observations and Proposed Maintenance

- DATE 08/07/16

TIME 10:35 @ 12:15 PM

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: Aug. 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some information can be pre-populated from thermistor logs)

Site Name: EOX-5		Landfill: MAIN L.F.	
Thermistor Number: W3		Inclination: 70°	
Datalogger model no: RX-		Datalogger cable download model: USB	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 6.8m		Cable Lead Above Ground (m) 3m	
Datalogger Serial # 02020255		Nodal Points 16	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☐	BEAD 16 DAMAGED
Lock condition	☐	☐	CUT & REPLACED
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.68	

Manual Ground Temperature Readings

Bead	ohms ✓	Degrees C
1	1.44	16.7
2	1.38	14.8
3	1.44	16.6
4	1.56	18.7
5	1.44	16.7
6	1.22	8.9
7	1.06	4.1
8	0.95	0.12

Bead	ohms ✓	Degrees C
9	0.91	-1.1
10	0.88	-2.0
11	0.86	-2.9
12	0.84	-3.6
13	0.82	-4.2
14	0.80	-4.7
15	0.79	-4.9
16	0.0017	-93.1

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year:

Battery model number installed: UUB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

Observations and Proposed Maintenance

- REPROGRAMMED TO 24 HR SAMPLING

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRYN	Inspection Date: AUG 7 / 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOX-3		Landfill: MAIN LF.	
Thermistor Number: VT-4		Inclination: 63°	
Datalogger model no: RX-1		Datalogger cable download model:	
*Install Date:	First Date Event		Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m)	Cable Lead Above Ground (m)		
Datalogger Serial # 02020265	Nodal Points 16		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☐	BEADS 3, 14-16 REMOVED
Lock condition	☐	☐	CUT & REMOVED
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.63	

Manual Ground Temperature Readings

Bead	~~ohms~~ V	Degrees C
1	1.42	15.88
2	1.41	15.71
3	0	—
4	1.31	12.25
5	1.18	8.1
6	1.02	2.86
7	0.93	−0.25
8	0.90	−1.32

Bead	~~ohms~~ V	Degrees C
9	0.87	−2.45
10	0.73	−7.02
11	0.84	−3.5
12	0.81	−4.5
13	0.78	−5.3
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year:

Battery model number installed: LITHIUM

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

REPROGRAMMED TO 24 HR SAMPLING

Observations and Proposed Maintenance

DATE 08/07/16

TIME 12:09 @ 1:05

ANNEX M: Thermistor Inspection Template

Inspector Name: DARWIN JOHNSON	Inspection Date: AUG 1/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some information can be pre-populated from thermistor logs)

Site Name: FOX-5		Landfill: MAW LF	
Thermistor Number: VT-5		Inclination: 84°	
Datalogger model no: RX-1		Datalogger cable download model:	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 5	Cable Lead Above Ground (m) 3		
Datalogger Serial # 02020252	Nodal Points 16		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☐	BEADS 1-3, 12-16 DAMAGED
Lock condition	☐	☐	CUT AND CHANGED
Battery Installation Date			
Battery Levels	Main 11.34	Aux 3.75	

Manual Ground Temperature Readings

Bead	ohms ✓	Degrees C
1	0	—
2	0	—
3	0	—
4	1.02	2.5
5	0.93	-0.3
6	0.90	-1.3
7	0.87	-2.3
8	0.85	-2.8

Bead	ohms ✓	Degrees C
9	0.83	-3.7
10	0.80	-4.7
11	0.78	-5.3
12	0.0	—
13	0	—
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: _____

Battery model number installed: YLB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

- REPROGRAMMED TO 24 HRS

Observations and Proposed Maintenance

DATE 08/07/16

TIME 12:33 @ 1:30 PM

GOLDER PROJECT #1530908 PHASE 7000

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: AUGUST 6/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOX 5		Landfill: MAIN LF	
Thermistor Number: VT-6		Inclination: 84° degrees Inclined	
Datalogger model no: ZL6		Datalogger cable download model: USB	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 48m STRING		Cable Lead Above Ground (m) 3m LEAD	
Datalogger Serial # 02502256		Nodal Points 16 (11 WORKING)	

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	NO BEADS 1, 2, 12-16 NOT WORKING
Lock condition	☐	☑	NO CUT & REPLACED
Battery Installation Date			
Battery Levels	Main 11.34V		Aux 13.99V

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	0	—
2	0	—
3	1.05	3.43
4	0.95	0.06
5	0.91	−0.94
6	0.88	−2.06
7	0.85	−2.88
8	0.83	−3.87

Bead	ohms	Degrees C
9	0.80	−4.66
10	0.78	−5.36
11	0.78	−5.54
12	0	—
13	0	—
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: —

Battery model number installed: ULBIS

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

REPROGRAMMED TO 24 HR SAMPLING

Observations and Proposed Maintenance

DATE 08/06/16

TIME 6:06 @ 5:04

MEMORY 78% BEFORE REPROGRAMMING

GOLDER PROJECT #1530908 PHASE 2000

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: AUGUST 6/2016
Inspector Signature / Prepared By: [signature]	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: FOX-5	Landfill: MAIN LF		
Thermistor Number: VT-7	Inclination: 85°		
Datalogger model no: RX-16	Datalogger cable download model: USB		
*Install Date:	First Date Event	Last Date Event	
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 4.8m STRING	Cable Lead Above Ground (m) 3m		
Datalogger Serial # 0202025 7	Nodal Points 16 (11 WORKING)		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☑	BEADS 12-16 DAMAGED
Lock condition	☐	☑	CUT + REPLACED

Battery Installation Date

Battery Levels Main 11.34 ✓ Aux 13.38V

Manual Ground Temperature Readings

Bead	ohms ✓	Degrees C
1	1.55	20.6
2	1.23	9.35
3	0.96	0.76
4	0.92	-0.61
5	0.90	-1.4
6	0.87	-2.3
7	0.85	-3.2
8		-4.35

Bead	ohms ✓	Degrees C
9	0.80	-4.8
10	0.78	-5.5
11	0.77	-5.7
12	0	—
13	0	—
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: —

Battery model number installed: ULB15

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

REPROGRAMMED TO 24 HR SAMPLING

Observations and Proposed Maintenance

DATE 08/06/16 TIME 15:45 @ 4:35PM

GOLDER PROJECT #1530908 PHASE 2000

ANNEX M: Thermistor Inspection Template

Inspector Name: DARRIN JOHNSON	Inspection Date: AUGUST 6, 2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: COV-5		Landfill: MAIN LANDFILL	
Thermistor Number: VT-8		Inclination: 87°	
Datalogger model no: RX-1		Datalogger cable download model: USB	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m)	Cable Lead Above Ground (m)		
Datalogger Serial #	Nodal Points 16 (10 WORKING)		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☑	BEADS 11-16 DAMAGED
Lock condition	☐	☑	CUT & REPLACED
Battery Installation Date			
Battery Levels	Main 11.34 V		Aux 13.75V

Manual Ground Temperature Readings

Bead	ohms	Degrees C
1	1.31	12.3
2	1.08	4.6
3	0.94	0.06
4	0.91	−0.94
5	0.88	−1.90
6	0.86	−2.78
7	0.83	−3.71
8	0.80	−4.85

Bead	ohms	Degrees C
9	0.79	−5.27
10	0.78	−5.53
11	0	—
12	0	—
13	0	—
14	0	—
15	0	—
16	0	—

Battery Information

Batteries changed ? Yes ☐ No ☑ Monitoring Year: —

Battery model number installed: ULBIS

Expected battery life (years): 2019

Datalogger Programming (Describe programming completed; beads and frequency)

REPROGRAMMED TO 24 HR SAMPLING

Observations and Proposed Maintenance

ANNEX M: Thermistor Inspection Template

Inspector Name: Kevin Raby	Inspection Date: Aug 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: Fox 5		Landfill: Hillside	
Thermistor Number: VT		Inclination: 86°	
Datalogger model no:		Datalogger cable download model: USB	
*Install Date:	First Date Event		Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 4.4	Cable Lead Above Ground (m) 3		
Datalogger Serial # 02020261	Nodal Points 10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☒	☐	
Cover	☒	☐	
Data Logger	☒	☐	
Cable	☒	☐	
Beads	☐	☐	Dry bead not working
Lock condition	☐	☐	Replaced w/ crown.
Battery Installation Date			
Battery Levels (V)	Main 11.34	Aux 13.26	

Manual Ground Temperature Readings

Bead	ohms ✓	Degrees C
1	1.25	10.06
2	1.21	8.73
3	0.93	3.99
4	~~0.87~~	—
5	0.90	-0.58
6	0.86	-1.43
7	0.86	-2.76
8	0.84	-3.73

Bead	ohms ✓	Degrees C
9	0.82	-4.14
10	0.81	-4.61

Battery Information

Batteries changed ? Yes ☐ No ☒ Monitoring Year: 2016

Battery model number installed: ULB 15

Expected battery life (years): 7 to 9 0717

Datalogger Programming (Describe programming completed; beads and frequency)

Programmed to 24hr interval

Observations and Proposed Maintenance

Datalogger check 8/7/16 1240 at 8/7/16 13:12

ANNEX M: Thermistor Inspection Template

Inspector Name: Kevin Zatko	Inspection Date: Aug 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: Fox 5		Landfill: Middle	
Thermistor Number: VT-1		Inclination: 90°	
Datalogger model no: R		Datalogger cable download model: USB	
*Install Date:	First Date Event		Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 4.4	Cable Lead Above Ground (m) 3		
Datalogger Serial # 02020230	Nodal Points # 10		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☐	☐	#5 not working. and #2
Lock condition	☐	☐	Replaced w/ crown.
Battery Installation Date			
Battery Levels	Main 11.34		Aux 13.38V

Manual Ground Temperature Readings

Bead	~~ohms~~ V	Degrees C
1	1.27	10.9
2	—	—
3	1.23	9.6
4	1.18	7.7
5	—	—
6	0.95	O.H.
7	0.90	-1.5
8	-2.52 → 0.87	

Bead	~~ohms~~ V	Degrees C
9	0.84	-3.3
10	0.83	-3.7

Battery Information

Batteries changed ? Yes ☐ No ☒ Monitoring Year: —

Battery model number installed: ULB-15

Expected battery life (years): 4/19 07 M

Datalogger Programming (Describe programming completed: beads and frequency)

Programmed to 24 hr interval

Observations and Proposed Maintenance

datalogger clock: 8/7/16 12:28 at 8/7/16 13:24.

ANNEX M: Thermistor Inspection Template

Inspector Name: Kevin Putting	Inspection Date: Aug 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: Fox 5		Landfill: Middle	
Thermistor Number: VT-1		Inclination: 90°	
Datalogger model no: RX		Datalogger cable download model: USB	
*Install Date:		First Date Event	Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 3.8	Cable Lead Above Ground (m) 3		
Datalogger Serial # 02020120	Nodal Points 9		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☑	☐	
Cover	☑	☐	
Data Logger	☑	☐	
Cable	☑	☐	
Beads	☑	☐	
Lock condition	☐	☐	Replaced w/ crown
Battery Installation Date			
Battery Levels	Main 11.34	Aux 13.14	

Manual Ground Temperature Readings

Bead	~~ohms~~ V	Degrees C
1	1.26	10.35
2	1.23	9.57
3	1.29	11.37
4	1.25	10.16
5	1.13	6.81
6	0.96	0.63
7	0.92	-0.67
8	0.87	-2.21

Bead	~~ohms~~ V	Degrees C
9	0.86	-2.75

Battery Information

Batteries changed ? Yes ☐ No ☒ Monitoring Year: —

Battery model number installed: ULB-15

Expected battery life (years): 7.9 07M

Datalogger Programming (Describe programming completed; beads and frequency)

Programmed to 24hr interval.

Observations and Proposed Maintenance

datalogger clock: 08/07/16 11:54 at 08/07/16 12:57.

ANNEX M: Thermistor Inspection Template

Inspector Name: Kevin Rathbun	Inspection Date: Aug 7/2016
Inspector Signature / Prepared By:	

Thermistor Information (*Some Information can be pre-populated from thermistor logs)

Site Name: Fox 5		Landfill: Middle	
Thermistor Number: VT- 2		Inclination: 90°	
Datalogger model no: R-		Datalogger cable download model: USB	
*Install Date: Aug 7/2016	First Date Event		Last Date Event
*Coordinates and Elevation	N	E	Elev
Length of Cable (m) 7	Cable Lead Above Ground (m) 3		
Datalogger Serial # 02020270	Nodal Points		

Thermistor Inspection

	Good	Needs Maintenance	Description
Casing	☒	☐	
Cover	☒	☐	
Data Logger	☒	☐	
Cable	☒	☐	
Beads	☐	☐	
Lock condition	☐	☐	Replaced w/ crown
Battery Installation Date 7/2016	(Y 2 3 07M EXPIRATION EXPIRY)		
Battery Levels	Main 11.34 ✓	Aux 13.14 ✓	

Manual Ground Temperature Readings

Bead	ohms	Degrees C

Bead	ohms	Degrees C

Battery Information

Batteries changed ? Yes ☑ No ☐ Monitoring Year: 2016

Battery model number installed: WBJ-15

Expected battery life (years): 2023 2023 (7-8 YEARS)

Datalogger Programming (Describe programming completed: beads and frequency)

Programmed to ~~4hr~~ 24hr intervals:

Observations and Proposed Maintenance

VT-12 Reinstalled Aug 7/2016.
Date/Time synced with computer.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Middle Site

Monitoring Well ID: MW-5

Sample Number(s) include dups.: All + Dup

Bottles filled (by parameter type): All + Dup

Date of Sampling Event: Aug 7 Time: 10:00

Weather: +5 slight wind Fog

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water): good, dry ground

Lock (condition, presence, model, manufacturer): ~~good~~ changed to crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): _____

Well pipe height above ground (cm) (to top of pipe)= 51cm

Static water level (cm) from top of pipe = 147.5

Static water level (cm) (below ground surface) calculated = 205.5

Measured well refusal depth (cm) (measure after sampling)= 205 cm

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: no

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: 250ml/3min

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	7.14	7.05	6.81	6.56
Conductivity (µS/cm) mS	.037	.038	.035	.035
Turbidity (NTU)	00	00	00	00
Temperature (degC)	8.03	6.89	6.26	5.38

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): soapwater, decon interface

Number washes: _____ Number rinses: _____

Other Relevant Comments: _____

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Middle site

Monitoring Well ID: MW6

Sample Number(s) include dups.:

Bottles filled (by parameter type): Partial

Date of Sampling Event: ~~SB~~ Aug. 7 Time: 11:30

Weather: +5 cloud over, fog, breeze from North.

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

good. dry ground Loose bolders.

Lock (condition, presence, model, manufacturer): change to crown. (broke)

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): interface probe

Well pipe height above ground (cm) (to top of pipe)= 65cm

Static water level (cm) from top of pipe = 191.5cm

Static water level (cm) (below ground surface) calculated = 199.cm

Measured well refusal depth (cm) (measure after sampling)= 199cm

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate: 250mL/4min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.51			
Conductivity (~~uS~~/cm) mS	.043			
Turbidity (NTU)	00			
Temperature (degC)	8.83°C			

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...):

Decontamination of sampling equipment

Type of decontamination fluid (s): Soap, water decon interface

Number washes: 1 Number rinses: 1

Other Relevant Comments: not recharging, not able to fill all bottles.

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Middle site

Monitoring Well ID: MW-7

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: Aug 7 Time: 12:00

Weather: +5 N wind cloudy

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

- good, dry ground

Lock (condition, presence, model, manufacturer): Needs to be changed (crown Lock) installed

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): _____

Well pipe height above ground (cm) (to top of pipe)= 70

Static water level (cm) from top of pipe = _____

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 101cm dry

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: _____

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: _____

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): _____

Decontamination of sampling equipment

Type of decontamination fluid (s): Soap water deion interface

Number washes: 1 Number rinses: 1

Other Relevant Comments: dry well, SAND on end of probe

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: middle site

Monitoring Well ID: MW-8

Sample Number(s) include dups.:

Bottles filled (by parameter type): All

Date of Sampling Event: Aug 7 Time: 12:40

Weather: +5 N wind cloudy

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water): good, dry ground

Lock (condition, presence, model, manufacturer): Replace w crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 62cm

Static water level (cm) from top of pipe = 137 cm

Static water level (cm) (below ground surface) calculated = 206 cm

Measured well refusal depth (cm) (measure after sampling)= 206 cm

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate: 250ml / 3 min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.51	6.45	6.41	
Conductivity (uS/cm) mS	.033	.033	.032	
Turbidity (NTU)	00	00	00	
Temperature (degC)	6.94	5.76	5.68	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): water soap decon interface

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Middle site

Monitoring Well ID: MW-9

Sample Number(s) include dups.:

Bottles filled (by parameter type): All 1/2 PBC Bottle

Date of Sampling Event: Time: 1:05

Weather: +5 N wind cloudy

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water): water ponded in well casing, dry ground

Lock (condition, presence, model, manufacturer): replaced w crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): interface Probe

Well pipe height above ground (cm) (to top of pipe)= 62cm

Static water level (cm) from top of pipe = 169.3

Static water level (cm) (below ground surface) calculated = 197.3

Measured well refusal depth (cm) (measure after sampling)= 197.3

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: Yes

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.55	6.38		
Conductivity (uS/cm) MS	.021	.021		
Turbidity (NTU)	00	00		
Temperature (degC)	6.10	5.44		

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): water methyl soap decon interface

Number washes: 1 Number rinses: 1

Other Relevant Comments: well dry at Large PCB bottle only half full. Floating siltation

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: MAIN

Monitoring Well ID: MW10

Sample Number(s) include dups.:

Bottles filled (by parameter type): Ø

Date of Sampling Event: Aug 6 Time: 15:00

Weather:

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

dry ground, well in good condition

Lock (condition, presence, model, manufacturer): changed Lock to crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (~~interface probe, tape~~, etc):

Well pipe height above ground (cm) (to top of pipe)=

Static water level (cm) from top of pipe =

Static water level (cm) (below ground surface) calculated =

Measured well refusal depth (cm) (measure after sampling)= 154cm dry well

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: Ø

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...):

Decontamination of sampling equipment

Type of decontamination fluid (s): water soap, decon interface Probe

Number washes: 1 Number rinses: 1

Other Relevant Comments: Dry well

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Main

Monitoring Well ID: MW-11

Sample Number(s) include dups.:

Bottles filled (by parameter type): 0

Date of Sampling Event: Aug 6 Time: 13:50

Weather: +20 Sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

good, dry Land

Lock (condition, presence, model, manufacturer): crown Lock installed

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 103

Static water level (cm) from top of pipe =

Static water level (cm) (below ground surface) calculated =

Measured well refusal depth (cm) (measure after sampling)= 230.5cm. dry

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...):

Decontamination of sampling equipment

Type of decontamination fluid (s): decon, interface probe = water, soap

Number washes: 1 Number rinses: 1

Other Relevant Comments: water/cm at bottom. not able to SAMPLE.

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: main

Monitoring Well ID: MW-12

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): Ø

Date of Sampling Event: Aug. 6 Time: 13:50

Weather: +20 Sunny

Names of Samplers: LB

Description of Well Condition and Surrounding ground conditions (note ponding of water): well slightly inclinded towards the East. Some ponding of water in casing

Lock (condition, presence, model, manufacturer): changed Lock (crown)

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe) tape, etc): _____

Well pipe height above ground (cm) (to top of pipe)= _____

Static water level (cm) from top of pipe = _____

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 136.5 cm dry well

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: Ø

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: _____

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): _____

Decontamination of sampling equipment

Type of decontamination fluid (s): water, soap, methyl. decon interface

Number washes: 1 Number rinses: 1

Other Relevant Comments: dry well

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: MAiA

Monitoring Well ID: MW-13

Sample Number(s) include dups.:

Bottles filled (by parameter type): Partial

Date of Sampling Event: Aug 6 Time: 13:45

Weather: +20 sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

good, dry ground Some ponding water in casing

Lock (condition, presence, model, manufacturer): Change Lock to crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)=

Static water level (cm) from top of pipe = 151.5cm

Static water level (cm) (below ground surface) calculated = 162cm

Measured well refusal depth (cm) (measure after sampling)=

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: NO

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.85	6.74		
Conductivity ~~(uS/cm)~~ mS	026	025		
Turbidity (NTU)	28.8	7.8		
Temperature (degC)	~~22~~ 14.29°	10.99		

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): slightly cloudy - no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): water SOAP, decon, interface

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: MAIN

Monitoring Well ID: MW 14

Sample Number(s) include dups.: Ø

Bottles filled (by parameter type): NO

Date of Sampling Event: Aug 96 Time: 15:30

Weather: +20 sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

good, dry ~~cond~~ ground.

Lock (condition, presence, model, manufacturer): add new Lock (crown)

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= _____ Diameter of well (cm)= _____

*Depth to top of screen (cm)= _____ Length screened section (cm)= _____

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc): _____

Well pipe height above ground (cm) (to top of pipe)= 46 cm

Static water level (cm) from top of pipe = _____

Static water level (cm) (below ground surface) calculated = _____

Measured well refusal depth (cm) (measure after sampling)= 154cm dry (ice) or moisture only

Thickness of water column (cm)= _____ Static volume of water in well (mL)= _____

Free product thickness (mm)= _____ Evidence of sludge or siltation: Ø

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information: _____

Well purged (Y/N): _____ Recharge Rate: _____

Volume Purged (L) (note multiple purging events if applicable): _____

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): _____

Decontamination of sampling equipment

Type of decontamination fluid (s): _____

Number washes: _____ Number rinses: _____

Other Relevant Comments: dry well

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Non haz site area

Monitoring Well ID: MW-15

Sample Number(s) include dups.:

Bottles filled (by parameter type): All

Date of Sampling Event: Aug. 6 Time: 11:50

Weather: +20°c Sunny

Names of Samplers: J.B.

Description of Well Condition and Surrounding ground conditions (note ponding of water):

Well in good condition, dry ground w Loose boulders

Lock (condition, presence, model, manufacturer): good condition

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 50cm

Static water level (cm) from top of pipe = 128.3cm

Static water level (cm) (below ground surface) calculated = 223.cm

Measured well refusal depth (cm) (measure after sampling)=

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: NO

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	7.98	7.92	7.69	7.35
Conductivity (~~uS~~/cm) mS	0.036	.028	.028	.027
Turbidity (NTU)	00	00	00	00
Temperature (degC)	10.45	9.07	7.69	7.78

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): interface decon soap, water

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Sta Area

Monitoring Well ID: MW-16

Sample Number(s) include dups.:

Bottles filled (by parameter type): All

Date of Sampling Event: Aug 6 Time: 12:15

Weather: 20°C light breeze

Names of Samplers: SB

Description of Well Condition and Surrounding ground conditions (note ponding of water): dry around casing. Ponded water in casing. dry ground w loose boulders

Lock (condition, presence, model, manufacturer): no lock; placed new lock.

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 40cm

Static water level (cm) from top of pipe = 131.5

Static water level (cm) (below ground surface) calculated = 155.4

Measured well refusal depth (cm) (measure after sampling)= ~~155.4~~ 155.4

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate: 250 mL per 5 min

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.58	6.57		
Conductivity (~~uS/cm~~) mS	.077	.076		
Turbidity (NTU)	00	00		
Temperature (degC)	12.34	10.58		

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s): decon probe w soapy water.

Number washes: 1 Number rinses: 1

Other Relevant Comments:

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: NON HAZ site area Station

Monitoring Well ID: MW 17

Sample Number(s) include dups.:

Bottles filled (by parameter type): All

Date of Sampling Event: Aug 6 Time: 13:00

Weather: +20 sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water): Good condition, dry ground

Lock (condition, presence, model, manufacturer): in good condition

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 35cm

Static water level (cm) from top of pipe = 155cm

Static water level (cm) (below ground surface) calculated = 169cm

Measured well refusal depth (cm) (measure after sampling)=

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation:

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.83	6.58		
Conductivity (uS/cm)	0.034	0.035		
Turbidity (NTU)	00	00		
Temperature (degC)	12.96	12.90		

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear, no odour

Decontamination of sampling equipment

Type of decontamination fluid (s):

Number washes: Number rinses:

Other Relevant Comments: Slow recovery - set up at next well. unable to F.V last bottle full

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: ~~Landfill~~ station site area

Monitoring Well ID: MW-18

Sample Number(s) include dups.:

Bottles filled (by parameter type): 0

Date of Sampling Event: Aug. 6 Time: 13:30

Weather: +20 sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water):

in good condition, dry ground

Lock (condition, presence, model, manufacturer): change lock to crown

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 34cm

Static water level (cm) from top of pipe =

Static water level (cm) (below ground surface) calculated =

Measured well refusal depth (cm) (measure after sampling)= 154.5cm ice/dry well

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: NO

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH				
Conductivity (uS/cm)				
Turbidity (NTU)				
Temperature (degC)				

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...):

Decontamination of sampling equipment

Type of decontamination fluid (s):

Number washes: Number rinses:

Other Relevant Comments: Dry, moisture at bottom of well

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

ANNEX J: Monitoring Well Sampling Log (Complete All Fields)

Site Name: Fox 5 Landfill Name: Nashwaak Landsite

Monitoring Well ID: MW-18

Sample Number(s) include dups.:

Bottles filled (by parameter type): Partial NoPCB

Date of Sampling Event: Aug 6 Time: 14:30

Weather: +20 sunny

Names of Samplers: JB

Description of Well Condition and Surrounding ground conditions (note ponding of water): Good condition, dry ground

Lock (condition, presence, model, manufacturer): good

Pre-Measured Data (From Water Well Record Log)

*Depth of well installation (cm)= Diameter of well (cm)=

*Depth to top of screen (cm)= Length screened section (cm)=

*note: *depths are from ground surface*

Field Measurements

Measurement method (interface probe, tape, etc):

Well pipe height above ground (cm) (to top of pipe)= 34cm

Static water level (cm) from top of pipe = 152.5cm

Static water level (cm) (below ground surface) calculated = 162.cm

Measured well refusal depth (cm) (measure after sampling)=

Thickness of water column (cm)= Static volume of water in well (mL)=

Free product thickness (mm)= Evidence of sludge or siltation: NO

Purging Information Summary*

Purging/sampling equipment, sampling technique and equipment calibration information:

Well purged (Y/N): Recharge Rate:

Volume Purged (L) (note multiple purging events if applicable):

Parameter	Initial	Stabilized	Final	Notes (if not stabilized)
pH	6.81	6.99	7.00	
Conductivity (~~uS~~/cm) mS	.038	.033	.033	
Turbidity (NTU)	4.8	00	00	
Temperature (degC)	13.62	10.11	9.06	

Visual/olfactory observations (incl. colour, odour, presence of free product/sheen/globules, siltation...): clear no odour

Decontamination of sampling equipment

Type of decontamination fluid (s):

Number washes: Number rinses:

Other Relevant Comments: unable to fill Large bottle, well dry

* Complete field notes including full suite of water quality indicator parameters VS time as per EPA low flow sampling procedures should be apended to this summary.

SITE NAME: Fox 3

RECORD OF SOIL SAMPLING Aug 6

SAMPLER NAME:

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Stn Area	MW15a	40	moist sand and gravel Boulders present				3	Y
	MW15B	30	Boulder refusal at 40cm				3	Y
Stn Area	MW16a	<30	sand w/cobbles Boulder refusal at 30				3	Y
	~~MW16B~~		moist sand loose boulders at surface				3	Y
Stn Area	MW17a	30-40	Some cobbles present.				3	Y
	MW17B	30					3	Y
Stn Area	MW18a	50	loose sand Some gravel				3	Y
	MW18B	30		duplicate			3	Y
Stn Area	MW19a	50	loose sand				3	Y
	MW19B	30	loose sand				3	Y

SITE NAME: Fox 5 Aug 6

RECORD OF SOIL SAMPLING

DATE:
SAMPLER NAME:

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
MAIN LAND FILL	MW-10A	50 cm	MOIST SAND with cobbles				3	Y
"	MW-10B	30 cm	"				3	Y
Main.	MW-14A	<30	Rocky refusal ~30 cm. cobbles w/ sand				3	Y
Main	MW-13A	30	Rocky Refusal at 30. Cobbles w/ sand				3	Y
Main	MW-12A	~30	Sand + gravel with some cobbles rocky refusal ~30				3	Y
Main	MW-11A	~30	sand + gravel w/cobbles refusal at 30 due to rocks.				3	Y

Aug 6

GOLDER ASSOCIATES

SITE NAME: Fox 5 Aug 7

RECORD OF S[illegible] SAMPLING

DATE: Aug 7
SAMPLER NAME: JJ

LANDFILL NAME	SOIL SAMPLE ID	DEPTH (m)	SOIL DESCRIPTION	GPS Northing	GPS Easting	GPS Elevation	Photographs	Backfilled (Y/N)
Middle	MW-5a	40cm	dry silty sand w/ cobbles.				3	Y
	MW-5B	30cm	rocky refusal at ~40cm				3	Y
Middle	MW-6a	50cm	sand with cobbles dry.				3	Y
	MW-6B	30 cm	"				3	Y
Middle	MW-7a	50cm	sand w/ cobbles	duplicate			3	Y
	MW-7B	30cm	"				3	Y
Middle	MW-8a	30cm	Sand w̄ Cobbles				3	Y
	MW-8B	50cm	Sand w̄ cobbles					
Middle	MW-9a	<30cm	Sand w̄ cobbles refusal at Rock				3	Y
	MW-9B	~~X~~	~~X~~					

Aug 7

Golder Project #1530908 Phase 1000

GOLDER ASSOCIATES

APPENDIX C

Laboratory Certificates of Analysis and QA/QC Reports
Historical Monitoring Results

Appendix C1

Certificate Of Analysis –
Paracel Laboratories Ltd.,
Aug. 19, 2016; Order #1634132

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 107623/79624/7625

Report Date: 19-Aug-2016
Order Date: 15-Aug-2016

Order #: 1634132

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1634132-01	MW15-A
1634132-02	MW-15B
1634132-03	MW-16A
1634132-04	MW-17A
1634132-05	MW-17B
1634132-06	MW-18A
1634132-07	MW-18B
1634132-08	MW-19A
1634132-09	MW-19B
1634132-10	MW-10A
1634132-11	MW-10B
1634132-12	MW-11A
1634132-13	MW-12A
1634132-14	MW-13A
1634132-15	MW-14A
1634132-16	MW-5A
1634132-17	MW-5B
1634132-18	MW-6A
1634132-19	MW-6B
1634132-20	MW-7A
1634132-21	MW-7B
1634132-22	MW-8A
1634132-23	MW-8B
1634132-24	MW-9A

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 19-Aug-2016
Order Date: 15-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
CCME-SQG: Metals by ICP-OES	based on MOE E3470, ICP-OES	18-Aug-16	18-Aug-16
Mercury by CVAA	EPA 7471B - CVAA, digestion	19-Aug-16	19-Aug-16
PCBs, total	SW846 8082A - GC-ECD	17-Aug-16	17-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	18-Aug-16	18-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Aug-16	19-Aug-16
Solids, %	Gravimetric, calculation	18-Aug-16	18-Aug-16

Certificate of Analysis

Report Date: 19-Aug-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 15-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW15-A	MW-15B	MW-16A	MW-17A
	Sample Date:	06-Aug-16	06-Aug-16	06-Aug-16	06-Aug-16
	Sample ID:	1634132-01	1634132-02	1634132-03	1634132-04
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	96.2	95.3	91.8	93.0
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	148	136	106	97.3
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	<1.0	<1.0	3.6	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	33.2	30.8	19.7	14.3
Cobalt	1.0 ug/g dry	7.0	6.3	6.3	4.2
Copper	1.0 ug/g dry	17.0	14.6	19.4	7.0
Lead	1.0 ug/g dry	5.6	4.4	19.8	6.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	12.4	10.9	7.7	5.7
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	6.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	50.9	46.5	31.5	27.2
Zinc	1.0 ug/g dry	41.1	37.1	103	40.1
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	18	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	59	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	33	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	96.2%	101%	111%	105%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 19-Aug-2016

Order Date: 15-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-17B	MW-18A	MW-18B	MW-19A
	Sample Date:	06-Aug-16	06-Aug-16	06-Aug-16	06-Aug-16
	Sample ID:	1634132-05	1634132-06	1634132-07	1634132-08
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	89.7	94.3	93.8	94.6
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	110	68.2	67.7	86.1
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	17.1	10.7	10.5	14.1
Cobalt	1.0 ug/g dry	5.2	3.3	3.1	3.8
Copper	1.0 ug/g dry	8.9	5.5	5.3	7.3
Lead	1.0 ug/g dry	8.1	6.8	5.3	6.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	7.5	4.3	4.2	5.8
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	31.7	19.7	19.3	24.9
Zinc	1.0 ug/g dry	46.4	29.7	28.6	33.2
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	89.5%	102%	101%	107%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 19-Aug-2016

Order Date: 15-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-19B	MW-10A	MW-10B	MW-11A
	Sample Date:	06-Aug-16	06-Aug-16	06-Aug-16	06-Aug-16
	Sample ID:	1634132-09	1634132-10	1634132-11	1634132-12
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	94.2	95.1	95.0	94.8
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	93.1	86.0	85.3	80.8
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	15.1	12.6	11.7	13.3
Cobalt	1.0 ug/g dry	4.1	3.6	3.6	3.7
Copper	1.0 ug/g dry	8.7	6.3	6.3	6.8
Lead	1.0 ug/g dry	7.2	7.9	7.0	13.0
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	6.0	5.5	5.2	5.4
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	26.1	22.4	21.7	22.6
Zinc	1.0 ug/g dry	33.4	32.3	31.7	29.8
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	100%	90.9%	92.0%	92.6%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 19-Aug-2016

Order Date: 15-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-12A	MW-13A	MW-14A	MW-5A
	Sample Date:	06-Aug-16	06-Aug-16	06-Aug-16	07-Aug-16
	Sample ID:	1634132-13	1634132-14	1634132-15	1634132-16
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	97.5	95.7	94.9	92.6
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	54.1	62.8	55.7	59.0
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	<1.0	<1.0	<1.0	1.3
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	8.5	9.0	7.3	14.1
Cobalt	1.0 ug/g dry	2.7	2.9	2.8	4.1
Copper	1.0 ug/g dry	5.5	5.7	4.2	6.9
Lead	1.0 ug/g dry	9.6	9.2	8.7	6.9
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	3.8	3.9	3.5	6.2
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	15.1	16.8	14.1	25.6
Zinc	1.0 ug/g dry	40.6	30.8	25.5	33.0
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	35	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	18	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	85.7%	86.1%	87.7%	86.4%

Certificate of Analysis

Report Date: 19-Aug-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 15-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-5B	MW-6A	MW-6B	MW-7A
	Sample Date:	07-Aug-16	07-Aug-16	07-Aug-16	07-Aug-16
	Sample ID:	1634132-17	1634132-18	1634132-19	1634132-20
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	88.5	91.2	90.3	95.8
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	60.3	42.4	44.4	45.3
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	1.2	1.5	1.4	2.1
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	14.3	12.1	12.2	16.1
Cobalt	1.0 ug/g dry	4.0	3.5	3.5	4.6
Copper	1.0 ug/g dry	6.8	5.5	5.5	7.8
Lead	1.0 ug/g dry	7.6	6.4	6.6	7.4
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	6.2	5.3	4.9	6.9
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	26.1	22.7	22.7	28.6
Zinc	1.0 ug/g dry	32.8	27.4	27.6	39.3
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	64.6%	92.7%	89.1%	79.4%

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 19-Aug-2016

Order Date: 15-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW-7B	MW-8A	MW-8B	MW-9A
	Sample Date:	07-Aug-16	07-Aug-16	07-Aug-16	07-Aug-16
	Sample ID:	1634132-21	1634132-22	1634132-23	1634132-24
	MDL/Units	Soil	Soil	Soil	Soil
Physical Characteristics					
% Solids	0.1 % by Wt.	95.2	89.9	87.8	90.3
Metals					
Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Barium	1.0 ug/g dry	37.3	49.3	47.0	44.5
Beryllium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Boron	1.0 ug/g dry	1.9	1.2	1.1	1.2
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	1.0 ug/g dry	13.4	12.6	12.4	11.3
Cobalt	1.0 ug/g dry	3.9	3.4	3.4	3.3
Copper	1.0 ug/g dry	6.7	5.9	5.5	7.2
Lead	1.0 ug/g dry	7.2	5.8	6.0	6.6
Mercury	0.1 ug/g dry	<0.1	<0.1	<0.1	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	1.0 ug/g dry	5.6	5.6	5.2	5.0
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Tin	5.0 ug/g dry	<5.0	<5.0	<5.0	<5.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	1.0 ug/g dry	23.8	23.5	23.1	21.3
Zinc	1.0 ug/g dry	32.4	27.0	26.4	25.8
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6
PCBs					
PCBs, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Decachlorobiphenyl	Surrogate	76.7%	97.4%	89.1%	93.0%

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	1.0	ug/g						
Boron	ND	1.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium	ND	1.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	1.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	1.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.5	ug/g						
Thallium	ND	1.0	ug/g						
Tin	ND	5.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	1.0	ug/g						
Zinc	ND	1.0	ug/g						
PCBs									
PCBs, total	ND	0.05	ug/g						
Surrogate: Decachlorobiphenyl	*0.0792*		*ug/g*		*79.2*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g dry	ND				40	
F2 PHCs (C10-C16)	ND	4	ug/g dry	ND				30	
F3 PHCs (C16-C34)	ND	8	ug/g dry	ND				30	
F4 PHCs (C34-C50)	ND	6	ug/g dry	ND				30	
Metals									
Antimony	ND	1.0	ug/g dry	ND				30	
Arsenic	ND	1.0	ug/g dry	ND				30	
Barium	137	1.0	ug/g dry	148			8.1	30	
Beryllium	ND	1.0	ug/g dry	ND			0.0	30	
Boron	ND	1.0	ug/g dry	ND			0.0	30	
Cadmium	ND	0.5	ug/g dry	ND				30	
Chromium	31.9	10.0	ug/g dry	33.2			4.0	30	
Cobalt	6.53	1.0	ug/g dry	6.99			6.8	30	
Copper	16.0	1.0	ug/g dry	17.0			6.1	30	
Lead	4.86	1.0	ug/g dry	5.57			13.5	30	
Mercury	ND	0.1	ug/g dry	ND			0.0	30	
Molybdenum	ND	1.0	ug/g dry	ND			0.0	30	
Nickel	11.8	1.0	ug/g dry	12.4			4.9	30	
Selenium	ND	1.0	ug/g dry	ND			0.0	30	
Silver	ND	0.5	ug/g dry	ND			0.0	30	
Thallium	ND	1.0	ug/g dry	ND			0.0	30	
Tin	ND	5.0	ug/g dry	ND			0.0	30	
Uranium	ND	1.0	ug/g dry	ND				30	
Vanadium	46.8	1.0	ug/g dry	50.9			8.6	30	
Zinc	39.1	1.0	ug/g dry	41.1			5.0	30	
PCBs									
PCBs, total	ND	0.05	ug/g dry	ND				40	
Surrogate: Decachlorobiphenyl	*0.102*		*ug/g dry*		*97.8*	*60-140*			
Physical Characteristics									
% Solids	84.9	0.1	% by Wt.	84.5			0.4	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	186	7	ug/g		93.0	80-120			
F2 PHCs (C10-C16)	98	4	ug/g	ND	100	60-140			
F3 PHCs (C16-C34)	181	8	ug/g	ND	89.2	60-140			
F4 PHCs (C34-C50)	148	6	ug/g	ND	110	60-140			
Metals									
Antimony	246		ug/L	ND	98.3	70-130			
Arsenic	253		ug/L	ND	101	70-130			
Barium	215		ug/L		86.0	70-130			
Beryllium	217		ug/L	ND	86.7	70-130			
Boron	248		ug/L	11.2	94.9	70-130			
Cadmium	297		ug/L	ND	119	70-130			
Chromium	209		ug/L		83.7	70-130			
Cobalt	354		ug/L	140	85.6	70-130			
Copper	555		ug/L	340	86.0	70-130			
Lead	301		ug/L	111	75.8	70-130			
Mercury	1.23	0.1	ug/g	ND	82.0	70-130			
Molybdenum	231		ug/L	18.3	85.2	70-130			
Nickel	449		ug/L	247	80.7	70-130			
Selenium	185		ug/L	ND	74.1	70-130			
Silver	184		ug/L	ND	73.5	70-130			
Thallium	195		ug/L	16.6	71.2	70-130			
Tin	229		ug/L	13.0	86.4	70-130			
Uranium	281		ug/L	ND	112	70-130			
Vanadium	1210		ug/L	1020	77.0	70-130			
Zinc	997		ug/L	821	70.4	70-130			
PCBs									
PCBs, total	0.523	0.05	ug/g	ND	126	60-140			
Surrogate: Decachlorobiphenyl	*0.106*		*ug/g*		*102*	*60-140*			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody
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№ 107623

Page 1 of 4

Client Name: Golder Associates	Project Reference: 1530908-2000	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: Alyssa Troke	Quote # 18-304 Dew lines	
Address: 1931 Robertson Road, Ottawa K2H 5B7	PO # 16-010.	Date Required:
Telephone: 613 592 9600	Email Address: alyssa_troke@golder.com dplenderleith@golder.com	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table _ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1634132 - Soil. 1634136 - water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	see Note	-60ml + 250ml-
1	~~MW15-A~~ MW15-A	S		2	Aug-6									X	✓
2	MW-15B	S		2	Aug 6									X	✓
3	MW-16A	S		2	Aug-6									X	✓
4	MW-17A	S		2	Aug-6									X	✓
5	MW-17B	S		2	Aug-6									X	✓
6	MW-18A	S		2	Aug 6									X	✓
7	MW-18B	S		2	Aug 6									X	✓
8	MW-19A	S		2	Aug 6									X	✓
9	MW-19B	S		2	Aug 6									X	✓
10	MW-10A	S		2	Aug 6									X	✓

Comments: Extra sample received labelled MW-11a for soil. taken Aug 6. ↳ add to coc for all parameters.

Method of Delivery: Walk-in

Relinquished By (Sign): Jeanne Woodhouse	Received by Driver/Depot: SUMEPORN DOKMAI	Received at Lab:	Verified By: Rachel Subject
Relinquished By (Print): Jeanne Woodhouse	Date/Time: Aug 16, 2016 12:02	Date/Time: Aug 15/16 5:00pm	Date/Time: Aug 16/16 2:49
Date/Time: Aug 15/16 4:30 pm	Temperature: 11.2 °C	Temperature: 14.6 °C	pH Verified [✓] By: RS

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№ 107624

Page 2 of 4

Client Name: GAL	Project Reference: 1530908/2000
Contact Name: see page 1	Quote # ~~15-304~~ 16-010.
Address:	PO #
	Email Address: alyssa-troke@golder.com
Telephone:	dplenderleith@golder.com

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day

Date Required: ______

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: ______ [ ] Other: ______

Matrix Type: (S) (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number:
1634132 - Soil
1634136 - Water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See Quote						
1	MW-10B	S		2	Aug 6									X		-60mL + 250mL-				✓
2	MW-12A	S		2	Aug 6									X						✓
3	MW-13A	S		2	Aug 6									X						✓
4	MW-14A	S		2	Aug 6									X						✓
5	MW-5A	S		2	Aug 7									X						✓
6	MW-5B	S		2										X						✓
7	MW-6A	S		2										X						✓
8	MW-6B	S		2										X						✓
9	MW-7A	S		2										X						✓
10	MW-7B	S		2										X						✓

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign): [signature]	Received by Driver/Depot: SUMEEPORN DOKMAK	Received at Lab: [signature]	Verified By: Rachel Silbert
Relinquished By (Print): Joanne Woodhouse	Date/Time: AUG16,2016 12:02	Date/Time: 08/16/16 5:00pm	Date/Time: Aug 16/16 2:49
Date/Time: Aug 15/16 430pm	Temperature: 11.2 °C	Temperature: ____ °C	pH Verified [✓] By: RS

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Chain of Custody
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№ 107625

Client Name: GAL	Project Reference: 1530908 - 2000	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see page 1	Quote # 15-304 16-010	
Address:	PO #	
Telephone:	Email Address: alyssa_troke@golder.com dplenderleith@golder.com	Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number:
1634132 - soil
1634136 - water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See Quote						
1	MW-8A	S		2	Aug 7/16									X		60 mL + 250 mL				
2	MW-8B	"		2	"									X				↓		
3	MW-9A	"		2	"									X				↓		
4	MW-5	W		6	Aug 7	10:10								X						
5	MW-6	W		4	Aug 7	11:35								X	No BTEX or PHC bottle					
6	MW-8	W		6	Aug 7	1240								X						
7	MW-9	W		6	Aug 7	1315								X						
8	MW-13	W		4	Aug 6	1330								X	No PCB or PHC bottle					
9	MW-15	W		6	Aug 6	1150								X						
10	MW-16	W		6	Aug 6	1225														

Comments:
Cancel PCB + PHC F2-F4 for MW6 + MW13. PB Nov

Method of Delivery: Walk-in

Relinquished By (Sign): Jeanne Woodhouse	Received by Driver/Depot:	Received at Lab: SUNEEPORN DOKMAI	Verified By: Rachel Subject
Relinquished By (Print): Jeanne Woodhouse	Date/Time: Aug 15/16 5:00pm	Date/Time: AUG 16 2016 10:09	Date/Time: Aug 16/16 2:49
Date/Time: Aug 15/16 430 pm	Temperature: ____ °C	Temperature: 11.2 °C	pH Verified By: RS

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Chain of Custody
(Lab Use Only)

№ 107626

Page 4 of 4

Client Name: GAL	Project Reference: 1530908-2000	TAT: [X] Regular [ ] 3 Day
Contact Name: see page1	Quote # 15-304 Rev-010.	[ ] 2 Day [ ] 1 Day
Address:	PO #	Date Required:
Telephone:	Email Address: alyss_troke@golder.com cc: plenderleith@golder.com	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table _ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1634132-Soil. 1634136-Water.

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	see Quote						
1	MW-19	W		5	Aug 6	1400								X	NO PCB bottle					
2	MW-17	W		5	Aug 6	1300								X	"					
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Cancel PCB for MW19 + MW17 per Alyss. OSR

Method of Delivery: Walk-in

Relinquished By (Sign): Jeanne Woodhouse	Received by Driver/Depot:	Received at Lab: OLIVIER PORTMAN	Verified By: Rachel Subject
Relinquished By (Print): Jeanne Woodhouse	Date/Time: Aug 15/16 5:00pm	Date/Time: AUG 16, 2016 12:02	Date/Time: Aug 16/16 2:49
Date/Time: Aug 15/16 430	Temperature: _____ °C	Temperature: 19.2 °C	pH Verified [ ] By: KS

Appendix C2

Certificate Of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1634136

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 107625/107626

Report Date: 2-Sep-2016
Order Date: 15-Aug-2016

Revised Report

Order #: 1634136

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1634136-01	MW-5
1634136-02	MW-6
1634136-03	MW-8
1634136-04	MW-9
1634136-05	MW-13
1634136-06	MW-15
1634136-07	MW-16
1634136-08	MW-19
1634136-09	MW-17

Approved By:

Tim McCooeye
Senior Advisor

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 15-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	17-Aug-16	17-Aug-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Aug-16	18-Aug-16
PCBs, total	EPA 608 - GC-ECD	18-Aug-16	18-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	16-Aug-16	18-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	18-Aug-16	18-Aug-16

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 15-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-5	MW-6	MW-8	MW-9
	Sample Date:	07-Aug-16	07-Aug-16	07-Aug-16	07-Aug-16
	Sample ID:	1634136-01	1634136-02	1634136-03	1634136-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	0.005 mg/L	<0.005	<0.005	0.006	<0.005
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [1]	<0.025 [1]	<0.025 [1]	<0.025 [1]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [1]	-	<0.100 [1]	<0.100 [1]
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [1]	-	<0.100 [1]	<0.100 [1]
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [1]	-	<0.100 [1]	<0.100 [1]
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	-	<0.00005	<0.00005
Decachlorobiphenyl	Surrogate	72.5%	-	76.0%	84.6%

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 15-Aug-2016
Project Description: 1530908-2000

	Client ID:	MW-13	MW-15	MW-16	MW-19
	Sample Date:	06-Aug-16	06-Aug-16	06-Aug-16	06-Aug-16
	Sample ID:	1634136-05	1634136-06	1634136-07	1634136-08
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Copper	0.0005 mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Zinc	0.005 mg/L	<0.005	<0.005	0.010	<0.005
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [1]	<0.025 [1]	<0.025 [1]	<0.025 [1]
F2 PHCs (C10-C16)	0.100 mg/L	-	<0.100 [1]	<0.100 [1]	<0.100 [1]
F3 PHCs (C16-C34)	0.100 mg/L	-	<0.100 [1]	<0.100 [1]	<0.100 [1]
F4 PHCs (C34-C50)	0.100 mg/L	-	<0.100 [1]	<0.100 [1]	<0.100 [1]
PCBs					
PCBs, total	0.00005 mg/L	-	<0.00005	<0.00005	-
Decachlorobiphenyl	Surrogate	-	88.6%	77.5%	-

	Client ID:	MW-17	-	-	-
	Sample Date:	06-Aug-16	-	-	-
	Sample ID:	1634136-09	-	-	-
	MDL/Units	Water	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	-	-	-
Arsenic	0.001 mg/L	<0.001	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-
Cobalt	0.0005 mg/L	<0.0005	-	-	-
Copper	0.0005 mg/L	<0.0005	-	-	-
Lead	0.0001 mg/L	<0.0001	-	-	-
Nickel	0.001 mg/L	<0.001	-	-	-
Zinc	0.005 mg/L	<0.005	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [1]	-	-	-
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [1]	-	-	-
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [1]	-	-	-
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [1]	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.100	mg/L						
F3 PHCs (C16-C34)	ND	0.100	mg/L						
F4 PHCs (C34-C50)	ND	0.100	mg/L						
Metals									
Mercury	ND	0.0001	mg/L						
Arsenic	ND	0.001	mg/L						
Cadmium	ND	0.0001	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Lead	ND	0.0001	mg/L						
Nickel	ND	0.001	mg/L						
Zinc	ND	0.005	mg/L						
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*.00020.*		*mg/L*		*80.6*	*60-140*			

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 15-Aug-2016
Project Description: 1530908-2000

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND				30	
Metals									
Mercury	ND	0.0001	mg/L	ND				20	
Arsenic	0.0046	0.001	mg/L	0.0036			22.7	20	QR-01
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	0.00625	0.0005	mg/L	0.00630			0.7	20	
Copper	ND	0.0005	mg/L	ND			0.0	20	
Lead	ND	0.0001	mg/L	ND			0.0	20	
Nickel	0.0133	0.001	mg/L	0.0133			0.0	20	
Zinc	0.009	0.005	mg/L	0.008			0.6	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.99	0.025	mg/L		99.4	68-117			
F2 PHCs (C10-C16)	1.22	0.100	mg/L		68.0	60-140			
F3 PHCs (C16-C34)	3.24	0.100	mg/L		87.2	60-140			
F4 PHCs (C34-C50)	2.11	0.100	mg/L		85.2	60-140			
Metals									
Mercury	0.00309	0.0001	mg/L	ND	103	70-130			
Arsenic	46.1		ug/L		92.2	80-120			
Cadmium	46.9		ug/L		93.9	80-120			
Chromium	46.8		ug/L		93.6	80-120			
Cobalt	46.5		ug/L		93.0	80-120			
Copper	46.1		ug/L		92.1	80-120			
Lead	43.1		ug/L		86.1	80-120			
Nickel	46.2		ug/L		92.3	80-120			
Zinc	48		ug/L		95.9	80-120			
PCBs									
PCBs, total	0.00110	0.00005	mg/L		110	60-140			
Surrogate: Decachlorobiphenyl	*0.00021*		*mg/L*		*87.2*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time -
Applies to samples: MW-5, MW-6, MW-8, MW-9, MW-13, MW-15, MW-16, MW-19, MW-17

Sample - Insufficient volume -
Applies to samples: MW-9

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory.

QC Qualifiers :

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1, all results reported as mg/L.

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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№ 107625

Page 3 of 4

Client Name: GAL	Project Reference: 1530908 - 2000	TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Contact Name: see page 1	Quote # ~~15304~~ 16-010	
Address:	PO #	Date Required:
Telephone:	Email Address: alyssa_troke@golder.com dplenderleith@golder.com	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: _____ [ ] Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number:
1634132 - Soil
1634136 - water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See Quote						
1	MW-8A	S		2	Aug 7/16									X				60mL + 250mL -		
2	MW-8B			2	"									X						
3	MW-9A			2	"									X				↓		
4	MW-5	W		6	Aug 7	10:10								X						
5	MW-6	W		4	Aug 7	11:35								X	No B PCB or PHC bottle					
6	MW-8	W		6	Aug 7	1240								X						
7	MW-9 * Please Negative PCBs	W		6	Aug 7	1315								X						
8	MW-13	W		4	Aug 6	1330								X	No PCB or PHC bottle					
9	MW-15	W		6	Aug 6	1150								X						
10	MW-16	W		6	Aug 6	1225								X						

Comments:
Cancel PCB + PHC F2-F4 for MW6 + MW13. PB Aug 16

Method of Delivery: Walk-in

Relinquished By (Sign): Jeanne Woodhouse	Received by Driver/Depot:	Received at Lab: SUNRISE DORMAN	Verified By: Rachel Subject
Relinquished By (Print): Jeanne Woodhouse	Date/Time: Aug 15/16 5:00pm	Date/Time: AUG 16 2016 12:02	Date/Time: Aug 16/16 2:44
Date/Time: Aug 15/16 430 pm	Temperature: ____ °C	Temperature: 11.2 °C	pH Verified [X] By: RS

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www.paracellabs.com

Chain of Custody (Lab Use Only)
№ 107626

Client Name: GAL	Project Reference: 1530908-2000
Contact Name: see page1	Quote # 15-304. 16-010.
Address:	PO #
Telephone:	Email Address: alyss_troke@golder.com, dplenderleith@golder.com

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day

Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: ______ [ ] Other: ______

Matrix Type: (S) (Soil/Sed.) (GW) (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number:
1634132-Soil.
1634136-Water.

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See Quote						
1	MW-19	W		5	Aug 6	1400								X	NO PCB bottle					
2	MW-17	W		5	Aug 6	1300								X	"					
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments: Cancel PCB for MW-19 + MW-17 per [illegible]

Method of Delivery: Walk-in

Relinquished By (Sign): [signature]	Received by Driver/Depot: [signature]	Received at Lab: OUMEEPORN DOKMAI	Verified By: Rachel Subject
Relinquished By (Print): Joanne Woodhouse	Date/Time: 08/15/16 5:00pm	Date/Time: AUG 16, 2016 12:02	Date/Time: Aug 16/16 2:49
Date/Time: Aug 15/16 430	Temperature: ____ °C	Temperature: 19.2 °C	pH Verified [ ] By: RS

Appendix C3

Certificate Of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1634161

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 107627

Report Date: 2-Sep-2016
Order Date: 16-Aug-2016

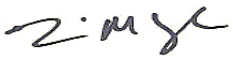
Revised Report

Order #: 1634161

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1634161-01	MW-19

Approved By:



Tim McCooeye
Senior Advisor

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 16-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
PCBs, total	EPA 608 - GC-ECD	18-Aug-16	18-Aug-16

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 16-Aug-2016
Project Description: 1530908-2000

	Client ID:	MW-19	-	-	-
	Sample Date:	06-Aug-16	-	-	-
	Sample ID:	1634161-01	-	-	-
	MDL/Units	Water	-	-	-
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	-	-	-
Decachlorobiphenyl	Surrogate	94.3%	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*0.00020*		*mg/L*		*80.6*	*60-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
PCBs									
PCBs, total	0.00110	0.00005	mg/L		110	60-140			
Surrogate: Decachlorobiphenyl	*0.00021*		*mg/L*		*87.2*	*60-140*			

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 16-Aug-2016
Project Description: 1530908-2000

Qualifier Notes:

Login Qualifiers :

Sample - Insufficient volume - Bottle half full
Applies to samples: MW-19

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1, all results reported as mg/L.

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

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Ottawa, Ontario K1G 4J8
p: 1-800-749-1947
e: paracel@paracellabs.com
www.paracellabs.com

Chain of Custody (Lab Use Only)

№ 107627

Page 1 of 1

Client Name: Golder Associates	Project Reference: 1530908-2000
Contact Name: Alyssa Troke	Quote # ~~15-304~~ Golder Dew Lines Monitoring
Address: 1931 Robertson Road, Ottawa K2H 5B7	PO #
Telephone: 613 592 9600	Email Address: alyssa-troke@golder.com dplenderleith@golder.com

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day

Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: ______ [ ] Other: ______

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1634161

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	see Quote (PCBs)					
1	MW-19	W		1	Aug 6	1400								X	½ full				
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Proceed regardless of insufficient volume

Method of Delivery: Walk-in

Relinquished By (Sign): J. Woodhouse	Received by Driver/Depot: [signature]	Received at Lab: SUNPEPORN DOKMAI	Verified By: Rachel Subject
Relinquished By (Print): Joanne Woodhouse	Date/Time: 08/16/16 11:12am	Date/Time: Aug 16, 2016 03:10	Date/Time: Aug 16/16 4:50
Date/Time: Aug 16, 2016 10am	Temperature: 8.8 °C	Temperature: 8.8 °C	pH Verified [x] By: N/A

Appendix C4

Certificate Of Analysis –
AGAT Laboratories Ltd.,
Sept. 15, 2016; Order #16Z126843

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD
1931 ROBERTSON ROAD
OTTAWA, ON K2H5B7
(613) 592-9600

ATTENTION TO: Alyssa Troke

PROJECT: 1530908-2000

AGAT WORK ORDER: 16Z126843

SOIL ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Sep 15, 2016

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

CCME Metals Scan (Soil) (incl. Hg)

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-09-15

Parameter	Unit	G / S	RDL	SAMPLE DESCRIPTION: MW-18B dup SAMPLE TYPE: Soil DATE SAMPLED: 8/6/2016 7777704	SAMPLE DESCRIPTION: MW-7A dup SAMPLE TYPE: Soil DATE SAMPLED: 8/6/2016 7777711
Arsenic	mg/kg		1	3	2
Cadmium	mg/kg		0.5	<0.5	<0.5
Cobalt	mg/kg		0.5	4.0	4.2
Chromium	mg/kg		1	15	15
Copper	mg/kg		1	9	9
Lead	mg/kg		1	6	7
Mercury	mg/kg		0.10	<0.10	<0.10
Nickel	mg/kg		1	6	7
Zinc	mg/kg		1	45	41

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
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Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PCBs (Total) - Soil

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-09-15

SAMPLE DESCRIPTION:				MW-18B dup	MW-7A dup
SAMPLE TYPE:				Soil	Soil
DATE SAMPLED:				8/6/2016	8/6/2016
Parameter	Unit	G / S	RDL	7777704	7777711
PCBs	mg/kg		0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits			
Decachlorobiphenyl	%	60-130		116	120

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7777704-7777711 Results are based on the dry weight of soil extracted.

Certified By:

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
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Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-09-15

		SAMPLE DESCRIPTION:		MW-18B dup	MW-7A dup
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		8/6/2016	8/6/2016
Parameter	Unit	G / S	RDL	7777704	7777711
C6 - C10 (F1)	mg/kg		5	<5	<5
C>10 - C16 (F2)	mg/kg		10	<10	<10
C>16 - C34 (F3)	mg/kg		50	<50	<50
C>34 - C50 (F4)	mg/kg		50	<50	<50
Gravimetric Heavy Hydrocarbons	mg/kg		50	NA	NA
Moisture Content	%		0.1	5.8	4.9

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7777704-7777711 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Soil Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals Scan (Soil) (incl. Hg)															
Arsenic	7787168		3	2	NA	< 1	105%	70%	130%	102%	80%	120%	103%	70%	130%
Cadmium	7787168		<0.5	<0.5	NA	< 0.5	106%	70%	130%	111%	80%	120%	107%	70%	130%
Cobalt	7787168		5.3	4.8	9.9%	< 0.5	102%	70%	130%	108%	80%	120%	106%	70%	130%
Chromium	7787168		12	12	0.0%	< 1	88%	70%	130%	104%	80%	120%	100%	70%	130%
Copper	7787168		12	11	8.7%	< 1	97%	70%	130%	106%	80%	120%	100%	70%	130%
Lead	7787168		5	5	0.0%	< 1	103%	70%	130%	104%	80%	120%	105%	70%	130%
Mercury	7787168		<0.10	<0.10	NA	< 0.10	118%	70%	130%	92%	80%	120%	93%	70%	130%
Nickel	7787168		9	8	11.8%	< 1	99%	70%	130%	108%	80%	120%	105%	70%	130%
Zinc	7787168		24	24	NA	< 1	98%	70%	130%	111%	80%	120%	105%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

AGAT Laboratories

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FAX (905)712-5122
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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Trace Organics Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCBs (Total) - Soil															
PCBs	7779859		< 0.05	< 0.05	NA	< 0.05	118%	60%	140%	99%	60%	140%	101%	60%	140%
PCBs (Total) - Water															
PCBs	7773484		< 0.05	< 0.05	NA	< 0.05	118%	60%	140%	117%	60%	140%	87%	60%	140%
Petroleum Hydrocarbon F1 - F4 in Water															
C6 - C10 (F1)	7771856		< 25	< 25	NA	< 25	104%	70%	130%	115%	70%	130%	89%	70%	130%
C>10 - C16 (F2)		TW	< 100	< 100	NA	< 100	102%	70%	130%	81%	70%	130%	70%	70%	130%
C>16 - C34 (F3)		TW	< 100	< 100	NA	< 100	107%	70%	130%	96%	70%	130%	71%	70%	130%
C>34 - C50 (F4)		TW	< 100	< 100	NA	< 100	100%	70%	130%	85%	70%	130%	102%	70%	130%
Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil															
C6 - C10 (F1)	7783958		< 5	< 5	NA	< 5	96%	60%	130%	105%	60%	130%	92%	60%	130%
C>10 - C16 (F2)	7785901		< 10	< 10	NA	< 10	102%	70%	130%	96%	70%	130%	70%	70%	130%
C>16 - C34 (F3)	7785901		< 50	< 50	NA	< 50	103%	70%	130%	97%	70%	130%	72%	70%	130%
C>34 - C50 (F4)	7785901		< 50	< 50	NA	< 50	98%	70%	130%	97%	70%	130%	83%	70%	130%

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Water Analysis

RPT Date: Sep 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals - (Water) - (incl. Hg)															
Arsenic	7778482		< 0.001	< 0.001	NA	< 0.001	99%	90%	110%	98%	90%	110%	106%	70%	130%
Cadmium	7778482		< 0.0001	< 0.0001	NA	< 0.0001	99%	90%	110%	97%	90%	110%	100%	70%	130%
Chromium	7778482		< 0.001	< 0.001	NA	< 0.001	102%	90%	110%	103%	90%	110%	106%	70%	130%
Cobalt	7778482		< 0.0005	< 0.0005	NA	< 0.0005	105%	90%	110%	105%	90%	110%	100%	70%	130%
Copper	7778482		< 0.005	< 0.005	NA	< 0.005	105%	90%	110%	104%	90%	110%	99%	70%	130%
Lead	7778482		< 0.0001	< 0.0001	NA	< 0.0001	100%	90%	110%	99%	90%	110%	96%	70%	130%
Mercury	7779737		<0.0001	<0.0001	NA	< 0.0001	101%	90%	110%	100%	90%	110%	98%	80%	120%
Nickel	7778482		< 0.005	< 0.005	NA	< 0.005	107%	90%	110%	106%	90%	110%	102%	70%	130%
Zinc	7778482		< 0.005	< 0.005	NA	< 0.005	104%	90%	110%	103%	90%	110%	97%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Trace Organics Analysis			
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
PCBs	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Initial Sample Volume			GC/FID
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
C6 - C10 (F1)	VOL-91-5010	MOE PHC-E3421	(P&T)GC/FID
C>10 - C16 (F2)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>16 - C34 (F3)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>34 - C50 (F4)	VOL -91- 5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
C6 - C10 (F1)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
C>10 - C16 (F2)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>16 - C34 (F3)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>34 - C50 (F4)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL-91-5009	CCME Tier 1 Method	Balance
Water Analysis			
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW-846 7470 & 245.1	CVAAS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

AGAT Laboratories

14

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only

Work Order #: 1671268843

Cooler Quantity: 1

Arrival Temperatures: 9.3 | 9.4 | 9.1

6.6 | 6.4 | 6

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: on ice

Report Information:

Company: Golder Associates
Contact: Alyssa Troke
Address: 1931 Robertson Road
K2H 5B7
Phone: 613 592 9600 Fax:
Reports to be sent to:
1. Email: alyssa_troke@golder.com
2. Email: dplenderleith@golder.com

Project Information:

Project: 1530908-2000
Site Location:
Sampled By:
AGAT Quote #: 69566 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)

☐ Regulation 558
☒ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☐ Yes ☑ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Please Circle) Y / N	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	Quote 69566
MW-18B dup	Aug 6		2	S		-														X	
MW-7A dup	Aug 7		2	S		-														X	
MW-5 dup	Aug 7	1010	5	W		N														X	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Joanne Woodhouse Joanne Woodhouse	Aug 16	1030	[illegible]	16-Aug-16	12h50
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			Steve	16/8/17	1042
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº: T 028920

Appendix C5

Certificate Of Analysis –
AGAT Laboratories Ltd.,
Nov. 2, 2016; Order #16Z126843

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GOLDER ASSOCIATES LTD
1931 ROBERTSON ROAD
OTTAWA, ON K2H5B7
(613) 592-9600

ATTENTION TO: Alyssa Troke

PROJECT: 1530908-2000

AGAT WORK ORDER: 16Z126843

SOIL ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Mike Muneswar, BSc (Chem), Senior Inorganic Analyst

DATE REPORTED: Nov 02, 2016

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PCBs (Total) - Water

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-11-02

		SAMPLE DESCRIPTION:		MW-5 dup
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2016-08-07
Parameter	Unit	G / S	RDL	7777719
PCBs	mg/L		0.00005	<0.00005
Initial Sample Volume				0.68
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	60-130		109

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Petroleum Hydrocarbon F1 - F4 in Water

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-11-02

		SAMPLE DESCRIPTION:		MW-5 dup
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2016-08-07
Parameter	Unit	G / S	RDL	7777719
C6 - C10 (F1)	mg/L		0.025	<0.025
C>10 - C16 (F2)	mg/L		0.1	<0.1
C>16 - C34 (F3)	mg/L		0.1	<0.1
C>34 - C50 (F4)	mg/L		0.1	<0.1
Gravimetric Heavy Hydrocarbons	mg/L		0.5	NA

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7777719 The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and nC34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16 - C50 and are only determined if the chromatogram of the C34 - C50 Hydrocarbons indicated that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6-C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153/04, results are considered valid without determining the PAH contribution if not requested by the client.
NA = Not Applicable

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

CLIENT NAME: GOLDER ASSOCIATES LTD

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

CCME Metals - (Water) - (incl. Hg)

DATE RECEIVED: 2016-08-16

DATE REPORTED: 2016-11-02

		SAMPLE DESCRIPTION:		MW-5 dup
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2016-08-07
Parameter	Unit	G / S	RDL	7777719
Arsenic	mg/L		0.001	<0.001
Cadmium	mg/L		0.0001	<0.0001
Chromium	mg/L		0.001	<0.001
Cobalt	mg/L		0.0005	<0.0005
Copper	mg/L		0.005	<0.005
Lead	mg/L		0.0001	<0.0001
Mercury	mg/L		0.0001	<0.0001
Nickel	mg/L		0.005	<0.005
Zinc	mg/L		0.005	0.005

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Soil Analysis

RPT Date: Nov 02, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals Scan (Soil) (incl. Hg)															
Arsenic	7787168		3	2	NA	< 1	105%	70%	130%	102%	80%	120%	103%	70%	130%
Cadmium	7787168		<0.5	<0.5	NA	< 0.5	106%	70%	130%	111%	80%	120%	107%	70%	130%
Cobalt	7787168		5.3	4.8	9.9%	< 0.5	102%	70%	130%	108%	80%	120%	106%	70%	130%
Chromium	7787168		12	12	0.0%	< 1	88%	70%	130%	104%	80%	120%	100%	70%	130%
Copper	7787168		12	11	8.7%	< 1	97%	70%	130%	106%	80%	120%	100%	70%	130%
Lead	7787168		5	5	0.0%	< 1	103%	70%	130%	104%	80%	120%	105%	70%	130%
Mercury	7787168		<0.10	<0.10	NA	< 0.10	118%	70%	130%	92%	80%	120%	93%	70%	130%
Nickel	7787168		9	8	11.8%	< 1	99%	70%	130%	108%	80%	120%	105%	70%	130%
Zinc	7787168		24	24	NA	< 1	98%	70%	130%	111%	80%	120%	105%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Trace Organics Analysis

RPT Date: Nov 02, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
PCBs (Total) - Soil															
PCBs	7779859		< 0.05	< 0.05	NA	< 0.05	118%	60%	140%	99%	60%	140%	101%	60%	140%
PCBs (Total) - Water															
PCBs	7773484		< 0.05	< 0.05	NA	< 0.05	118%	60%	140%	117%	60%	140%	87%	60%	140%
Petroleum Hydrocarbon F1 - F4 in Water															
C6 - C10 (F1)	7771856		< 25	< 25	NA	< 25	104%	70%	130%	115%	70%	130%	89%	70%	130%
C>10 - C16 (F2)		TW	< 100	< 100	NA	< 100	102%	70%	130%	81%	70%	130%	70%	70%	130%
C>16 - C34 (F3)		TW	< 100	< 100	NA	< 100	107%	70%	130%	96%	70%	130%	71%	70%	130%
C>34 - C50 (F4)		TW	< 100	< 100	NA	< 100	100%	70%	130%	85%	70%	130%	102%	70%	130%
Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil															
C6 - C10 (F1)	7783958		< 5	< 5	NA	< 5	96%	60%	130%	105%	60%	130%	92%	60%	130%
C>10 - C16 (F2)	7785901		< 10	< 10	NA	< 10	102%	70%	130%	96%	70%	130%	70%	70%	130%
C>16 - C34 (F3)	7785901		< 50	< 50	NA	< 50	103%	70%	130%	97%	70%	130%	72%	70%	130%
C>34 - C50 (F4)	7785901		< 50	< 50	NA	< 50	98%	70%	130%	97%	70%	130%	83%	70%	130%

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

Water Analysis

RPT Date: Nov 02, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
CCME Metals - (Water) - (incl. Hg)															
Arsenic	7778482		< 0.001	< 0.001	NA	< 0.001	99%	90%	110%	98%	90%	110%	106%	70%	130%
Cadmium	7778482		< 0.0001	< 0.0001	NA	< 0.0001	99%	90%	110%	97%	90%	110%	100%	70%	130%
Chromium	7778482		< 0.001	< 0.001	NA	< 0.001	102%	90%	110%	103%	90%	110%	106%	70%	130%
Cobalt	7778482		< 0.0005	< 0.0005	NA	< 0.0005	105%	90%	110%	105%	90%	110%	100%	70%	130%
Copper	7778482		< 0.005	< 0.005	NA	< 0.005	105%	90%	110%	104%	90%	110%	99%	70%	130%
Lead	7778482		< 0.0001	< 0.0001	NA	< 0.0001	100%	90%	110%	99%	90%	110%	96%	70%	130%
Mercury	7779737		<0.0001	<0.0001	NA	< 0.0001	101%	90%	110%	100%	90%	110%	98%	80%	120%
Nickel	7778482		< 0.005	< 0.005	NA	< 0.005	107%	90%	110%	106%	90%	110%	102%	70%	130%
Zinc	7778482		< 0.005	< 0.005	NA	< 0.005	104%	90%	110%	103%	90%	110%	97%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GOLDER ASSOCIATES LTD

AGAT WORK ORDER: 16Z126843

PROJECT: 1530908-2000

ATTENTION TO: Alyssa Troke

SAMPLING SITE:DEW Line

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Trace Organics Analysis			
PCBs	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541 & 8082	GC/ECD
PCBs	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
Initial Sample Volume			GC/FID
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3510 & 8082	GC/ECD
C6 - C10 (F1)	VOL-91-5010	MOE PHC-E3421	(P&T)GC/FID
C>10 - C16 (F2)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>16 - C34 (F3)	VOL-91-5010	MOE PHC-E3421	GC/FID
C>34 - C50 (F4)	VOL -91- 5010	MOE PHC-E3421	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5010	MOE PHC-E3421	BALANCE
C6 - C10 (F1)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
C>10 - C16 (F2)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>16 - C34 (F3)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
C>34 - C50 (F4)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL - 5012	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL-91-5009	CCME Tier 1 Method	Balance
Water Analysis			
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW-846 7470 & 245.1	CVAAS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

AGAT Laboratories

14

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only

Work Order #: 1671268843

Cooler Quantity: 1

Arrival Temperatures: 9.3 | 9.4 | 9.1

6.6 | 6.4 | 6

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: on ice

Report Information:

Company: Golder Associates
Contact: Alyssa Troke
Address: 1931 Robertson Road
K2H 5B7
Phone: 613 592 9600 Fax:
Reports to be sent to:
1. Email: alyssa_troke@golder.com
2. Email: dplenderleith@golder.com

Project Information:

Project: 1530908-2000
Site Location:
Sampled By:
AGAT Quote #: 69566 PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:
Contact:
Address:
Email:

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)

☐ Regulation 558
☒ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☑ No

Report Guideline on Certificate of Analysis ☐ Yes ☑ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Please Circle) Y / N	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	Quote 69566
MW-18B dup	Aug 6		2	S		-														X	
MW-7A dup	Aug 7		2	S		-														X	
MW-5 dup	Aug 7	1010	5	W		N														X	

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Joanne Woodhouse Joanne Woodhouse	Aug 16	1030	[illegible]	16-Aug-16	12h50
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			Steve	16/8/17	1042
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº: T 028920

Appendix C6

Certificate Of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1635445

PARACEL LABORATORIES LTD.
TRUSTED. RESPONSIVE. RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 20409/102554

Report Date: 2-Sep-2016
Order Date: 26-Aug-2016

Order #: 1635445

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1635445-01	MW-6
1635445-02	MW-16
1635445-03	MW-12
1635445-04	MW-13
1635445-05	MW-15
1635445-06	MW-14
1635445-07	MW-9
1635445-08	MW-10
1635445-09	Probe Blank
1635445-10	MW-7
1635445-11	Field Blank
1635445-12	Trip Blank

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 26-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	30-Aug-16	30-Aug-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Sep-16	2-Sep-16
PCBs, total	EPA 608 - GC-ECD	30-Aug-16	30-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	26-Aug-16	29-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	29-Aug-16	30-Aug-16

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-6	MW-16	MW-12	MW-13
	Sample Date:	19-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635445-01	1635445-02	1635445-03	1635445-04
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	<0.0001	0.0003	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	0.001
Cobalt	0.0005 mg/L	0.0045	0.0128	0.0244	0.0120
Copper	0.0005 mg/L	0.0064	0.0031	0.0082	0.0141
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	0.053	0.033	0.097	0.069
Zinc	0.005 mg/L	0.008	0.759	0.037	0.012
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.216 [1] [2]	<0.100 [2]	-
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	-	<0.00005	-
Decachlorobiphenyl	Surrogate	85.5%	-	88.8%	-

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	MW-15	MW-14	MW-9	MW-10
	Sample Date:	20-Aug-16	20-Aug-16	20-Aug-16	20-Aug-16
	Sample ID:	1635445-05	1635445-06	1635445-07	1635445-08
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	0.0003	0.0001	0.0002	0.0007
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	0.0094	0.0133	0.0243	0.0673
Copper	0.0005 mg/L	0.0056	0.0078	0.0079	0.0613
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	0.0003
Nickel	0.001 mg/L	0.036	0.042	0.102	0.256
Zinc	0.005 mg/L	0.024	0.025	0.043	0.119
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.100 [2]	<0.100 [2]	<0.100 [2]
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005
Decachlorobiphenyl	Surrogate	90.7%	90.2%	97.1%	77.8%

Certificate of Analysis

Report Date: 02-Sep-2016

Client: Golder Associates Ltd. (Ottawa)

Order Date: 26-Aug-2016

Client PO:

Project Description: 1530908-2000

	Client ID:	Probe Blank	MW-7	Field Blank	Trip Blank
	Sample Date:	19-Aug-16	19-Aug-16	19-Aug-16	08-Aug-16
	Sample ID:	1635445-09	1635445-10	1635445-11	1635445-12
	MDL/Units	Water	Water	Water	Water
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cadmium	0.0001 mg/L	<0.0001	0.0003	<0.0001	<0.0001
Chromium	0.001 mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	0.0005 mg/L	<0.0005	0.0308	<0.0005	<0.0005
Copper	0.0005 mg/L	<0.0005	0.0097	<0.0005	<0.0005
Lead	0.0001 mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.001 mg/L	<0.001	0.201	<0.001	<0.001
Zinc	0.005 mg/L	0.006	0.059	<0.005	<0.005
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	<0.025 [2]	<0.025 [2]	<0.025 [2]	<0.025 [2]
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [2]	<0.100 [2]	-	<0.100 [2]
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	<0.00005	<0.00005 [2]
Decachlorobiphenyl	Surrogate	74.8%	90.5%	93.1%	83.4% [2]

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.100	mg/L						
F3 PHCs (C16-C34)	ND	0.100	mg/L						
F4 PHCs (C34-C50)	ND	0.100	mg/L						
Metals									
Mercury	ND	0.0001	mg/L						
Arsenic	ND	0.001	mg/L						
Cadmium	ND	0.0001	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Lead	ND	0.0001	mg/L						
Nickel	ND	0.001	mg/L						
Zinc	ND	0.005	mg/L						
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*.00019*		*mg/L*		*77.9*	*60-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND				30	
Metals									
Mercury	ND	0.0001	mg/L	ND				20	
Arsenic	ND	0.001	mg/L	ND				20	
Cadmium	ND	0.0001	mg/L	ND				20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	0.00083	0.0005	mg/L	0.00083			0.1	20	
Copper	0.00055	0.0005	mg/L	0.00062			12.0	20	
Lead	ND	0.0001	mg/L	ND				20	
Nickel	ND	0.001	mg/L	ND			0.0	20	
Zinc	ND	0.005	mg/L	ND			0.0	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.93	0.025	mg/L		96.4	68-117			
F2 PHCs (C10-C16)	1.98	0.100	mg/L		110	60-140			
F3 PHCs (C16-C34)	4.07	0.100	mg/L		109	60-140			
F4 PHCs (C34-C50)	2.58	0.100	mg/L		104	60-140			
Metals									
Mercury	0.00292	0.0001	mg/L	ND	97.2	70-130			
Arsenic	44.0		ug/L		88.1	80-120			
Cadmium	47.0		ug/L		93.9	80-120			
Chromium	47.4		ug/L		94.7	80-120			
Cobalt	47.0		ug/L		94.0	80-120			
Copper	47.0		ug/L		94.0	80-120			
Lead	44.7		ug/L		89.4	80-120			
Nickel	46.4		ug/L		92.8	80-120			
Zinc	46		ug/L		91.9	80-120			
PCBs									
PCBs, total	0.00112	0.00005	mg/L		112	60-140			
Surrogate: Decachlorobiphenyl	*.00022*		*mg/L*		*89.3*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time -
Applies to samples: MW-6, MW-7, Trip

Sample - Insufficient volume - low volume PHCs - if analysis possible run as per client
Applies to samples: MW-16

Sample Qualifiers :

1 : Elevated Reporting Limits due to limited sample volume.

2 : Holding time had been exceeded upon receipt of the sample at the laboratory.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody
(Lab Use Only)

№ 20409

Page 1 of 15

Client Name: GAL	Project Reference: 1530908-2000	TAT: [✓] Regular [ ] 3 Day
Contact Name: see pg. 1	Quote # 16-010	[ ] 2 Day [ ] 1 Day
Address:	PO #	Date Required:
Telephone:	Email Address: see pg. 1	

Criteria: [ ] O. Reg. 153/04 (As Amended) Table ___ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: ___ [ ] Other: ___

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1635440-Soil 1635448-water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	see quote 16-010	Required Analyses	
✓1	EQ-3a	S		2	Aug 21/16		X		60mL + 250mL ✓
2	MW-6	W		6	Aug 19/16	15:45	X		✓
3	MW-16	W		5	Aug 20/16	11:00	X	no PCBs, analyse PHCs if poss. b/c	✓
4	MW-12	W		6	Aug 20/16	16:00	X	~~no PCBs~~	✓
5	MW-13	W		4	Aug 20/16	10:00	X	no PCBs or PHCs	✓
6	MW-15	W		6	Aug 20/16	12:00	X		✓
7	MW-14	W		6	Aug 20/16	13:00	X		✓
8	MW-9	W		6	Aug 20/16	17:00	X		✓
9	MW-10	W		6	Aug 20/16	14:00	X		✓
10	Probe Blank	W		6	Aug 19/16	17:00	X		✓

Comments: MW-16: analyse PHCs if possible (low volume)
MW-13: no PCB or PHC

Method of Delivery: Paracel

Relinquished By (Sign): Alyssa Tudo	Received by Driver/Depot: T. LOUISE	Received at Lab: SUNNYBORN DOR MAL	Verified By: Rachel Subject
Relinquished By (Print): Alyssa Tudo	Date/Time: 26/08/16 12:00 PM	Date/Time: Aug 26 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ___ °C	Temperature: 19.3 °C	pH Verified [✓] By: RS

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Chain of Custody (Lab Use Only)

№ 102554

Page 5 of 5

Client Name: GAL	Project Reference: 1530908
Contact Name: see page 1	Quote # 16-010
Address:	PO #
Telephone:	Email Address: see page 1

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day

Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: ______ [ ] Other: ______

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1635440-Soil 1635445-water.

Required Analyses

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Date	Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	See quote 16-010						
1	MW-7	W		6	Aug 19/16	14:50								X						
2	Field Blank	W		5	Aug 19/16	17:15								X	no PHC analysis					
3	Trip Blank	W		6	Aug 8/16									X						
4																				
5																				
6																				
7																				
8																				
9																				
10																				

Comments:

Method of Delivery: Paracel

Relinquished By (Sign): Alyssa Trake	Received by Driver/Depot: [signature]	Received at Lab: Sunetporn Dok Mai	Verified By: Rachel Subject
Relinquished By (Print): Alyssa Trake	Date/Time: 26/08/16 12:00	Date/Time: Aug 26, 2016 01:51	Date/Time: Aug 26/16 3:54
Date/Time: Aug 26/16 10:00	Temperature: ___ °C	Temperature: 19.3 °C	pH Verified [ ] By: RS

Appendix C7

Certificate Of Analysis –
Paracel Laboratories Ltd.,
Sept. 2, 2016; Order #1634163

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Certificate of Analysis

Golder Associates Ltd. (Ottawa)

1931 Robertson Rd.
Ottawa, ON K2H 5B7
Attn: Alyssa Troke

Client PO:
Project: 1530908-2000
Custody: 26765

Report Date: 2-Sep-2016
Order Date: 16-Aug-2016

Revised Report

Order #: 1634163

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1634163-01	MW98-02
1634163-02	Fox 4 - Rinsate

Approved By:

Tim McCooeye
Senior Advisor

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 16-Aug-2016
Project Description: 1530908-2000

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Mercury by CVAA	EPA 245.1 - Cold Vapour AA	17-Aug-16	17-Aug-16
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Aug-16	19-Aug-16
PCBs, total	EPA 608 - GC-ECD	18-Aug-16	18-Aug-16
PHC F1	CWS Tier 1 - P&T GC-FID	16-Aug-16	18-Aug-16
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	19-Aug-16	19-Aug-16

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)

Client PO:

Report Date: 02-Sep-2016

Order Date: 16-Aug-2016

Project Description: 1530908-2000

	Client ID:	MW98-02	Fox 4 - Rinsate	-	-
	Sample Date:	04-Aug-16	05-Aug-16	-	-
	Sample ID:	1634163-01	1634163-02	-	-
	MDL/Units	Water	Water	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Arsenic	0.001 mg/L	0.004	<0.001	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	0.0030	<0.0005	-	-
Copper	0.0005 mg/L	0.0006	<0.0005	-	-
Lead	0.0001 mg/L	0.0001	<0.0001	-	-
Nickel	0.001 mg/L	0.006	<0.001	-	-
Zinc	0.005 mg/L	0.090	<0.005	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.025 mg/L	0.395 [1]	<0.025 [1]	-	-
F2 PHCs (C10-C16)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
F3 PHCs (C16-C34)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
F4 PHCs (C34-C50)	0.100 mg/L	<0.100 [1]	<0.100 [1]	-	-
PCBs					
PCBs, total	0.00005 mg/L	<0.00005	<0.00005	-	-
Decachlorobiphenyl	Surrogate	54.8% [4]	72.4%	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L						
F2 PHCs (C10-C16)	ND	0.100	mg/L						
F3 PHCs (C16-C34)	ND	0.100	mg/L						
F4 PHCs (C34-C50)	ND	0.100	mg/L						
Metals									
Mercury	ND	0.0001	mg/L						
Arsenic	ND	0.001	mg/L						
Cadmium	ND	0.0001	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Lead	ND	0.0001	mg/L						
Nickel	ND	0.001	mg/L						
Zinc	ND	0.005	mg/L						
PCBs									
PCBs, total	ND	0.00005	mg/L						
Surrogate: Decachlorobiphenyl	*.00020.*		*mg/L*		*80.6*	*60-140*			

Certificate of Analysis
Client: Golder Associates Ltd. (Ottawa)
Client PO:

Report Date: 02-Sep-2016
Order Date: 16-Aug-2016
Project Description: 1530908-2000

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND				30	
Metals									
Mercury	ND	0.0001	mg/L	ND				20	
Arsenic	ND	0.001	mg/L	0.0013			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	ND	0.0005	mg/L	ND				20	
Lead	ND	0.0001	mg/L	ND			0.0	20	
Nickel	ND	0.001	mg/L	ND				20	
Zinc	ND	0.005	mg/L	ND			0.0	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	1.83	0.025	mg/L		91.3	68-117			
F2 PHCs (C10-C16)	1.67	0.100	mg/L		93.0	60-140			
F3 PHCs (C16-C34)	3.16	0.100	mg/L		85.0	60-140			
F4 PHCs (C34-C50)	2.12	0.100	mg/L		85.3	60-140			
Metals									
Mercury	0.00309	0.0001	mg/L	ND	103	70-130			
Arsenic	39.0		ug/L	1.3	75.3	80-120			QM-07
Cadmium	49.2		ug/L	0.01	98.4	80-120			
Chromium	49.9		ug/L	0.1	99.6	80-120			
Cobalt	49.0		ug/L	0.02	98.1	80-120			
Copper	48.0		ug/L	ND	96.0	80-120			
Lead	47.5		ug/L	0.08	94.8	80-120			
Nickel	49.2		ug/L	ND	98.5	80-120			
Zinc	52		ug/L	0.2	103	80-120			
PCBs									
PCBs, total	0.00110	0.00005	mg/L		110	60-140			
Surrogate: Decachlorobiphenyl	*0.00021*		*mg/L*		*87.2*	*60-140*			

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time - CCME F1-F4 past hold time
Applies to samples: MW98-02, Fox 4 - Rinsate

Sample Qualifiers :

1 : Holding time had been exceeded upon receipt of the sample at the laboratory.

4 : The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

Revision 1, all results reported as mg/L.

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

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Chain of Custody
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№ 26765

Page 2 of 2

Client Name: Golder Associates	Project Reference: 1530908-2000
Contact Name: see page 1	Quote #: ~~15-304~~ Golder Dew Lines Monitoring
Address:	PO #:
Telephone:	Email Address: alyssa_troke@golder.com dplenderleith@golder.com

TAT: [X] Regular [ ] 3 Day [ ] 2 Day [ ] 1 Day
Date Required:

Criteria: [ ] O. Reg. 153/04 (As Amended) Table __ [ ] RSC Filing [ ] O. Reg. 558/00 [ ] PWQO [X] CCME [ ] SUB (Storm) [ ] SUB (Sanitary) Municipality: [ ] Other:

Matrix Type: (S) Soil/Sed. (GW) (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1634162-Soil 1634163-water

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: see Quote
1	MW98-02	GW		6	Aug 4	1700	X
2	Fox 4 - Rinsate	GW		6	Aug 5	—	X
3							
4							
5							
6							
7							
8							
9							
10							

Comments: Samples not preserved, not field filtered. SC. Proceed regardless of hold time per Alyssa. SC

Method of Delivery:

Relinquished By (Sign): Joanne Woodhouse	Received by Driver/Depot:	Received at Lab: SUNREPORN DOR MAT	Verified By: Rachel Subject
Relinquished By (Print): Joanne Woodhouse	Date/Time: Aug 16/16 11:Bull	Date/Time: AUG 16 2016 03:10	Date/Time: Aug 16/18 5:00
Date/Time: Aug 16/2016 1030am	Temperature: 8.8 °C	Temperature: 8.8 °C	pH Verified [ ] By: RS

Appendix C8

Historical Soil Water Chemistry Data

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Background Data - Average						10	5.3	4.0	1.0	5.0	46	19	1.93	0.5	0.001				5.0		
Baseline Data - Average						**7.6**	**5.2**	**5.0**	**1.0**	**10.0**	**31.7**	**20.0**	**2.0**	**0.1**	**0.003**				**10**		
Baseline Data - Standard Deviation						1.4	1.8	1.6	0.0	0.0	6.2	0.0	0.6	0.00	0.000				7.1		
Baseline Data Average + 3xSD						12	11	9.8	1.0	10	50	20	3.8	0.1	0.003				31		
Detection Limit						<3.0	<5.0	<5.0	<1.0	<10	<15	<20	<1	<0.1	<0.003				<10		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																					
DEW Line Cleanup Tier I Criteria										*200*					*1*						
DEW Line Cleanup Tier II Criteria & DLCU Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2*	*5*				*2500*		
Monitoring Data																					
Upgradient																					
	MW-5 Surface															**TPH Sum will appear when F1, F2 and F3 fraction results are entered**					
24720/21	MW 5	2007	1	Phase I	10	5.5	<5.0	<5.0	<1.0	<10	30	<20	1.2	<0.10	<0.0030	<10	11	110	**126**		
210808-146-FOX-5	MW 5	2008	2	Phase I	0-10	**16**	**13**	**8.0**	<0.5	**10**	**63**	**29**	**2.7**	<0.1	<0.02	<20	<20	<20	**30**		
F509-5WA	MW 5	2009	3	Phase I	0-15	**10**	**18**	**9.0**	<0.5	8.0	**47**	**37**	**3.6**	<0.1	<0.02	<20	<20	<20	**30**		
F510-5WA	MW 5	2010	4	Phase I	0-15	**10**	**15**	4.0	<0.5	6.0	**40**	**30**	1.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19560	MW-5	2012	6	Phase I	0-10	5.3	4.4	2.4	<0.5	5.6	24	10	1.8	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-5-S	MW-5	2014	8	Phase II	0-15	**8.1**	**6.7**	4.5	<0.10	7	**41**	17	<1.0	<0.050	<0.010	<10	<10	<50	**35**		
MW-5b	MW-5	2016	10	Phase II	0-15	6.8	**6.2**	4	<0.5	7.6	**32.8**	14.3	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-5 Depth																				
24722	MW 5	2007	1	Phase I	40	6.4	**6.2**	**6.2**	<1.0	<10	**37**	<20	<1.0	<0.10	<0.0030	<10	5.3	26	**36**		
210808-147-FOX-5	MW 5	2008	2	Phase I	40-50	**16**	**17**	**7**	<0.5	**11**	**59**	**41**	**2.5**	<0.1	<0.02	<20	<20	<20	**30**		
F509-5WB	MW 5	2009	3	Phase I	40-50	**8.0**	**17**	**8.0**	<0.5	7.0	**41**	**34**	**2.7**	<0.1	<0.02	<20	<20	<20	**30**		
F510-5WB	MW 5	2010	4	Phase I	40-50	**11**	**12**	**5.0**	<0.5	8.0	**45**	**26**	1.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19562	MW-5	2012	6	Phase I	40-50	7.1	**6.1**	3.3	<0.5	7.1	**33**	14	**2.4**	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-5-D	MW-5	2014	8	Phase II	40-50	**9.7**	**8.1**	4.9	<0.10	8	**45**	19	1.1	<0.050	<0.010	<10	<10	<50	**35**		
MW-5a	MW-5	2016	10	Phase II	30-40	6.9	**6.2**	4.1	<0.5	6.9	**33**	14.1	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Downgradient																					
	MW-6 Surface																				
24726	MW 6	2007	1	Phase I	10	5.1	**5.3**	**5.0**	<1.0	<10	29	<20	<1.0	<0.10	<0.0030	<10	4.2	34	**43**		
210808-143-FOX-5	MW 6	2008	2	Phase I	0-10	**11**	**11**	**6.0**	<0.5	8.0	**44**	**23**	1.7	<0.1	<0.02	<20	<20	30	**50**		
F509-6WA	MW 6	2009	3	Phase I	0-15	5.0	**8**	**5.0**	<0.5	6.0	27	12	**2.9**	<0.1	<0.02	<20	<20	<20	**30**		
F510-6WA	MW 6	2010	4	Phase I	0-15	**8.0**	**11**	4.0	<0.5	7.0	**38**	**22**	1.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19564	MW 6	2012	6	Phase I	0-10	7.3	**6.5**	3.6	<0.5	7.6	**35**	14	**2.2**	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-6-S	MW-6	2014	8	Phase II	0-15	7.2	**5.3**	3.55	<0.5	6.1	**32.5**	13	1	<0.10	<0.05	<10	<10	<50	**35**		
MW-6b	MW-6	2016	10	Phase II	0-15	5.5	4.9	3.5	<0.5	6.6	27.6	12.2	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-6 Depth																				
24728	MW 6	2007	1	Phase I	40	5.7	**5.4**	**5.3**	<1.0	<10	**32**	<20	<1.0	<0.10	<0.0030	<10	<4.0	29	**36**		
210808-144-FOX-5	MW 6	2008	2	Phase I	40-50	**10**	**12**	**6**	<0.5	8	**52**	**26**	**2.1**	<0.1	<0.02	<20	<20	<20	**30**		
F509-6WB	MW 6	2009	3	Phase I	40-50	**8.0**	**12**	**7.0**	<0.5	7.0	**40**	19	**2.9**	<0.1	<0.02	<20	<20	<20	**30**		
F510-6WB	MW 6	2010	4	Phase I	40-50	**8.0**	**12**	4.0	<0.5	7.0	**37**	**23**	<1	<0.1	<0.02	<10	<10	<20	**20**		
12-19566	MW 6	2012	6	Phase I	40-50	6.9	**6.1**	3.3	<0.5	7.9	**34**	14	**2.1**	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-6-D	MW-6	2014	8	Phase II	40-50	**8**	**6.9**	4.4	<0.10	7.6	**40**	16	<1.0	<0.050	<0.010	<10	<10	<50	**35**		
MW-6a	MW-6	2016	10	Phase II	40-50	5.5	**5.3**	3.5	<0.5	6.4	27.4	12.1	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-7 Surface																				
24730/31	MW 7	2007	1	Phase I	10	6.4	**6.0**	**5.0**	<1.0	<10	**35**	<20	<1.0	<0.10	<0.0030	<10	4.1	63	**72**		
210808-139-FOX-5	MW 7	2008	2	Phase I	0-10	**10**	**11**	**5**	<0.5	7	**40**	**22**	<1.0	<0.1	<0.02	<20	<20	<20	**30**		
210808-140-FOX-5	MW 7	2008	2	Phase I	0-10	**11**	**18**	**6**	<0.5	7	**48**	**37**	1.5	<0.1	<0.02	<20	<20	<20	**30**		
F509-7WA	MW 7	2009	3	Phase I	0-15	**8.0**	**22**	**7.0**	<0.5	8.0	**45**	**40**	**3.2**	<0.1	<0.02	<20	<20	<20	**30**		
F510-7WA	MW 7	2010	4	Phase I	0-15	**10**	**17**	**5.0**	<0.5	9.0	**49**	**35**	1.0	<0.1	<0.02	<10	<10	25	**35**		
12-19568	MW 7	2012	6	Phase I	0-10	7.2	**6.1**	3.3	<0.5	7.3	**34**	13	2.0	0.012	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-7-S	MW-7	2014	8	Phase II	0-15	**10**	**6**	3.7	<0.10	6	**56**	13	<1.0	<0.050	<0.010	<10	<10	<50	**35**		
MW-7b	MW-7	2016	10	Phase II	0-15	6.7	**5.6**	3.9	<0.5	7.2	**32.4**	13.4	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-7 Depth																				
24732	MW 7	2007	1	Phase I	40	6.9	**6.5**	**5.8**	<1.0	<10	**42**	<20	<1.0	<0.10	<0.0030	<10	8.7	30	**44**		
210808-141-FOX-5	MW 7	2008	2	Phase I	40-50	**12**	**14**	**7**	<0.5	8.0	**57**	**30**	2	<0.1	<0.02	<20	<20	<20	**30**		
F509-7WB	MW 7	2009	3	Phase I	40-50	**9.0**	**13**	**8.0**	<0.5	7.0	**51**	**23**	**3.2**	<0.1	<0.02	<20	<20	<20	**30**		
F510-7WB	MW 7	2010	4	Phase I	40-50	**11**	**14**	**5.0**	<0.5	8.0	**55**	**27**	1.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19570	MW 7	2012	6	Phase I	40-50	7.5	**6.4**	3.5	<0.5	6.7	**37**	14	1.9	0.012	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-7-D	MW-7	2014	8	Phase II	40-50	**9.2**	**7.5**	4.6	<0.10	7.6	**45**	17	<1.0	<0.050	<0.010	<10	<10	<50	**35**		
MW-7a (Dup Avg)	MW-7	2016	10	Phase II	40-50	**8**	**7**	4.4	<0.5	7	**40**	16	2	<0.1	<0.05	<6	<7	<29	**21**		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-8 Surface																				
24736	MW 8	2007	1	Phase I	10	4.9	<5.0	<5.0	<1.0	<10	26	<20	1.2	<0.10	<0.0030	<10	6.3	47	**58**		
210808-135-FOX-5	MW 8	2008	2	Phase I	0-10	**9.0**	**7.0**	**5.0**	<0.5	6.0	**34**	15	**3.4**	<0.1	<0.02	<20	<20	27	**27**		
F509-8WA	MW 8	2009	3	Phase I	0-15	**8.0**	**15**	**7.0**	<0.5	6.0	**39**	**30**	**3.8**	<0.1	<0.02	<20	<20	<20	**30**		
F510-8WA	MW 8	2010	4	Phase I	0-15	**8.0**	**7.0**	3.0	<0.5	7.0	**33**	15	2	<0.1	<0.02	<10	<10	<20	**20**		
12-19572	MW 8	2012	6	Phase I	0-10	5.9	5.0	2.7	<0.5	5.9	27	11	**2.3**	0.015	<0.020	<5.0	<10	53	**61**		
F5-MID-MW-8-S	MW-8	2014	8	Phase II	0-15	7.1	5.1	3	<0.10	6.8	27	12	1	<0.050	<0.010	<10	<10	71	**81**		
MW-8b	MW-8	2016	10	Phase II	0-15	5.5	5.2	3.4	<0.5	6	26.4	12.4	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-8 Depth																				
24738	MW 8	2007	1	Phase I	40	4.5	<5.0	<5.0	<1.0	<10	27	<20	<1.0	<0.10	<0.0030	<10	6.0	37	**48**		
210808-136-FOX-5	MW 8	2008	2	Phase I	40-50	**10**	**11**	**5.0**	<0.5	7.0	**35**	**24**	**2.7**	<0.1	<0.02	<20	<20	<20	**30**		
F509-8WB	MW 8	2009	3	Phase I	40-50	7.0	**15**	**6.0**	<0.5	6.0	**34**	**26**	**3.2**	<0.1	<0.02	<20	<20	<20	**30**		
F510-8WB	MW 8	2010	4	Phase I	40-50	**9.0**	**13**	4.0	<0.5	7.0	**38**	**29**	2.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19574	MW 8	2012	6	Phase I	40-50	5.1	4.5	2.3	<0.5	5.8	24	10	**2.4**	0.012	<0.020	<5.0	<10	63	**71**		
F5-MID-MW-8-D	MW-8	2014	8	Phase II	40-50	7	**5.9**	3.9	<0.10	7.2	**33**	14	1.1	<0.050	<0.010	<10	<10	<50	**35**		
MW-8a	MW-8	2016	10	Phase II	40-50	5.9	**5.6**	3.4	<0.5	5.8	27	12.6	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-9 Surface																				
24740/41	MW 9	2007	1	Phase I	10	5.2	5.2	<5.0	<1.0	<10	31	<20	<1.0	<0.10	<0.0030	<10	7.3	22	**34**		
210808-132-FOX-5	MW 9	2008	2	Phase I	0-10	**9.0**	**9.0**	**5.0**	<0.5	7.0	**42**	**20**	**3.1**	<0.1	<0.02	<20	<20	<20	**30**		
F509-9WA	MW 9	2009	3	Phase I	0-15	7.0	**15**	**7.0**	<0.5	6.0	**36**	**27**	**3.8**	<0.1	<0.02	<20	<20	<20	**30**		
F510-9WA	MW 9	2010	4	Phase I	0-15	7.0	**7.0**	4.0	<0.5	8.0	**33**	14	2.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19576	MW 9	2012	6	Phase I	0-10	6.6	**5.8**	3.3	<0.5	7.5	30	13	**3.0**	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-9-S	MW-9	2014	8	Phase II	0-15	5.6	4.5	2.9	<0.10	5.9	26	11	1.4	<0.050	<0.010	<10	<10	<50	**35**		
MW-9a	MW-9	2016	10	Phase II	0-15	7.2	5	3.3	<0.5	6.6	25.8	11.3	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-9 Depth																				
24742	MW 9	2007	1	Phase I	40	4.6	<5.0	<5.0	<1.0	<10	28	<20	1.1	<0.10	<0.0030	<10	6.2	12	**23**		
210808-133-FOX-5	MW 9	2008	2	Phase I	40-50	**11**	**10**	**5.0**	<0.5	6.0	**40**	**22**	**3.0**	<0.1	<0.02	<20	<20	<20	**30**		
F509-9WB	MW 9	2009	3	Phase I	40-50	7.0	**12**	**6.0**	<0.5	5.0	**34**	18	**3.9**	<0.1	<0.02	<20	<20	<20	**30**		
F510-9WB	MW 9	2010	4	Phase I	40-50	**8.0**	**11**	4.0	<0.5	7.0	**35**	**23**	2.0	<0.1	<0.02	<10	<10	<20	**20**		
12-19578	MW 9	2012	6	Phase I	40-50	7.0	**6.1**	3.4	<0.5	8.2	31	14	**3.4**	<0.010	<0.020	<5.0	<10	<50	**33**		
F5-MID-MW-9-D	MW-9	2014	8	Phase II	40-50	5.6	5.1	3	<0.10	7	26	12	1.3	<0.050	<0.010	<10	<10	<50	**35**		
Not sampled - refusal	MW-9	2016	10	Phase II															#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

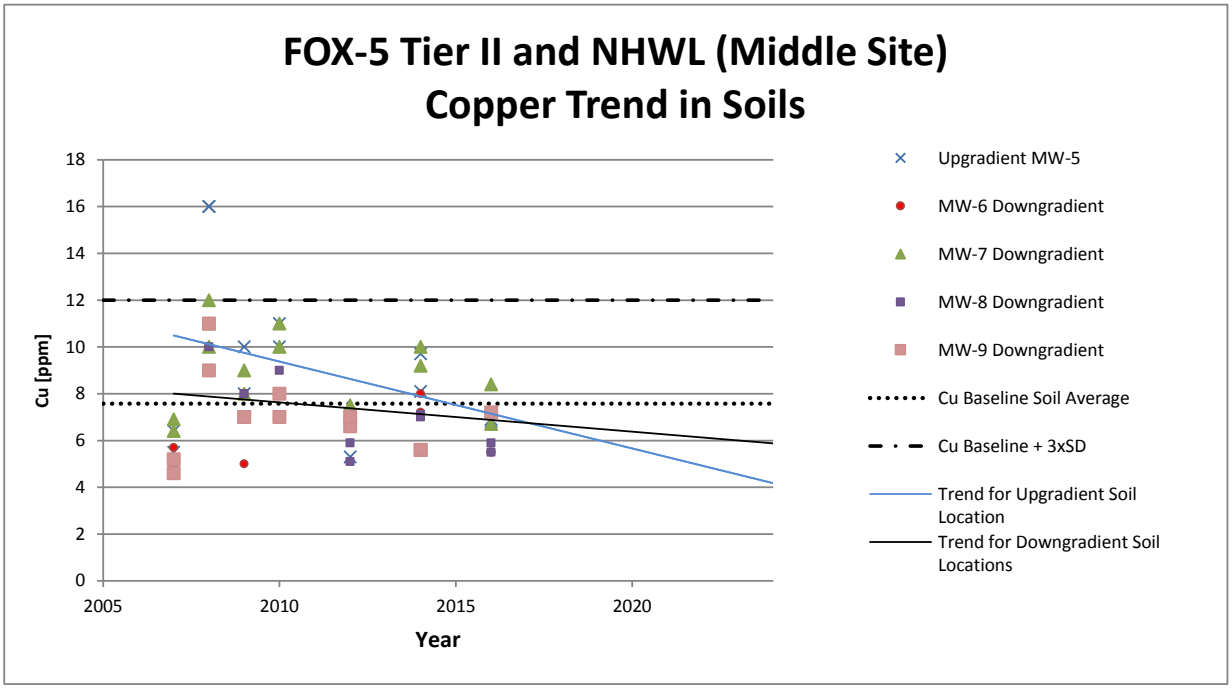
^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

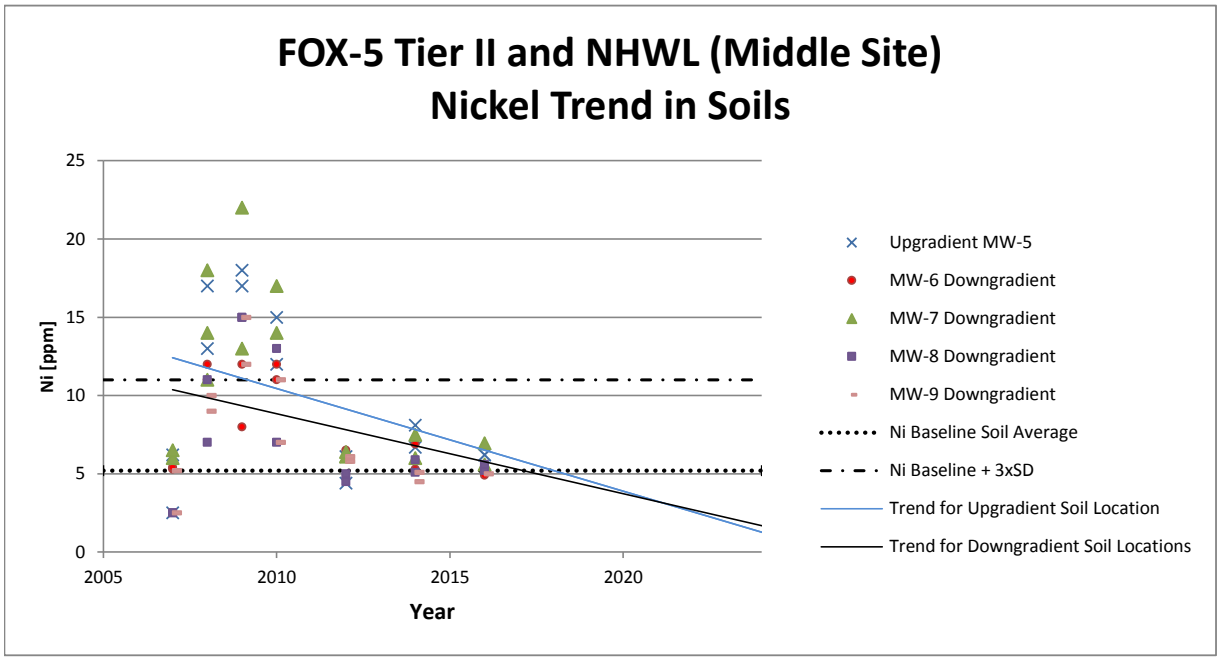
Legend

XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

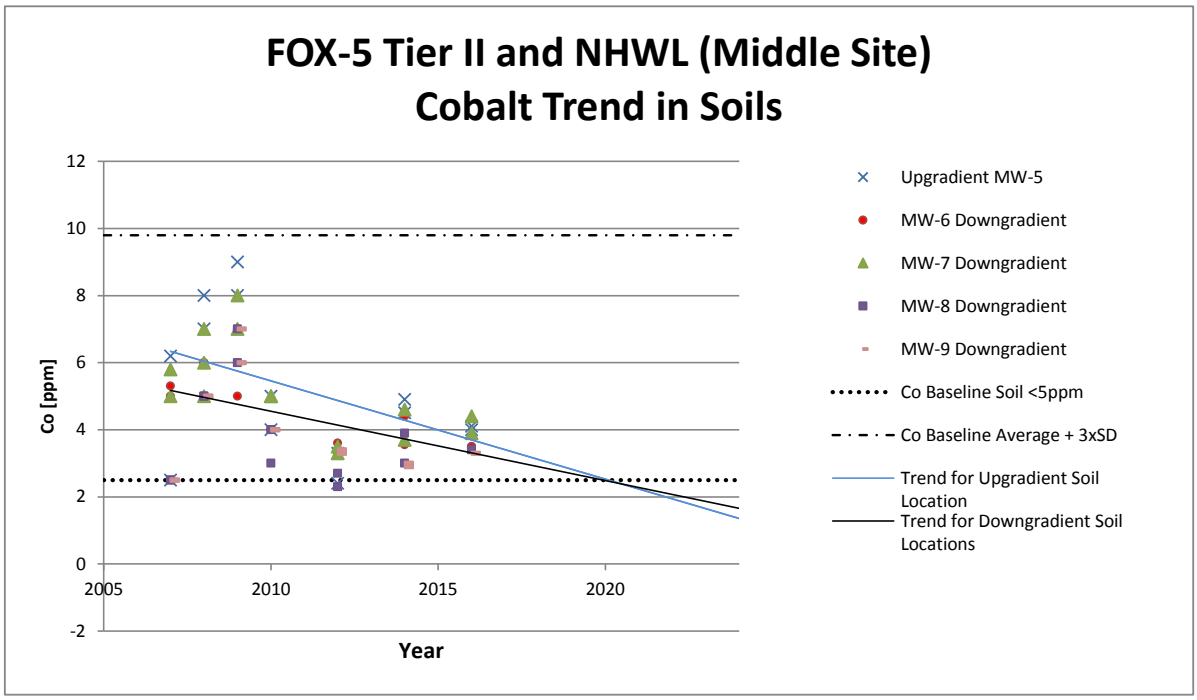
FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends

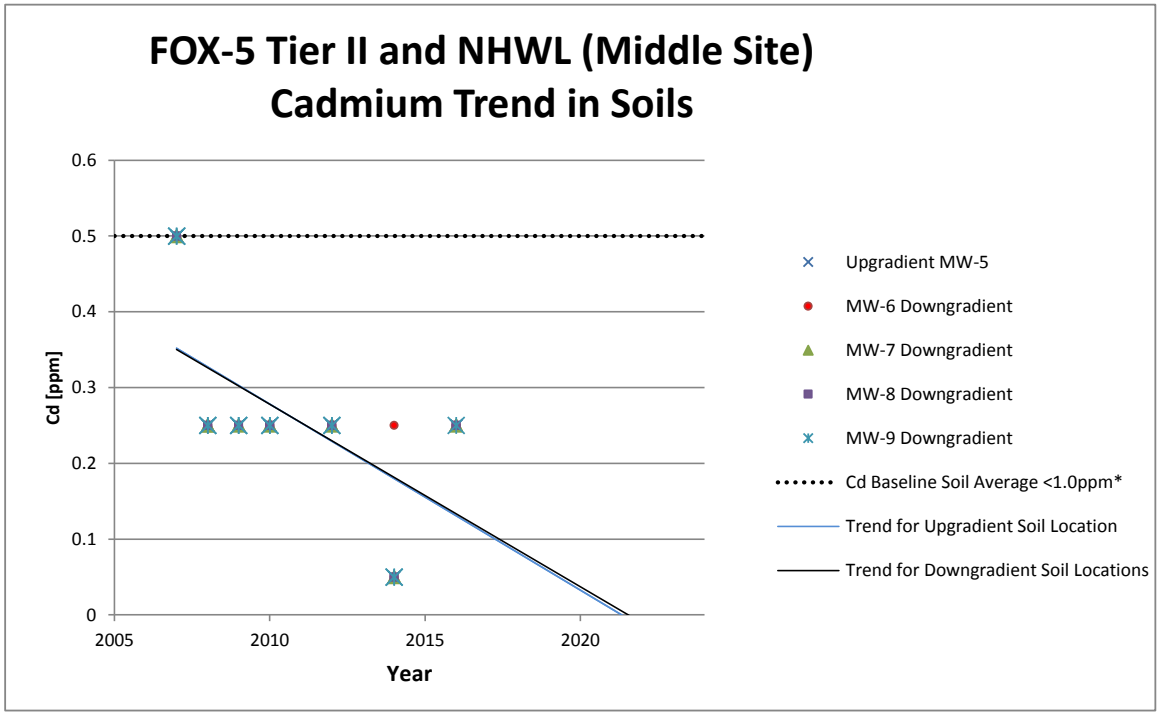
Where results are below detection, half of the detection limit has been used in the charts.





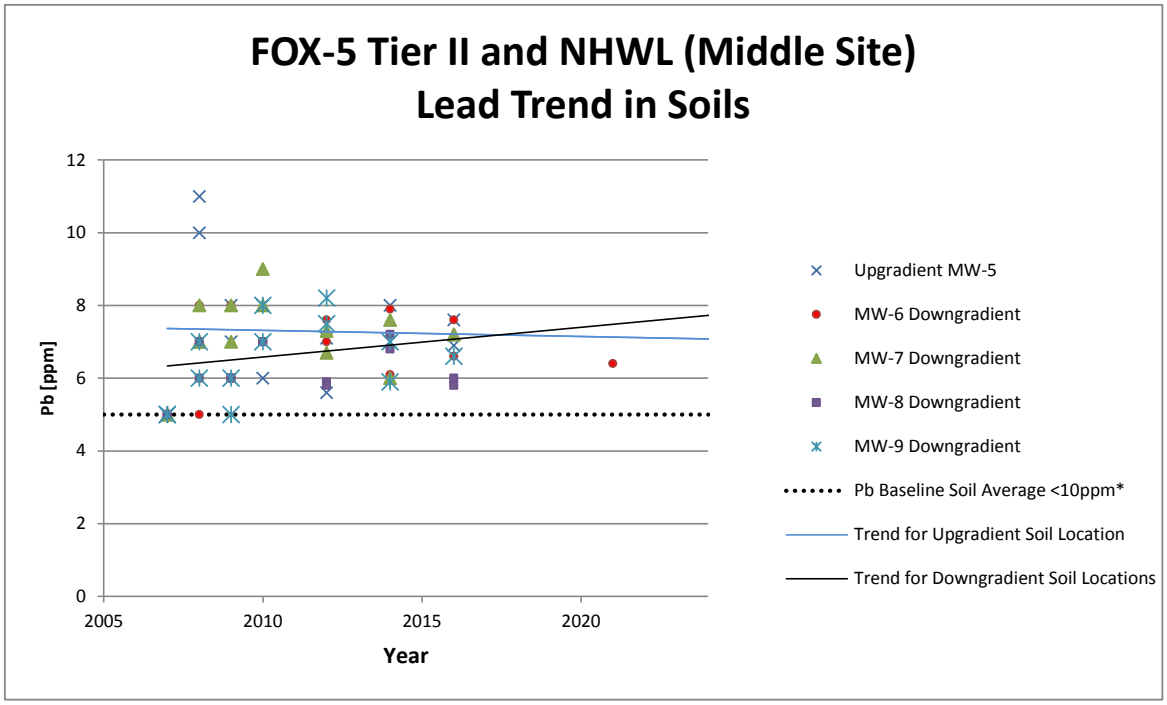
FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends



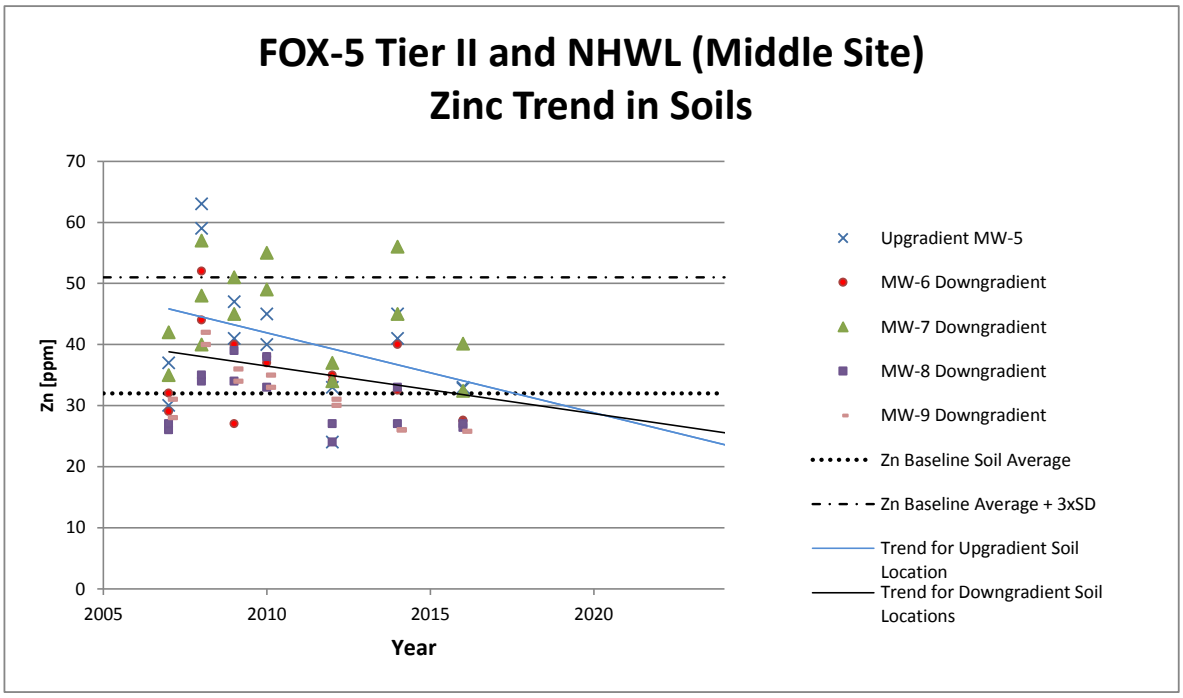


* Cd Baseline SD = 0, all Cd results below detection. Changes in detection limit cause change in trend.

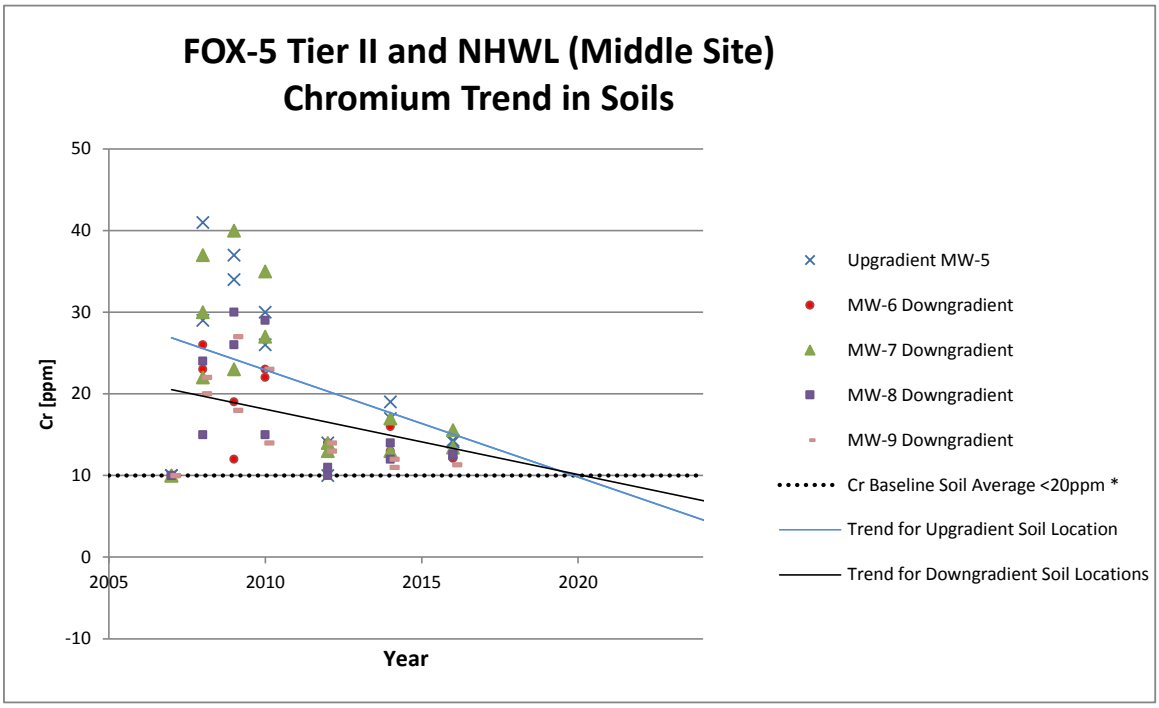
FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends



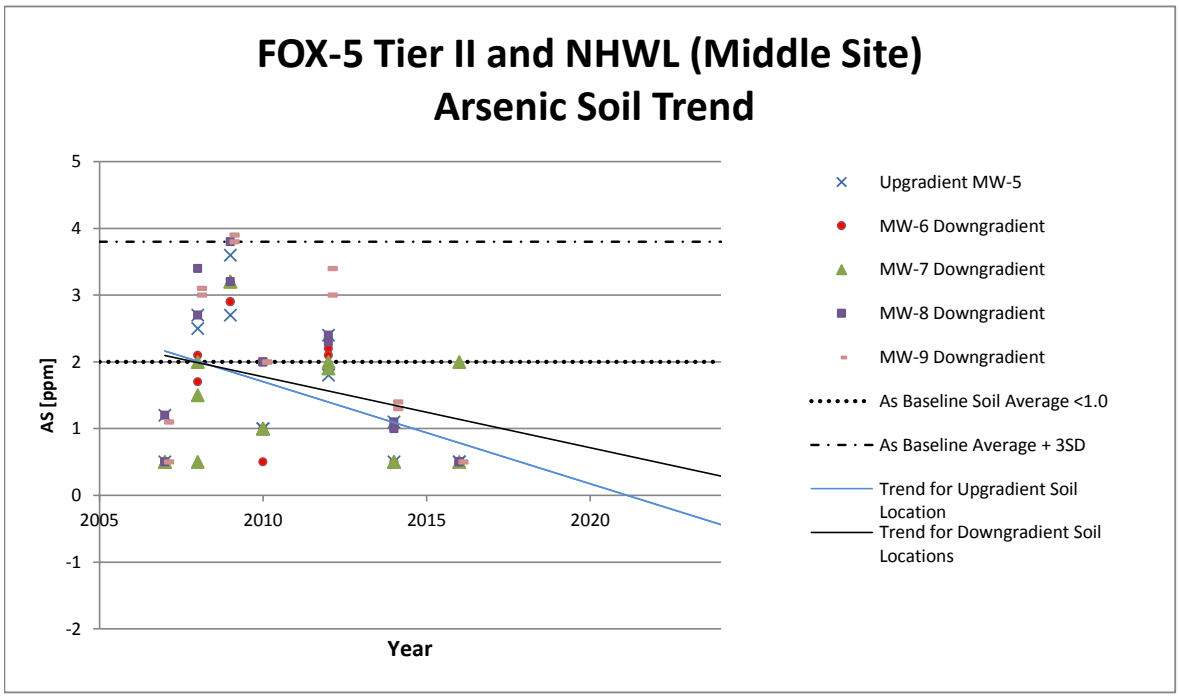
* Pb Baseline Standard Deviation = 0



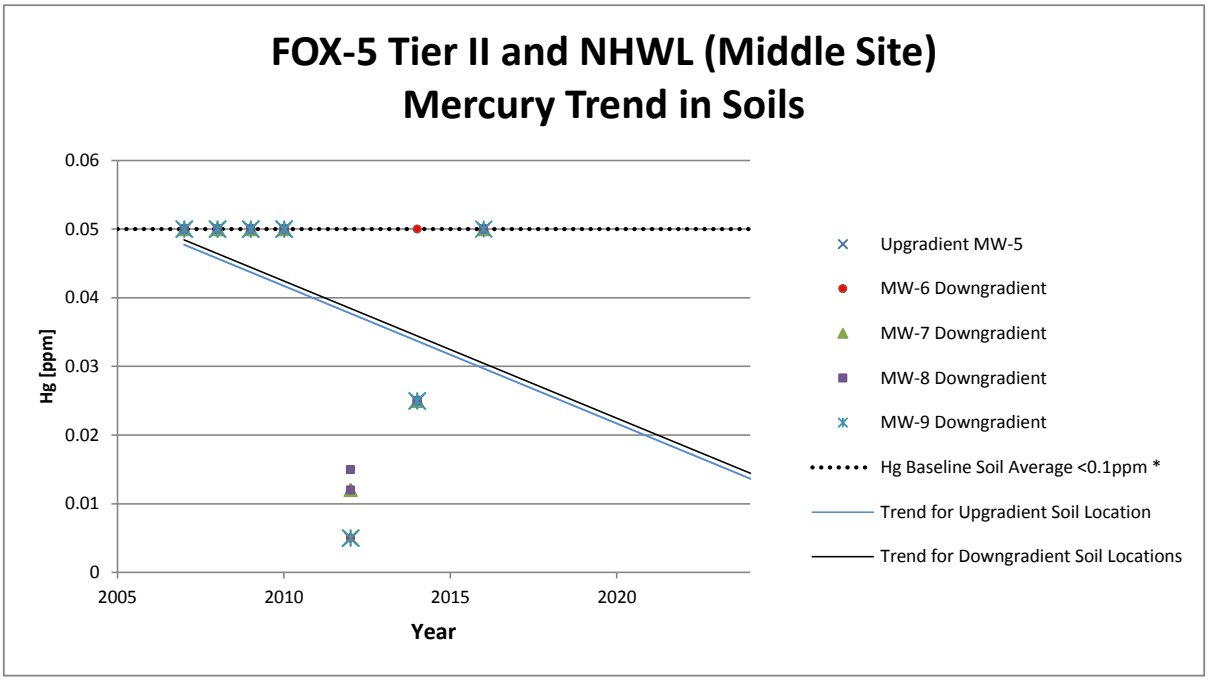
FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends



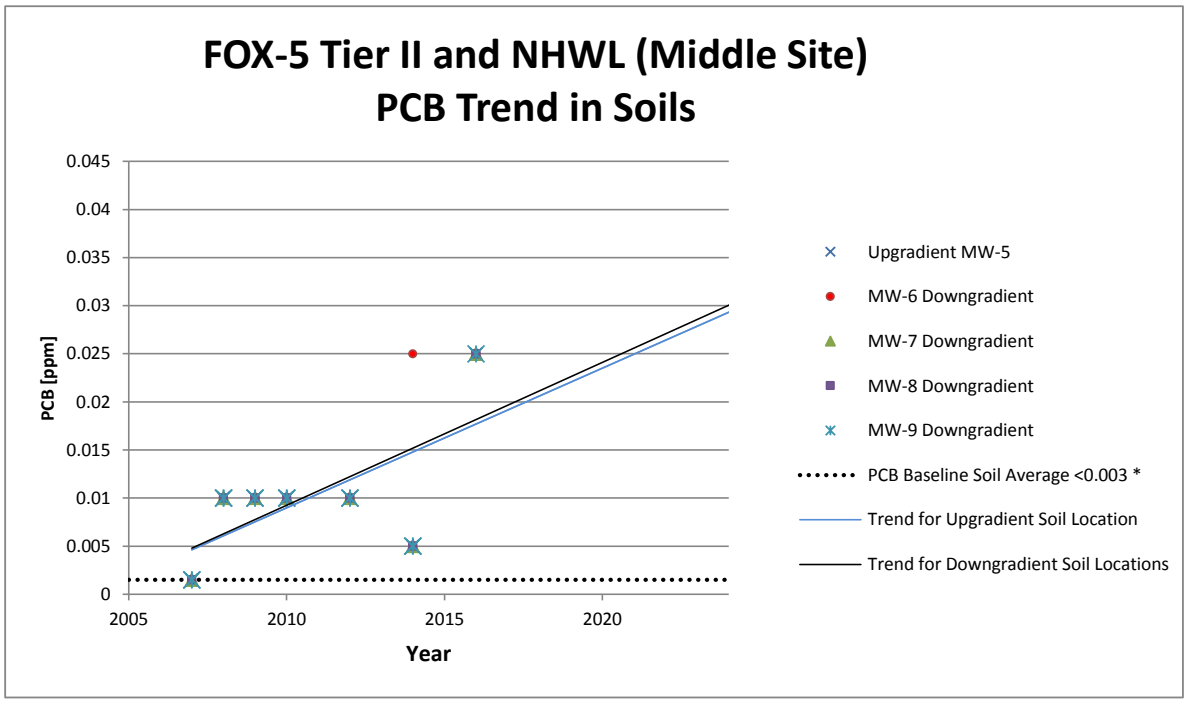
* Cr Baseline Standard Deviation = 0



FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends

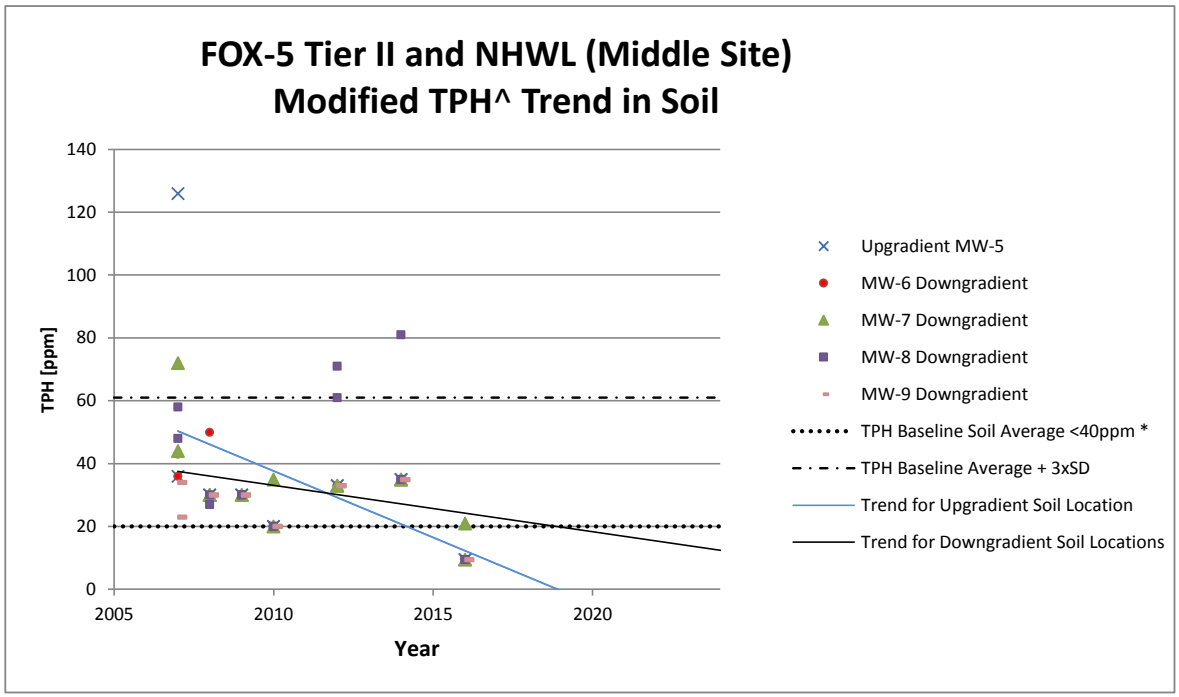


* Hg Baseline SD = 0 Detectable Hg seen in 2012 but at levels lower than detection limits from earlier years. All previous years showed no detectable Hg



* PCB Baseline SD = 0 All PCB Monitoring Results below detection. Trend reflects changes in detection limits.

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Disposal Facility and Non-Hazardous Waste Landfill (Middle Site)- Landfill Trends



^ Baseline samples from 2002 were analyzed as TPH, results from 2003 and later are Sum of PHC F1-F3 fractions.

FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Facility and NHWL (Middle Site) Groundwater Summary

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Cu [mg/L]	Ni [mg/L]	Co* [mg/L]	Cd* [mg/L]	Pb* [mg/L]	Zn [mg/L]	Cr [mg/L]	As* [mg/L]	Hg* [mg/L]	Total PCBs* [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	Modified TPH - Total C6-C34 [mg/L]	TPH Identity: % Fuel Oil	TPH Identity: % Lube Oil
Baseline Data - Average					**0.012**	**0.043**	**0.003**	**0.001**	**0.01**	**0.063**	**0.084**	**0.003**	**0.0004**	**0.00002**				**1**		
Baseline Data - Standard Deviation					0.009	0.048	0.001	0	0	0.098	0.092	0	0	0				0		
Baseline Data Average + 3xSD					0.03917	0.18744	0.006	0.001	0.01	0.3571	0.36	0.003	0.0004	0.00002				1		
Detection Limit					<0.0010	<0.0020	<0.0030	<0.0010	<0.010	<0.010	<0.0010	<0.0030	<0.00040	<0.000020				<1.0		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																				
Monitoring Data															**Total TPH will appear when F1, F2, F3 fractions are entered**					
Upgradient	**MW-5**																			
24724	MW 5	2007	1	Phase I	0.012	**0.044**	<0.0030	<0.0010	<0.010	**0.086**	**0.089**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
210808-148-FOX-5	MW 5	2008	2	Phase I	0.011	<0.005	0.001	<0.0001	0.002	0.020	0.002	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F509-5W	MW 5	2009	3	Phase I	0.002	<0.005	0.000	0.000	<0.001	<0.01	0.002	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F510-5W	MW 5	2010	4	Phase I	0.004	<0.005	0.000	0.000	<0.001	0.010	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.200		
12-19540/41	MW-5	2012	6	Phase I	0.003	0.004	0.001	<0.00010	0.001	0.013	0.004	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
F5-MID-MW-5	MW-5	2014	8	Phase II	0.009	0.021	0.002	0.000	0.004	0.028	0.036	0.001	<0.00001	<0.00005	<0.025	<0.1	<0.2	0.163		
MW-5 (Dup Avg)	MW-5	2016	10	Phase II	<0.003	<0.003	<0.0005	<0.0001	<0.0001	0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.1	<0.1	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
Downgradient																				
	MW-6																			
24729	MW 6	2007	1	Phase I	**0.018**	**0.100**	<0.0030	<0.0010	<0.010	0.039	**0.210**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
210808-145-FOX5	MW 6	2008	2	Phase I	0.001	<0.005	<0.0002	<0.0001	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F509-6W	MW 6	2009	3	Phase I	0.001	<0.005	0.000	0.000	<0.001	**0.070**	0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F510-6W	MW 6	2010	4	Phase I	0.002	<0.005	<0.0002	0.001	<0.001	0.020	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.200		
12-19542	MW 6	2012	6	Phase I	0.002	0.003	<0.00050	<0.00010	<0.0010	0.008	0.003	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
No sample collected - well was dry	MW-6	2014	8	Phase II														#N/A		
MW-6	MW-6	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001		<0.025			#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-7																			
24734	MW 7	2007	1	Phase I	**0.017**	**0.076**	**0.004**	<0.0010	<0.010	0.032	**0.140**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
210808-142-FOX5	MW 7	2008	2	Phase I	0.006	<0.005	<0.0004	<0.0001	<0.001	<0.01	0.002	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F509-7W	MW 7	2009	3	Phase I	0.001	<0.005	<0.0002	<0.0001	<0.001	<0.01	0.002	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F510-7W	MW-7	2010	4	Phase I	0.003	<0.005	<0.0002	<0.0001	<0.001	<0.01	0.002	<0.001	<0.0001	<0.0001	<0.1	<0.1	0.7	0.800		
	MW-7 - dry	2012	6	Phase I														#N/A		
No sample collected - well was dry		2014	8	Phase II														#N/A		
		2016	10	Phase II														#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		

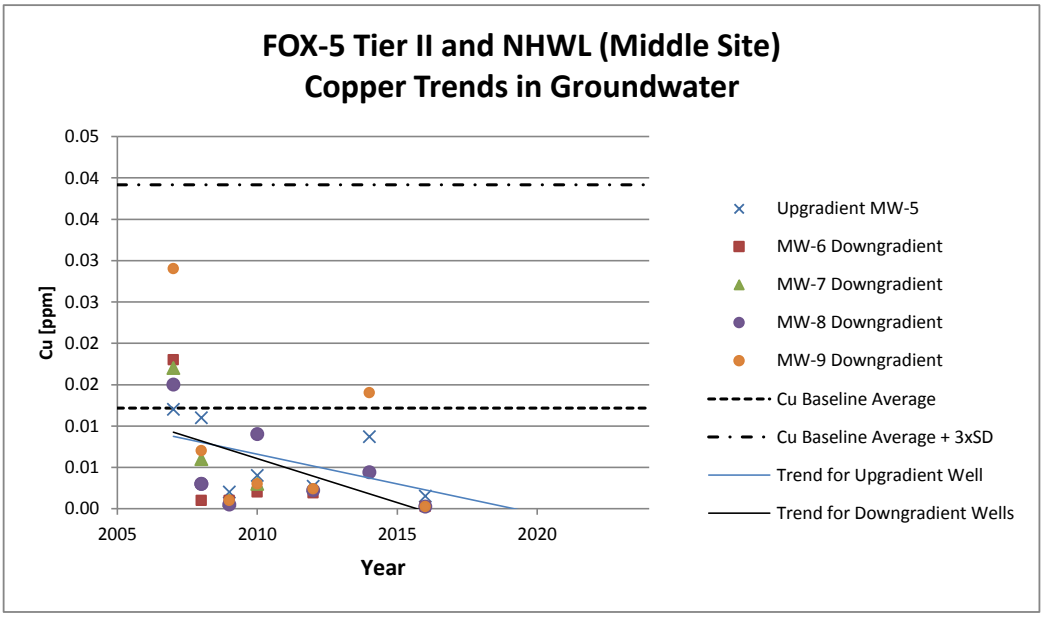
FOX-5 Qikiqtarjuaq (Broughton Island) Tier II Facility and NHWL (Middle Site) Groundwater Summary

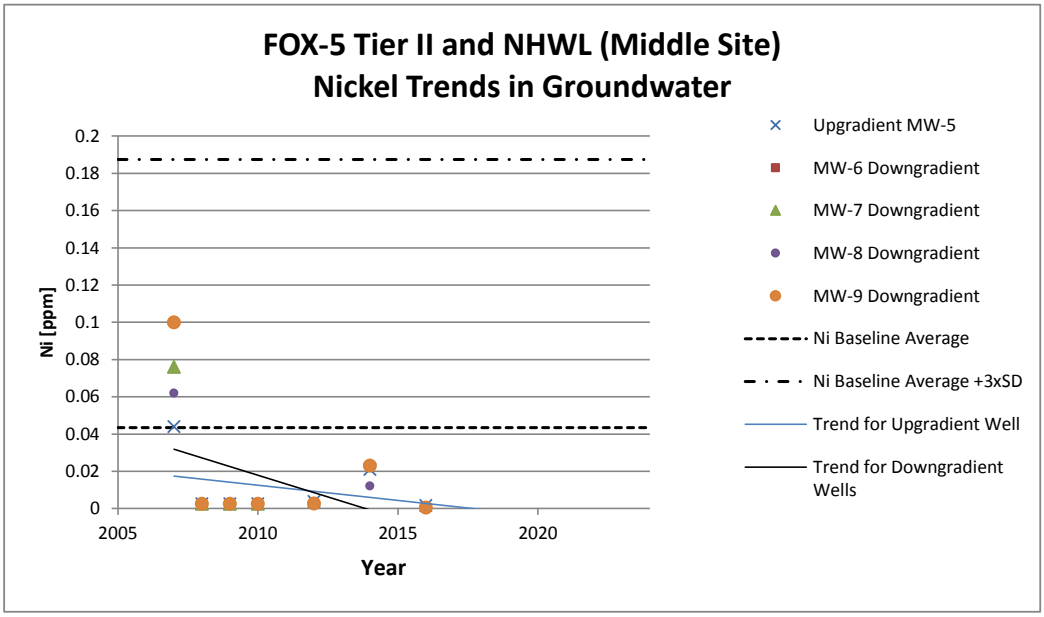
Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Cu [mg/L]	Ni [mg/L]	Co* [mg/L]	Cd* [mg/L]	Pb* [mg/L]	Zn [mg/L]	Cr [mg/L]	As* [mg/L]	Hg* [mg/L]	Total PCBs* [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	Modified TPH - Total C6-C34 [mg/L]	TPH Identity	
																			% Fuel Oil	% Lube Oil
MW-8																				
24739	MW 8	2007	1	Phase I	**0.015**	**0.062**	<0.0030	<0.0010	<0.010	**0.180**	**0.120**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
210808-137-FOX5	MW 8	2008	2	Phase I	0.003	<0.005	<0.0002	0.000	<0.001	0.030	0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
210808-138-FOX5	MW 8	2008	2	Phase I	0.003	<0.005	<0.0002	0.000	<0.001	0.010	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F509-8W	MW 8	2009	3	Phase I	<0.001	<0.005	<0.0002	0.000	<0.001	0.040	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F510-8W	MW 8	2010	4	Phase I	0.009	<0.005	0.000	0.001	<0.001	0.020	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.200		
12-19543	MW 8	2012	6	Phase I	0.002	0.003	<0.00050	<0.00010	<0.0010	0.012	0.004	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
F5-MID-MW-8	MW-8	2014	8	Phase II	0.004	0.012	0.002	0.000	0.002	0.037	0.020	0.001	<0.00001	<0.00005	<0.025	<0.1	<0.2	0.163		
MW-8	MW-8	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.006	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
MW-9																				
24744	MW 9	2007	1	Phase I	**0.029**	**0.100**	<0.0030	<0.0010	<0.010	0.042	**0.200**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
210808-134-FOX5	MW 9	2008	2	Phase I	0.007	<0.005	0.001	0.000	<0.001	0.020	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F509-9W	MW 9	2009	3	Phase I	0.001	<0.005	<0.0002	<0.0001	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
F510-9W	MW 9	2010	4	Phase I	0.003	<0.005	<0.0002	0.000	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.200		
12-19544	MW 9	2012	6	Phase I	0.002	0.003	<0.00050	<0.00010	<0.0010	0.006	0.003	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
F5-MID-MW-9	MW-9	2014	8	Phase II	**0.014**	0.023	0.002	0.000	0.003	**0.064**	0.036	0.001	<0.00001	<0.00005	<0.025	<0.1	<0.2	0.163		
MW-9	MW-9	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		

^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

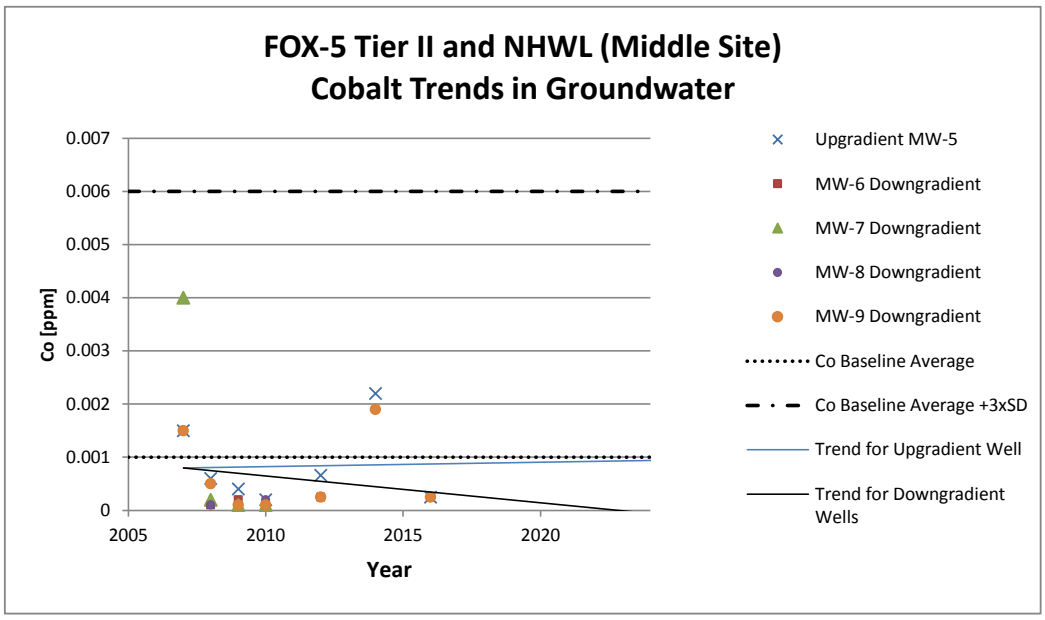
FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

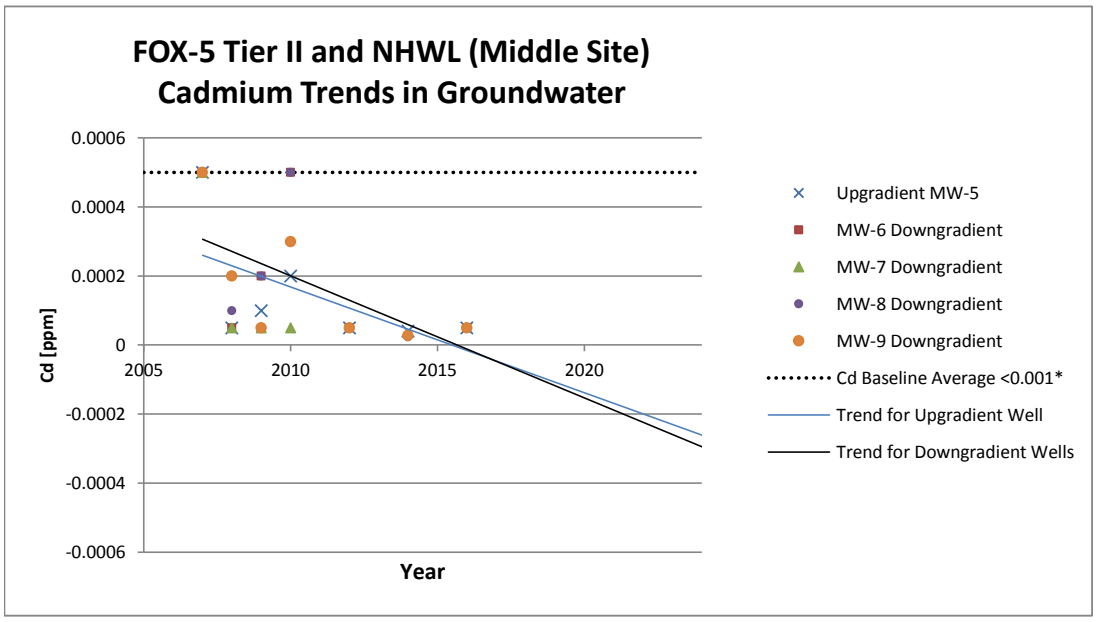
Where results are below detection, half of the detection limit has been used in the charts.





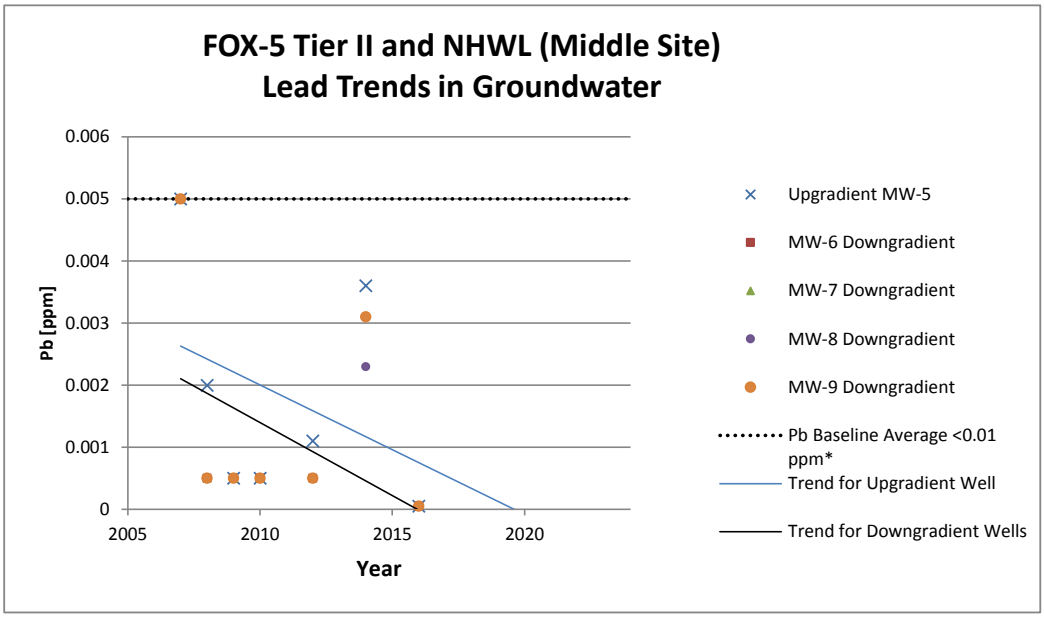
FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



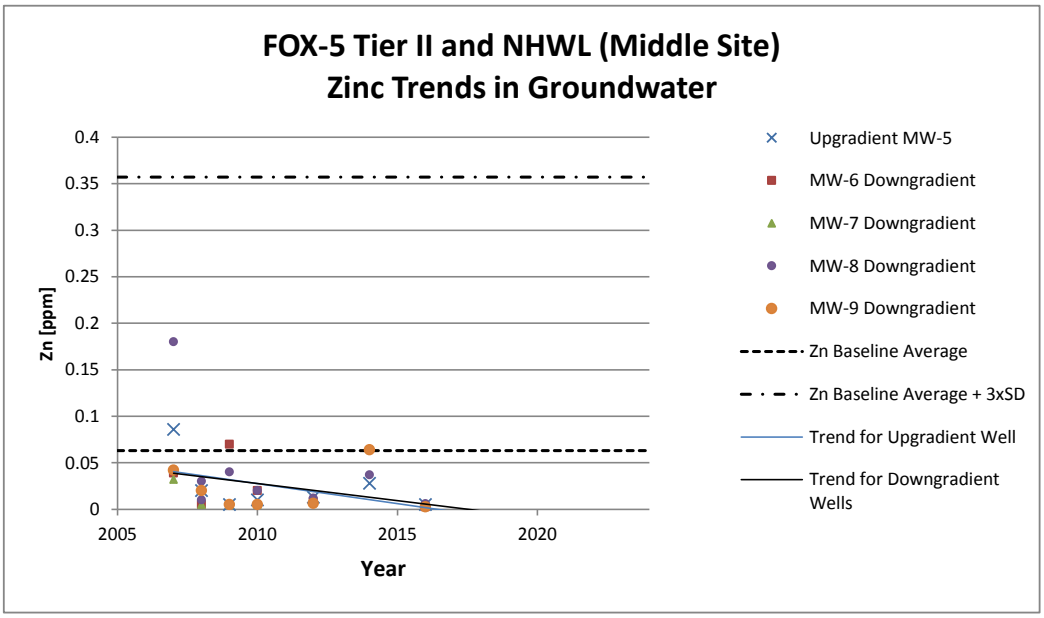


*Cd Baseline SD = 0

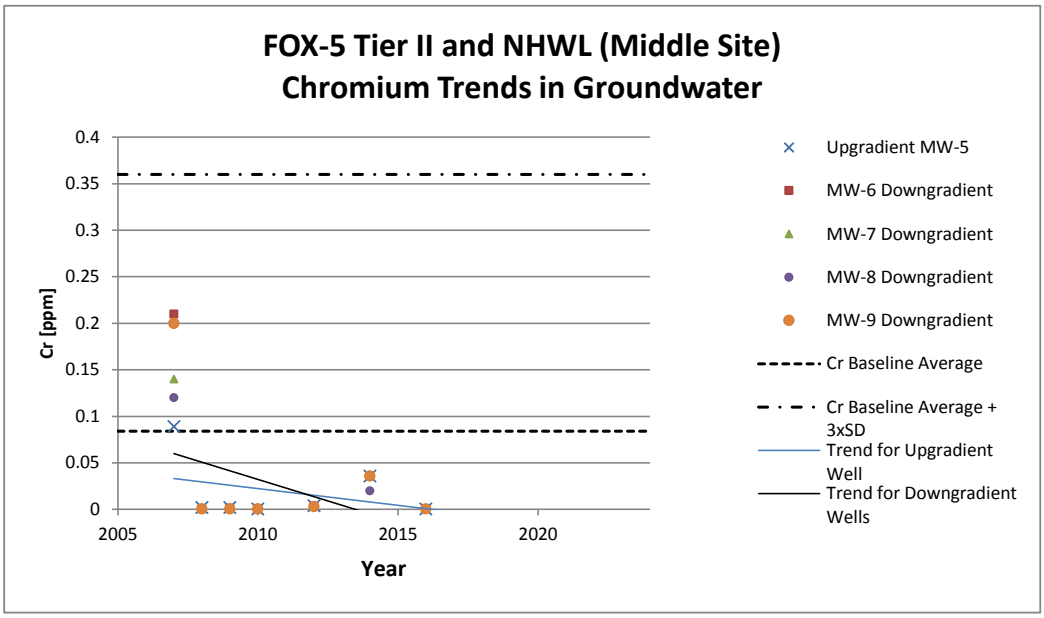
FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

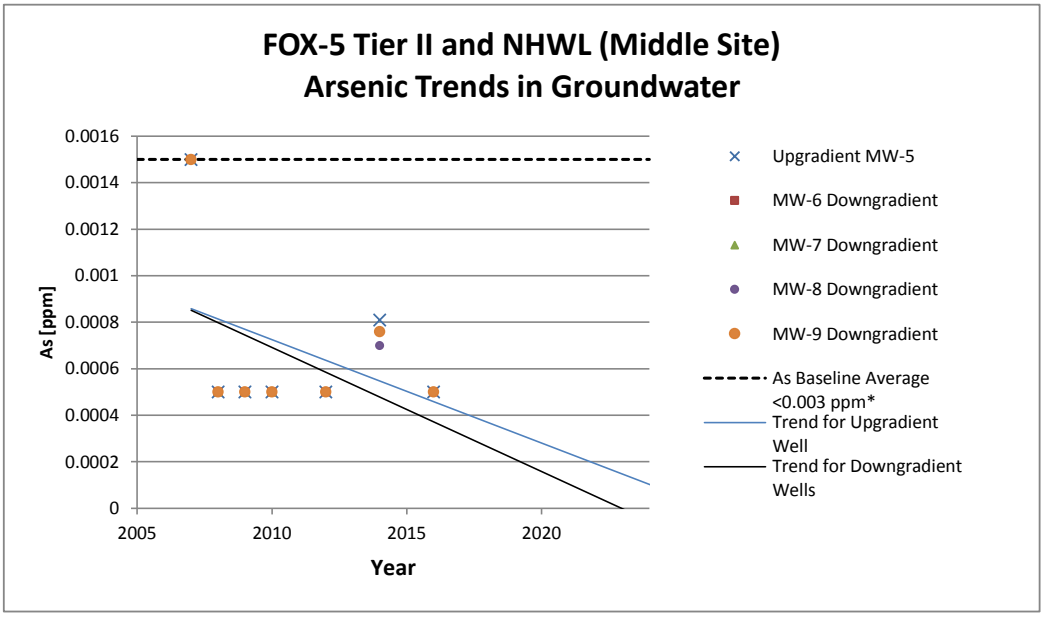


* Pb Baseline SD = 0



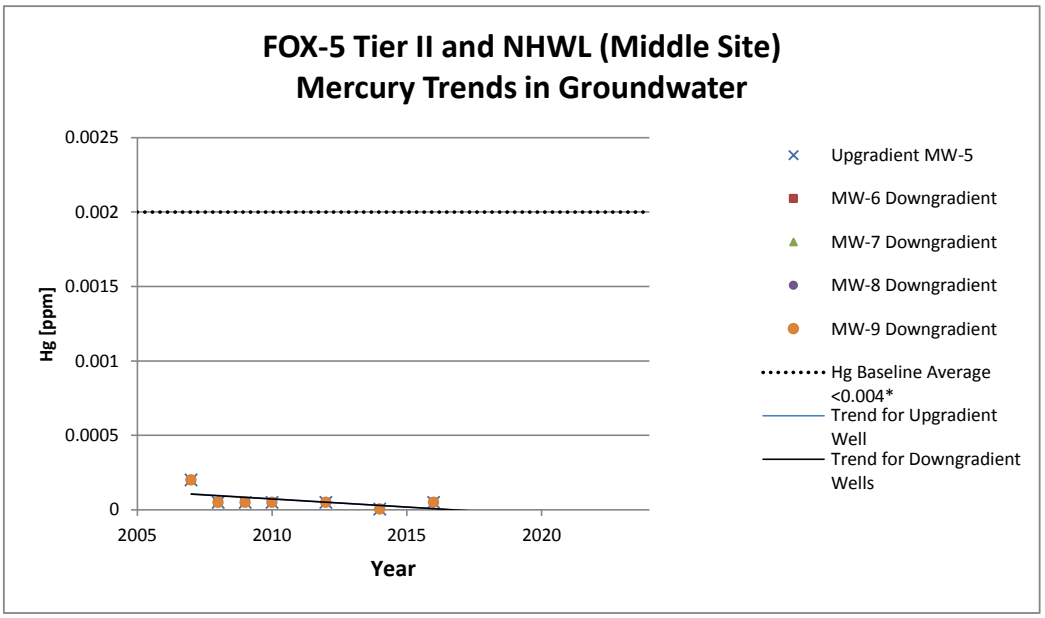
FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



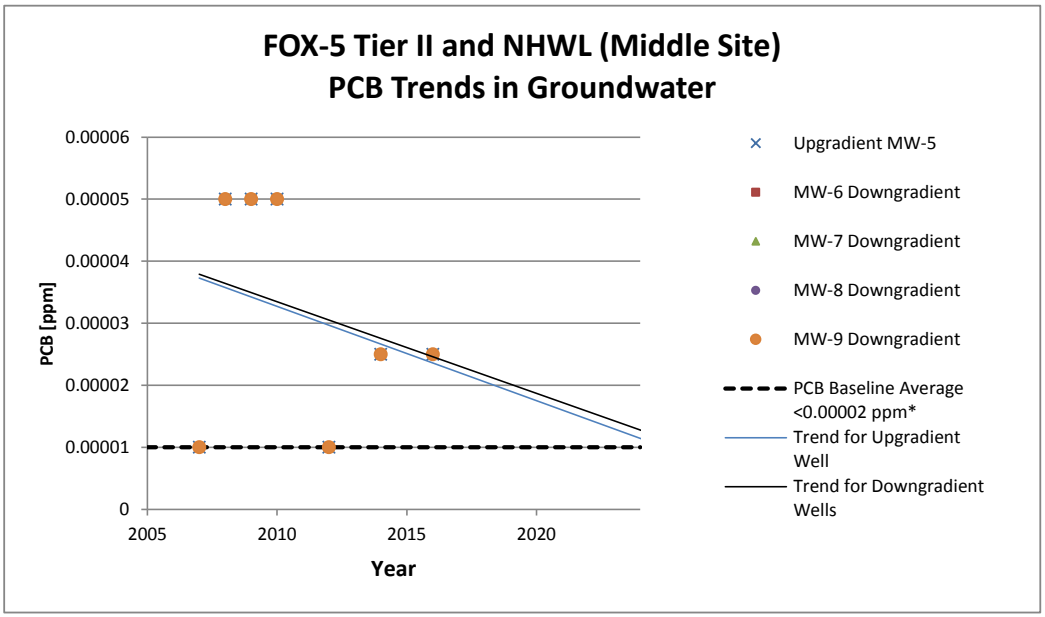


* As Baseline SD = 0 All As monitoring results below detection. Trend reflects changes in

FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

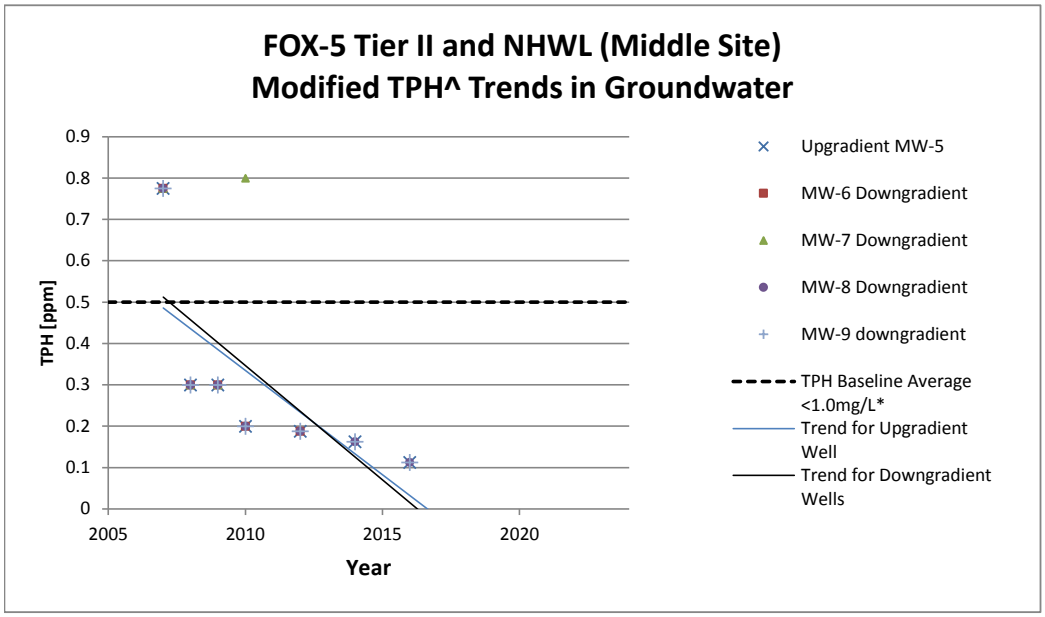


* Hg Baseline SD = 0. All Hg results below detection. Trend reflects changes in detection l



* PCB Baseline SD = 0. All PCB results below detection. Trend reflects changes in detect

FOX-5 Tier II and NHWL (Middle Site) Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



* TPH Baseline SD = 0
Most TPH results below detection. Trend shows changes in detection limits.
^ Modified TPH are Sum of PHC F1-F3 fractions.

FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Background Data - Average						11	5.3	5.0	1.0	10	46	20	1.9	0.5	0.010				5.0		
Baseline Data - Average						**8.5**	**5.0**	**5.0**	**1.0**	**10**	**38**	**20**	**2**	**0.10**	**0.003**				**69**	n/a	n/a
Baseline Data - Standard Deviation						3.9	2.3	0.6	0.10	6.5	27	1.7	1.4	0.00	0.10				182		
Baseline Data Average + 3xSD						20	12	6.8	1.3	30	119	25	6	0	0				615		
Detection Limit						<3.0	<5.0	<5.0	<1.0	<10	<15	<20	<1	<0.1	<0.003				<40		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																					
DEW Line Cleanup Tier I Criteria										*200*					*1*						
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2*	*5*				*2500*		
Monitoring Data																					
Upgradient																					
	MW-10 Surface															**TPH Sum will appear when F1-F3 results are entered.**					
24746	MW 10	2007	1	Phase I	10	4.9	<5.0	<5.0	<1.0	<10	32	<20	<1.0	<0.10	<0.0030	<10	4.0	11	20		
200808-128-FOX5	MW-10	2008	2	Phase I	0-10	**11**	**14**	**5.0**	<0.50	**10**	**44**	**28**	2.0	<0.1	<0.02	<20	<20	1750	**1770**		
F509-10WA	MW 10	2009	3	Phase I	0-15	6.0	**14**	**6.0**	<0.5	9.0	33	17	**2.7**	<0.1	<0.02	<20	<20	<20	30		
F510-10WA	MW-10	2010	4	Phase I	0-15	**10**	**11**	4.0	<0.5	**10**	**49**	**21**	2.0	<0.1	<0.02	<10	<10	<20	20		
12-19600	MW-10	2012	6	Phase I	0-10	6.7	**5.8**	3.2	<0.50	8.6	35	13	**2.6**	<0.010	<0.020	<10	<10	<50	35		
F5-MN-MW-10-S	MW-10	2014	8	Phase II	0-15	6.7	**5.6**	3.5	<0.10	7.6	37	13	<1.0	<0.050	<0.010	<10	<10	<50	35		
MW-10b	MW-10	2016	10	Phase II	0-15	6.3	**5.2**	3.6	<0.5	7	31.7	11.7	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-10 Depth																				
24748	MW 10	2007	1	Phase I	40	4.4	<5.0	<5.0	<1.0	<10	31	<20	<1.0	<0.10	<0.0030	<10	4.5	11	21		
200808-129-FOX5	MW-10	2008	2	Phase I	40-50	**13**	**24**	**7.0**	<0.5	**10**	**60**	**54**	**2.3**	<0.1	<0.02	<20	<20	<20	30		
F509-10WB	MW 10	2009	3	Phase I	40-50	6.0	**22**	**7.0**	<0.5	7.0	34	**25**	**2.5**	<0.1	<0.02	<20	<20	<20	30		
F510-10WB	MW-10	2010	4	Phase I	40-50	**10**	**27**	4.0	<0.5	9.0	**47**	**55**	1.0	<0.1	<0.02	<10	<10	<20	20		
12-19602	MW-10	2012	6	Phase I	40-50	7.2	**6.0**	3.2	<0.50	8.3	37	13	**2.5**	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-10-D	MW-10	2014	8	Phase II	40-50	8	**6.5**	4.4	<0.10	8.7	**43**	15	<1.0	<0.050	<0.010	<10	<10	<50	35		
MW-10a	MW-10	2016	10	Phase II	40-50	6.3	**5.5**	3.6	<0.5	7.9	32.3	12.6	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Downgradient																					
	MW-11 Surface																				
24750/51	MW 11	2007	1	Phase I	10	6.6	**5.8**	**5.5**	<1.0	**12**	32	<20	**3.4**	<0.10	<0.0030	<10	6.0	< 9.0	16		
200808-116-FOX5	MW 11	2008	2	Phase I	0-10	**12**	**13**	**6.0**	<0.5	**12**	**53**	**28**	**4.0**	<0.1	<0.02	<20	<20	<20	30		
F509-11WA	MW 11	2009	3	Phase I	0-15	**9.0**	**32**	**10**	<0.5	**13**	**43**	**35**	**5.0**	<0.1	<0.02	<20	<20	40	60		
F510-11WA	MW 11	2010	4	Phase I	0-15	**9.0**	**10**	4.0	<0.5	**13**	**42**	19	2.0	<0.1	<0.02	<10	<10	<20	20		
12-19616	MW-11	2012	6	Phase I	0-10	5.1	4.0	2.1	<0.50	**18**	24	7.6	**5.1**	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-11-S	MW-11	2014	8	Phase II	0-15	8	**6.4**	3.8	<0.10	**14.0**	**40**	14	1.2	<0.050	<0.010	<10	<10	<50	35		
MW-11a	MW-11	2016	10	Phase II	0-15	6.8	**5.4**	3.7	<0.5	**13**	29.8	13.3	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-11 Depth																				
24752	MW 11	2007	1	Phase I	40	4.7	<5.0	<5.0	<1.0	<10	20	<20	**2.9**	<0.10	<0.0030	<10	8.1	19	32		
200808-117-FOX5	MW 11	2008	2	Phase I	40-50	**11**	**12**	**5.0**	<0.5	**16**	**42**	**27**	**2.8**	<0.1	<0.02	<20	<20	<20	30		
F509-11WB	MW 11	2009	3	Phase I	40-50	8.0	**19**	**8.0**	<0.5	9.0	38	**30**	**5.4**	<0.1	<0.02	<20	<20	<20	30		
F510-11WB	MW 11	2010	4	Phase I	40-50	**11**	**13**	**5.0**	<0.5	**13**	**47**	**26**	**3.0**	<0.1	<0.02	<10	<10	<20	20		
12-19618	MW-11	2012	6	Phase I	40-50	6.1	**5.0**	2.4	<0.50	9.4	25	10	**3.4**	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-11-D	MW-11	2014	8	Phase II	40-50	**8.6**	**6.5**	3.7	<0.10	**14.0**	34	15	1.2	<0.050	<0.010	<10	<10	<50	35		
Not sampled - refusal	MW-11	2016	10	Phase II															#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-12 Surface																				
24756	MW 12	2007	1	Phase I	10	3.9	<5.0	<5.0	<1.0	<10	29	<20	1.6	<0.10	<0.0030	<10	5.2	35	45		
200808-119-FOX5	MW 12	2008	2	Phase I	0-10	**10**	**8**	4.0	<0.5	**11**	**57**	17	2.2	<0.1	<0.02	<20	<20	<20	30		
Dup 200808-120-FOX5	MW 12	2008	3	Phase I	0-10	**10**	**14**	4.0	<0.5	**14**	**57**	**31**	1.8	<0.1	<0.02	<20	<20	<20	30		
F509-12WA	MW 12	2009	4	Phase I	0-15	**9.0**	**17**	**6.0**	0.6	**21**	**67**	**28**	**25**	<0.1	<0.02	<20	<20	71	**91**		
F510-12WA	MW-12	2010	6	Phase I	0-15	**22**	**13**	4.0	<0.5	**18**	**76**	**26**	2.0	<0.1	**0.43**	<10	<10	39	49		
12-19612	MW-12	2012	8	Phase II	0-10	8.3	**5.9**	3.2	<0.50	**13**	**41**	13	**3.1**	<0.010	**0.06**	<5.0	<10	77	**85**		
F5-MN-MW-12-S	MW-12	2014	8	Phase II	0-15	5	2.8	1.7	<0.10	7.7	26	5.7	<1.0	<0.050	**0.013**	<10	<10	<50	35		
MW-12a	MW-12	2016	10	Phase II	0-15	5.5	3.8	2.7	<0.5	9.6	**40.6**	8.5	<1.0	<0.1	<0.05	<7	<4	35	40.5		
		2021	25	Phase II															#N/A		
		2031		Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-12 Depth																				
24758	MW 12	2007	1	Phase I	40	3.6	<5.0	<5.0	<1.0	<10	26	<20	1.1	<0.10	<0.0030	<10	6.3	17	28		
200808-121-FOX5	MW 12	2008	2	Phase I	40-50	**11**	**14**	**5.0**	<0.5	**17**	**59**	**32**	**3**	<0.1	<0.02	<20	<20	<20	30		
F509-12WB	MW 12	2009	3	Phase I	40-50	6.0	**19**	**6.0**	<0.5	7.0	**40**	**28**	**2.9**	<0.1	<0.02	<20	<20	<20	30		
F510-12WB	MW 12	2010	4	Phase I	40-50	8.0	**11**	3.0	<0.5	**14**	35	**22**	2.0	<0.1	<0.02	<10	<10	33	43		
12-19614	MW-12	2012	6	Phase I	40-50	5.2	4.4	2.4	<0.50	**11**	33	8.6	**3.3**	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-12-D	MW-12	2014	8	Phase II	40-50	**8.5**	3.6	2.1	0.12	**13.0**	38	7.7	<1.0	<0.050	**0.085**	<10	<10	110	**120**		
Not sampled - refusal	MW-12	2016	10	Phase II															#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-13 Surface																				
24760/61	MW 13	2007	1	Phase I	10	<3.0	<5.0	<5.0	<1.0	<10	21	<20	<1.0	<0.10	**0.005**	<10	6.8	33	45		
200808-122-FOX5	MW 13	2008	2	Phase I	0-10	**11**	**15**	**5.0**	<0.5	**11**	**52**	**30**	1.9	<0.1	<0.02	<20	<20	47	67		
F509-13WA	MW 13	2009	3	Phase I	0-15	7.0	**20**	**7.0**	<0.5	8.0	**39**	**20**	**3.3**	<0.1	<0.02	<20	<20	<20	30		
F510-13WA	MW 13	2010	4	Phase I	0-15	**11**	**9.0**	4.0	<0.5	**13**	**54**	18	2.0	<0.1	<0.02	<10	<10	23	33		
12-19608	MW-13	2012	6	Phase I	0-10	5.0	3.7	2.3	<0.50	7.7	29	7.9	2.2	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-13-S	MW-13	2014	8	Phase II	0-15	5.9	4.3	3.0	<0.10	7.8	34	9.3	<1.0	<0.050	<0.010	<10	<10	<50	35		
MW-13a	MW-13	2016	10	Phase II	0-15	5.7	3.9	2.9	<0.5	9.2	30.8	9	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-13 Depth																				
24762	MW 13	2007	1	Phase I	40	3.0	<5.0	<5.0	<1.0	<10	21	<20	<1.0	<0.10	<0.0030	<10	5.7	10	21		
200808-123-FOX5	MW 13	2008	2	Phase I	40-50	7	**25**	3.0	<0.5	7.0	35	**56**	<1.0	<0.1	<0.02	<20	<20	<20	30		
F509-13WB	MW-13	2009	3	Phase I	40-50	5.0	**21**	**6.0**	<0.5	6.0	30	16	1.9	<0.1	<0.02	<20	<20	21	41		
F510-13WB	MW 13	2010	4	Phase I	40-50	8.0	**8.0**	3.0	<0.5	9.0	**44**	17	1.0	<0.1	<0.02	<10	<10	<20	20		
12-19610	MW-13	2012	6	Phase I	40-50	5.2	3.7	2.3	<0.50	6.4	29	7.4	1.7	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-13-D	MW-13	2014	8	Phase II	40-50	5.5	3.9	2.5	<0.10	9.4	31	8.1	<1.0	<0.050	<0.010	<10	<10	<50	35		
Not sampled - refusal	MW-13	2016	10	Phase II															#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Analytical Data

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-14 Surface																				
24766	MW 14	2007	1	Phase I	10	<3.0	<5.0	<5.0	<1.0	<10	19	<20	1.3	<0.10	<0.0030	<10	4.1	9.2	18		
200808-125-FOX5	MW-14	2008	2	Phase I	0-10	8	**10**	4.0	<0.5	**10**	**41**	**20**	1.1	<0.1	<0.02	<20	<20	<20	30		
F509-14WA	MW-14	2009	3	Phase I	0-15	4.0	4.0	3.0	<0.5	6.0	19	8.0	**2.9**	<0.1	<0.02	<20	<20	<20	30		
F510-14WA	MW-14	2010	4	Phase I	0-15	7.0	**8.0**	3.0	<0.5	**10**	35	15	1.0	<0.1	<0.02	<10	<10	<20	20		
12-19604/05abc	MW-14	2012	6	Phase I	0-10	4.2	2.8	2.1	<0.50	**10**	23	5.7	**2.7**	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-14-S	MW-14	2014	8	Phase II	0-15	7.55	4.7	3.4	<0.5	**10.1**	36	9.9	2	<0.10	<0.05	<10	<10	<50	35		
MW-14a	MW-14	2016	10	Phase II	0-15	4.2	3.5	2.8	<0.5	8.7	25.5	7.3	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-14 Depth																				
24768	MW 14	2007	1	Phase I	40	3.8	<5.0	<5.0	<1.0	<10	27	<20	1.5	<0.10	<0.0030	<10	6.7	< 9.0	16		
200808-126-FOX5	MW-14	2008	2	Phase I	40-50	**9**	**12**	4.0	<0.5	**11**	**43**	**24**	1.3	<0.1	<0.02	<20	<20	<20	30		
F509-14WB	MW 14	2009	3	Phase I	40-50	5.0	**9.0**	**6.0**	<0.5	8.0	34	**21**	**3.2**	<0.1	<0.02	<20	<20	<20	30		
F510-14WB	MW 14	2010	4	Phase I	40-50	8.0	**7.0**	3.0	<0.5	9.0	35	14	1.0	<0.1	<0.02	<10	<10	<20	20		
12-19606/07abc	MW-14	2012	6	Phase I	40-50	5.5	3.9	3.3	<0.50	7.8	32	8.0	2.0	<0.010	<0.020	<5.0	<10	<50	33		
F5-MN-MW-14-D	MW-14	2014	8	Phase II	40-50	5	3.5	2.8	<0.10	7.2	30	7.7	<1.0	<0.050	<0.010	<10	<10	<50	35		
Not sampled - refusal	MW-14	2016	10	Phase II	1														#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

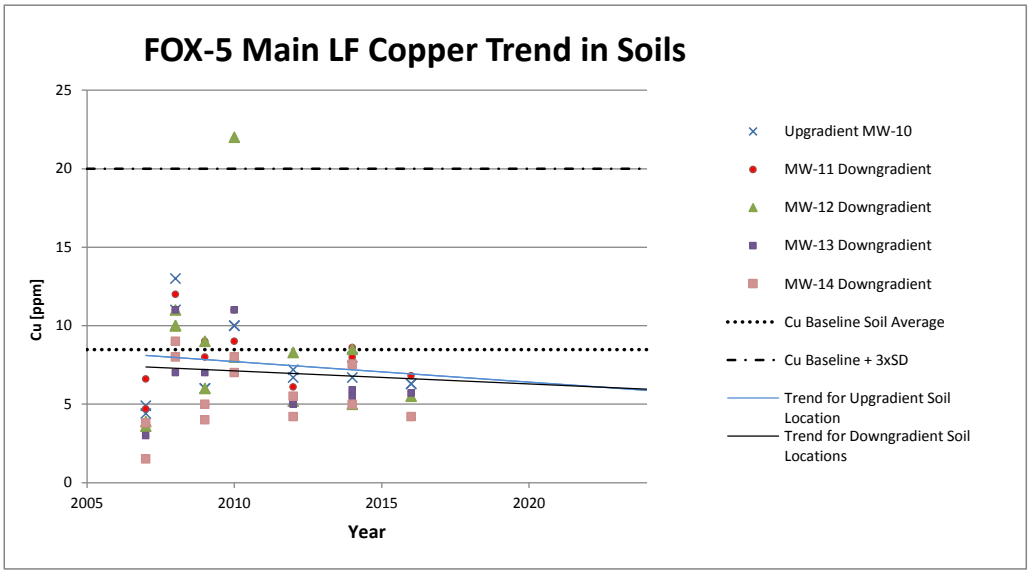
^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

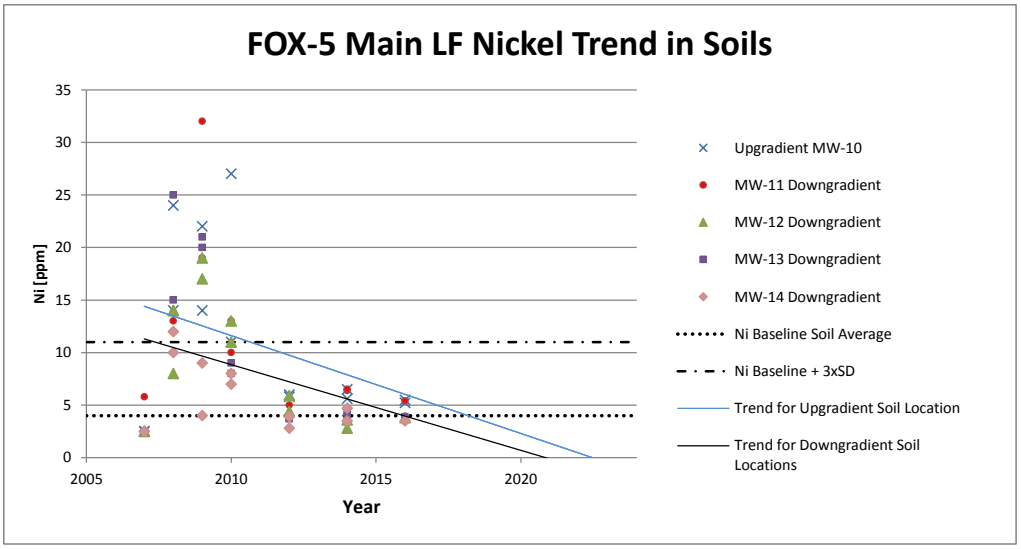
Legend

XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

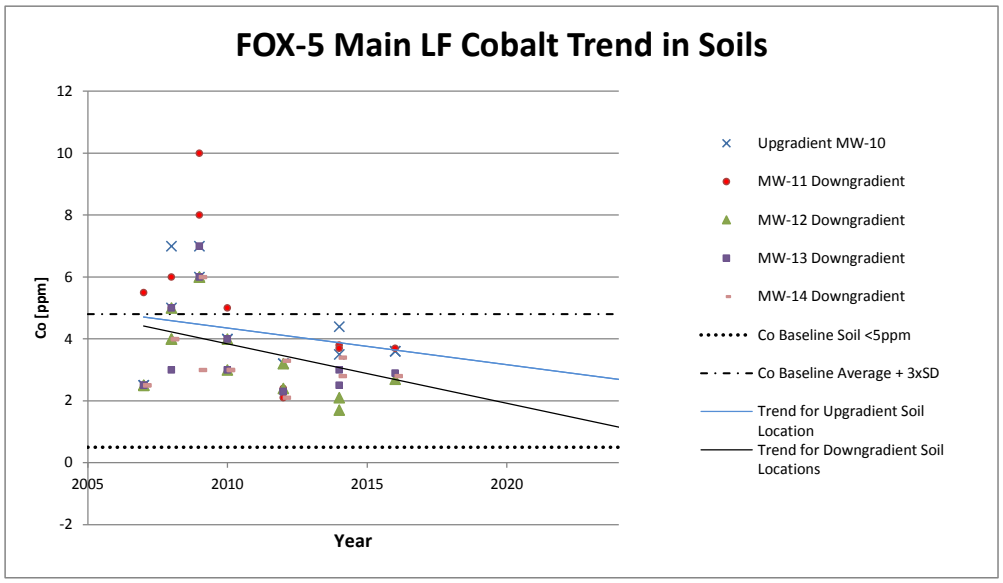
FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts

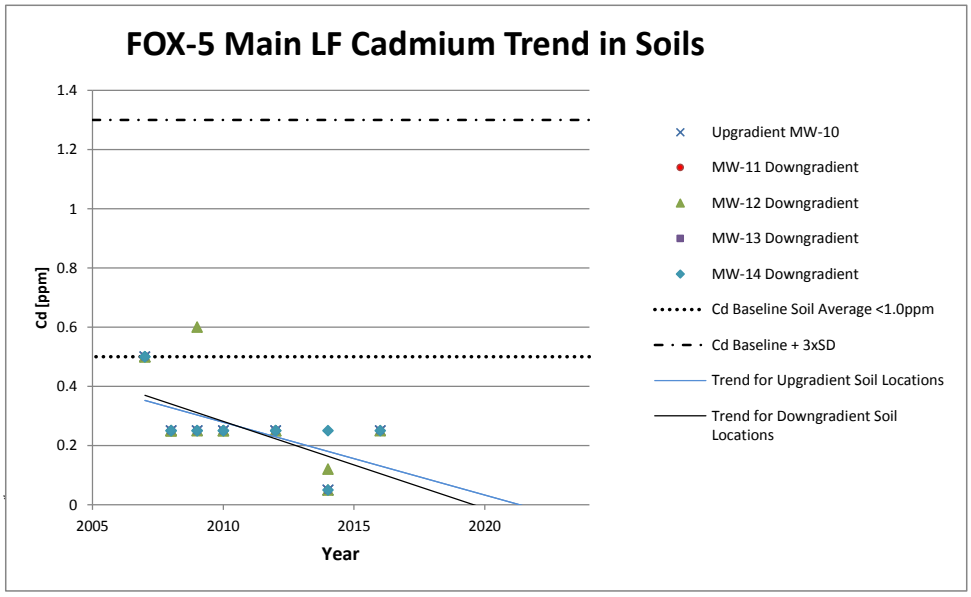
Where results are below detection, half of the detection limit has been used in the charts.



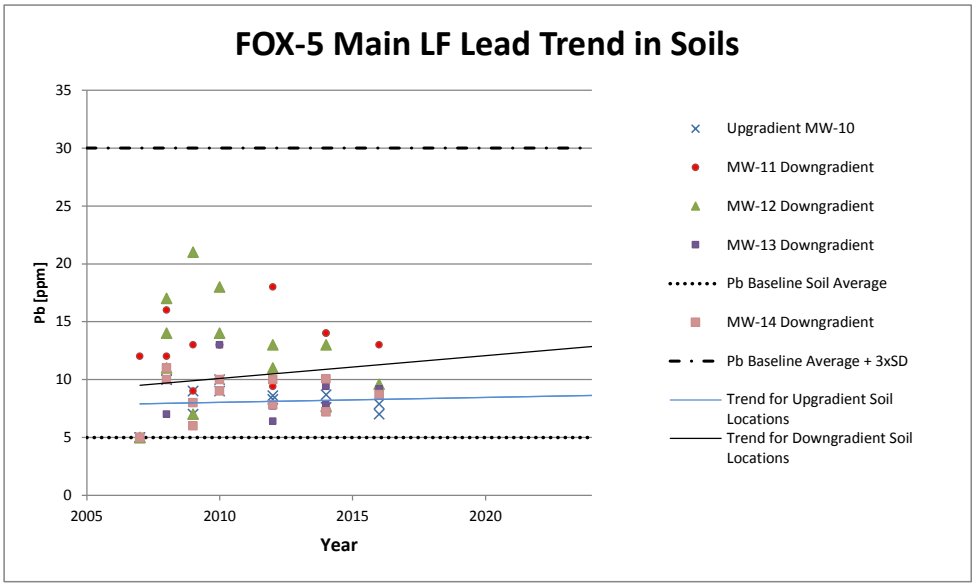


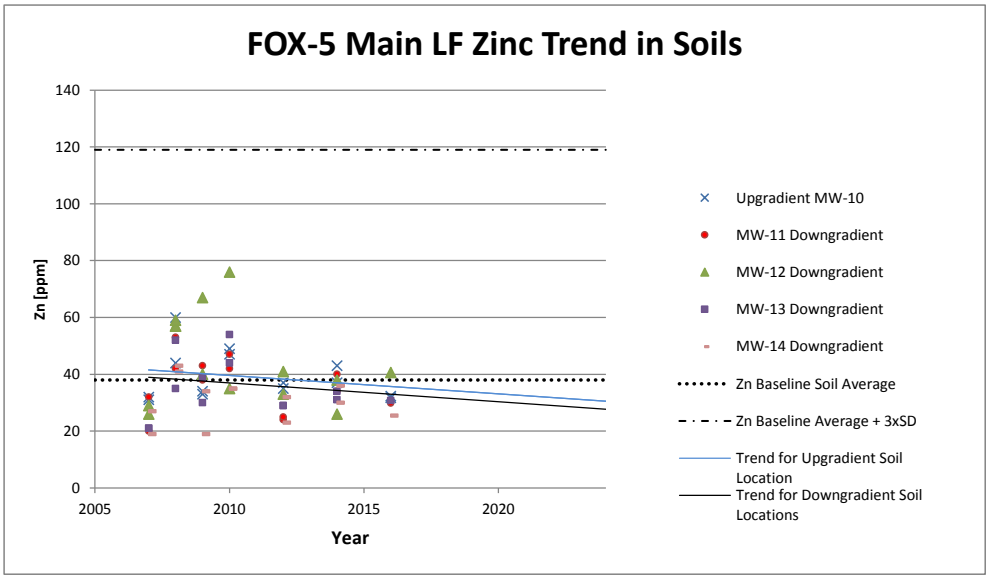
FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts



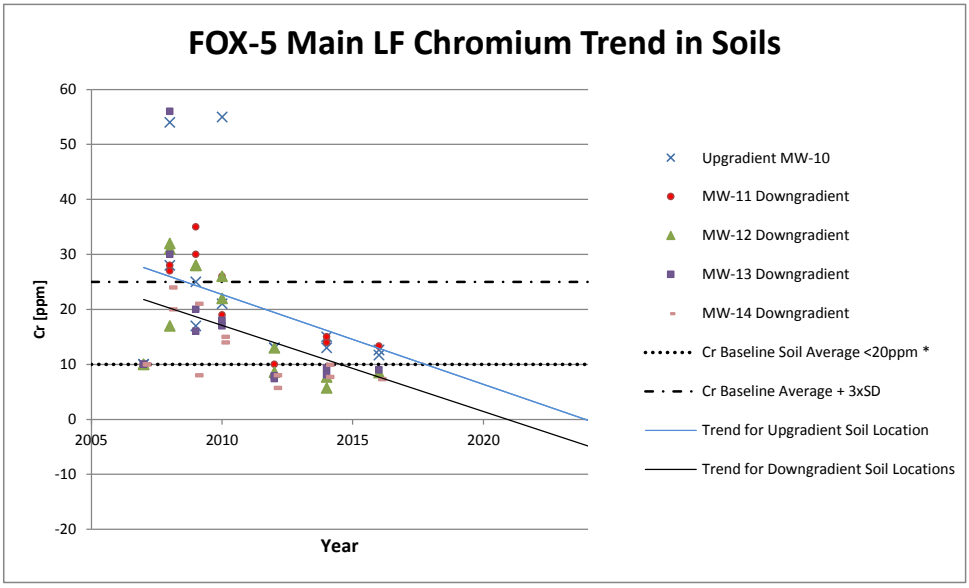


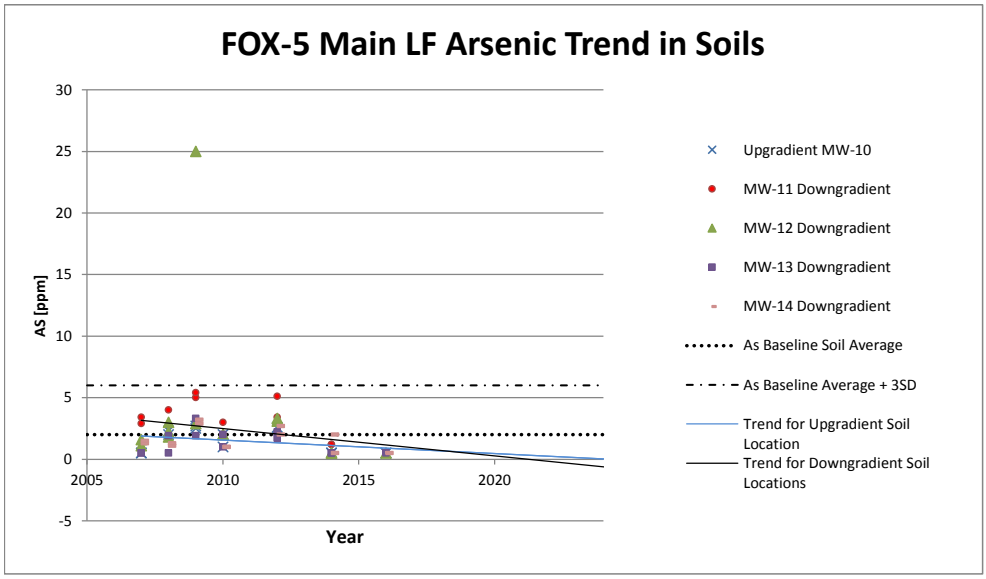
FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts



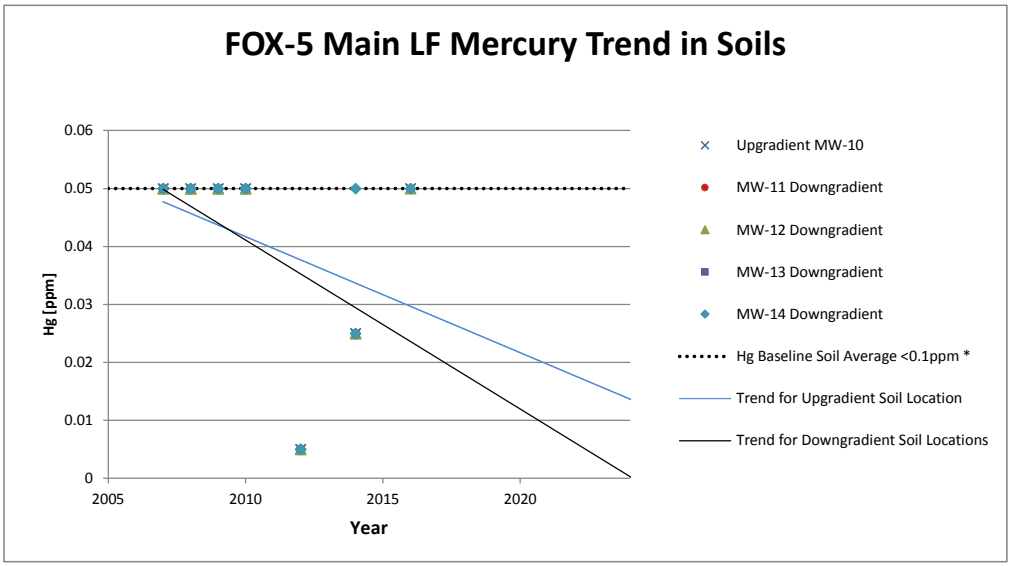


FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts

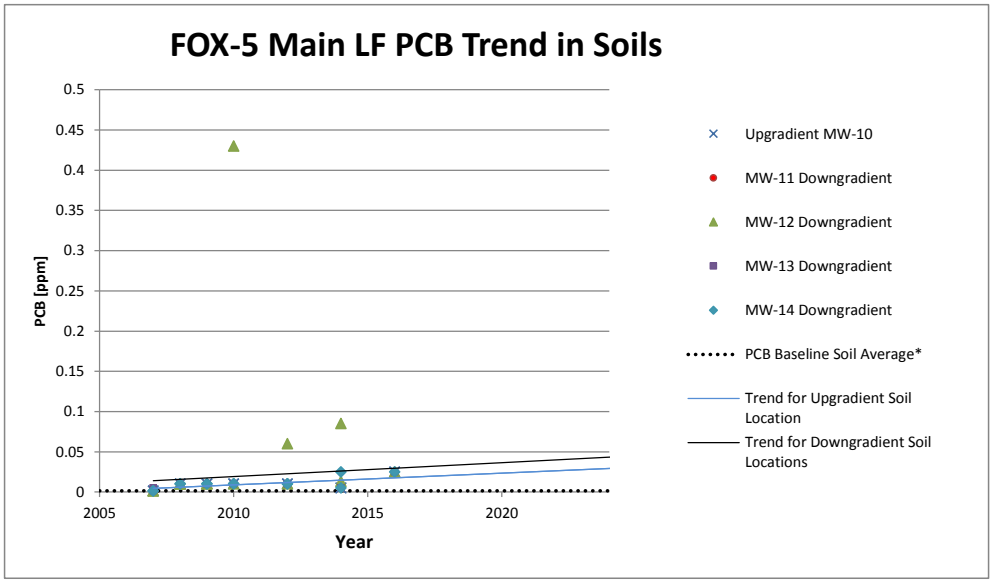




FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts

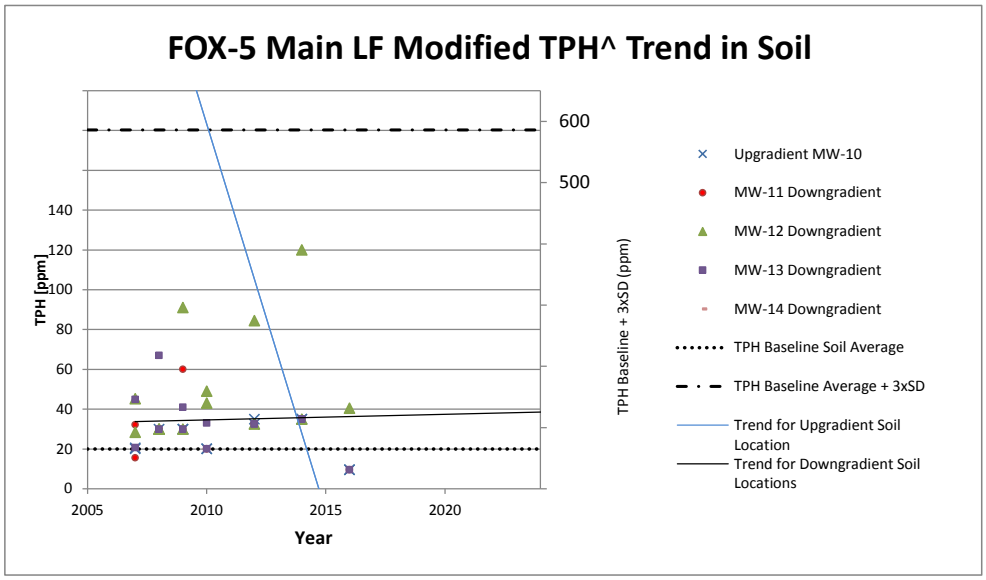


* Hg Baseline SD = 0 All Hg results below detection. Trend reflects changes in detection limits.



* PCB Baseline SD = 0

FOX-5 Qikiqtarjuaq (Broughton Island) Main Landfill - Summary of 2007-2024 Soil Charts



^ Baseline samples from 2002 and earlier were analyzed as TPH, results from 2003 and later are Sum of PHC F1-F3 fractions

FOX-5 Broughton Island Main Landfill - Summary of Groundwater Analytical Data

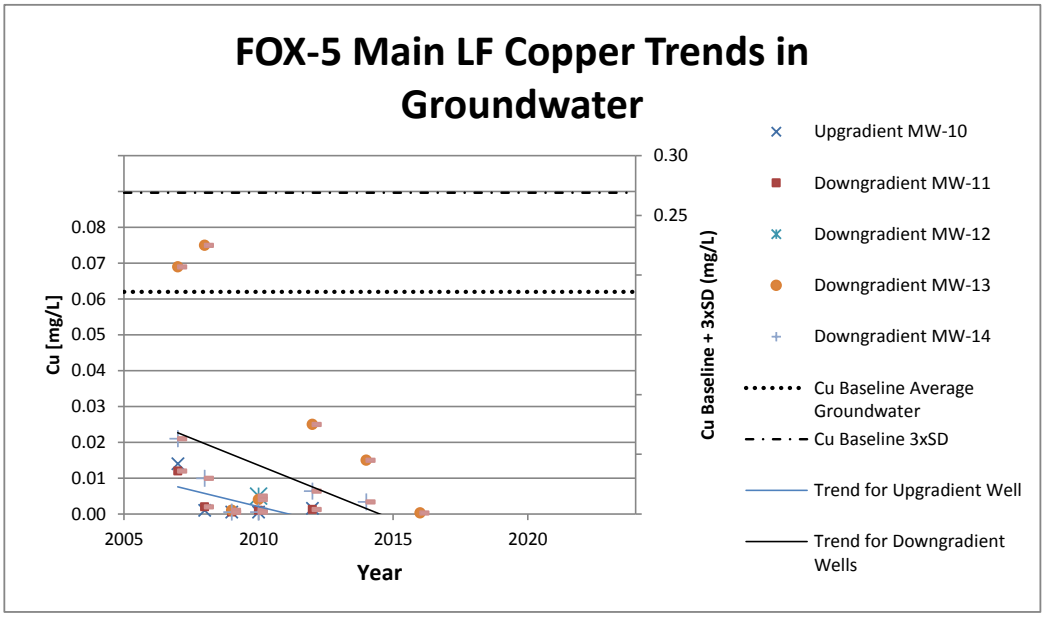
Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Cu	Ni	Co*	Cd*	Pb*	Zn	Cr	As*	Hg*	Total PCBs*	F1 C_6-C_{10}	F2 C_{10}-C_{16}	F3 C_{16}-C_{34}	Modified TPH - Total C6-C34	TPH Identity	
					[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	[mg/L]	% Fuel Oil	% Lube Oil
Baseline Data - Average					**0.062**	**0.047**	**0.003**	**0.001**	**0.01**	**0.11**	**0.084**	**0.003**	**0.0004**	**0.00002**				**1**		
Baseline Data - Standard Deviation					0.069	0.036	0.015	0	0	0.138	0.101	0.0046	0	0				0		
Baseline Data Average + 3xSD					0.27	0.16	0.048	0.001	0.01	0.52	0.39	0.017	0.0004	0.00002				1		
Detection Limit					<0.0010	<0.0020	<0.0030	<0.0010	<0.010	<0.010	<0.0010	<0.0030	<0.00040	<0.000020				<1.0		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																				
Monitoring Data																				
Upgradient																		**Total TPH will appear when F1, F2, F3 fractions are entered**		
	MW-10																			
24749/97	MW 10	2007	1	Phase I	0.014	**0.067**	**0.004**	<0.0010	<0.010	0.026	**0.13**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.8		
200808-130-FOX5	MW-10	2008	2	Phase I	0.001	<0.005	<0.0002	0.00010	<0.001	0.01	0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F509-10W	MW 10	2009	3	Phase I	<0.001	<0.005	<0.0002	0.00010	<0.001	0.07	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F510-10W	MW10	2010	4	Phase I	<0.001	<0.005	<0.0002	0.00020	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.2		
12-19550/51	MW-10	2012	6	Phase I	0.002	0.004	0.001	<0.00010	<0.0010	0.011	0.0073	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.2		
No sample collected - well was dry	MW-10	2014	8	Phase II														#N/A		
Not sampled - dry	MW-10	2016	10	Phase II														#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
Downgradient																				
	MW-11																			
24754	MW 11	2007	1	Phase I	0.012	**0.081**	<0.0030	<0.0010	<0.010	0.012	**0.16**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.8		
200808-118-FOX-5	MW-11	2008	2	Phase I	0.002	0.006	0.000	0.0006	<0.001	0.01	0.01	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F509-11W	MW 11	2009	3	Phase I	<0.001	<0.005	<0.0002	**0.001**	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F510-11W	MW-11	2010	4	Phase I	0.001	<0.005	<0.0002	0.0006	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.1	<0.2	0.2		
12-199554	MW-11	2012	6	Phase I	0.001	0.006	<0.00050	<0.00010	<0.0010	0.0045	0.0059	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.2		
No sample collected - insufficient water	MW-11	2014	8	Phase II														#N/A		
Not sampled - dry	MW-11	2016	10	Phase II														#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-12																			
24759	MW 12 - dry	2007	1	Phase I														#N/A		
	MW-12 - dry	2008	2	Phase I														#N/A		
F510-12W	MW-12	2010	3	Phase I	0.005	<0.005	<0.0002	0.0004	<0.001	0.02	<0.001	<0.001	<0.0001	<0.0001				#N/A		
	MW-12 - frozen	2012	4	Phase I														#N/A		
No sample collected - well was dry	MW-12	2014	6	Phase I														#N/A		
Not sampled - dry	MW-12	2016	8	Phase II														#N/A		
		2021	10	Phase II														#N/A		
		2031	15	Phase II														#N/A		
			25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-13																			

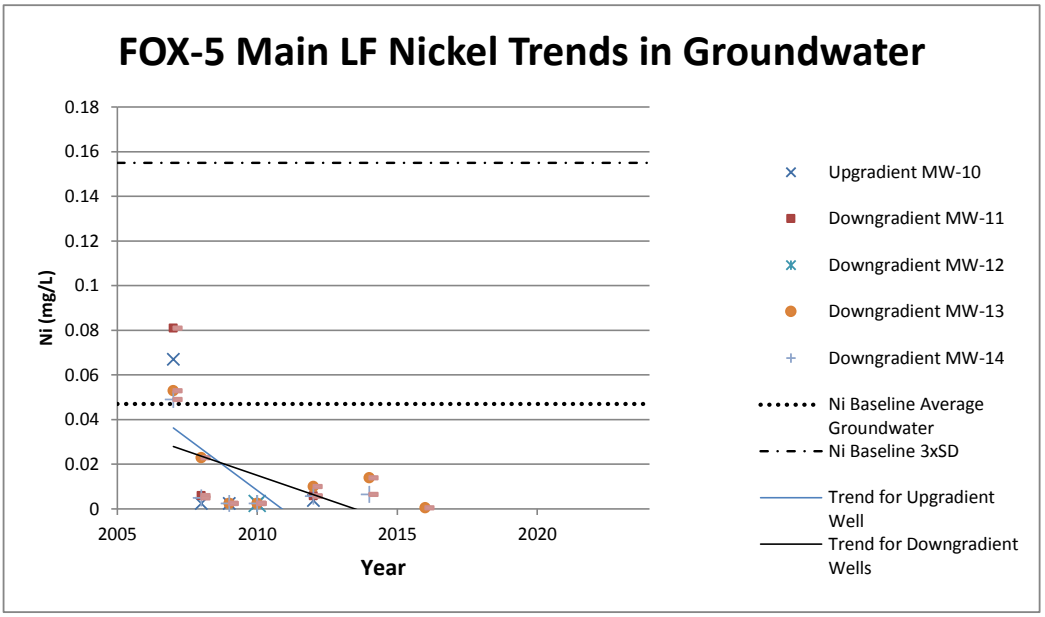
24764	MW 13	2007	1	Phase I	**0.069**	**0.053**	**0.004**	<0.0010	<0.010	**0.23**	**0.087**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.8		
200808-124-FOX-5	MW-13	2008	2	Phase I	**0.075**	0.023	0.001	0.0003	0.004	0.07	0.08	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F509-13W	MW 13	2009	3	Phase I	0.001	<0.005	<0.0002	0.0007	<0.001	**0.14**	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F510-13W	MW-13	2010	4	Phase I	0.004	<0.005	<0.0002	<0.0001	<0.001	0.02	0.001	<0.001	<0.0001	<0.0001	<0.1	0.6	0.6	**1.3**		
12-19553	MW-13	2012	6	Phase I	0.025	<0.020	<0.0050	<0.00090	**0.011**	0.061	0.042	<0.010	<0.00010					#N/A		
F5-MN-MW-13	MW-13	2014	8	Phase II	0.015	0.014	0.003	0.000	0.005	**0.22**	0.034	0.0014	0.00001	<0.00005	<0.025	<0.100	<0.100	0.1		
MW-13	MW-13	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001		<0.025			#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-14																			
24769	MW 14	2007	1	Phase I	0.021	**0.049**	<0.0030	<0.0010	<0.010	0.089	**0.088**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.8		
200808-127-FOX-5	MW-14	2008	2	Phase I	0.010	0.005	0.000	**0.001**	0.001	0.02	0.012	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F509-14W	MW 14	2009	3	Phase I	<0.001	<0.005	<0.0002	**0.001**	<0.001	**0.2**	0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.3		
F510-14W	MW-14	2010	4	Phase I	<0.001	<0.005	<0.0002	0.0002	<0.001	0.01	<0.001	<0.001	<0.0001	<0.0001	<0.1	<0.2	ND	0.2		
12-19552	MW-14	2012	6	Phase I	0.006	0.006	<0.00050	<0.00010	0.001	0.041	0.011	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.2		
F5-MN-MW-14	MW-14	2014	8	Phase II	0.003	0.007	0.001	0.000	0.002	0.048	0.015	0.00072	<0.0001	<0.0001	<0.025	<0.1	<0.1	0.1		
Not sampled - frozen	MW-14	2016	10	Phase II														#N/A		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		

^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

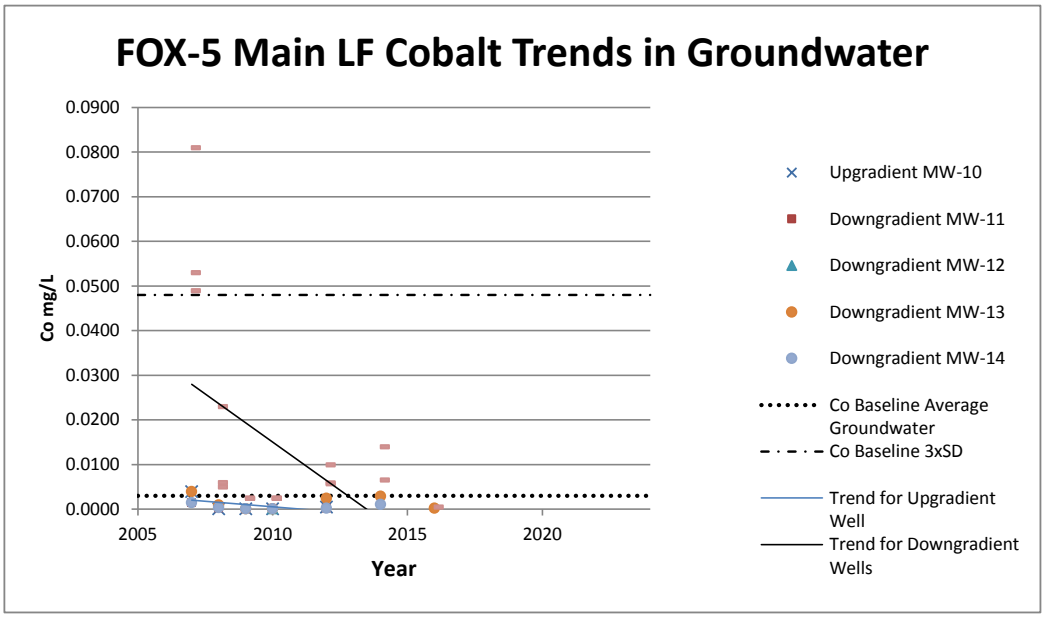
FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

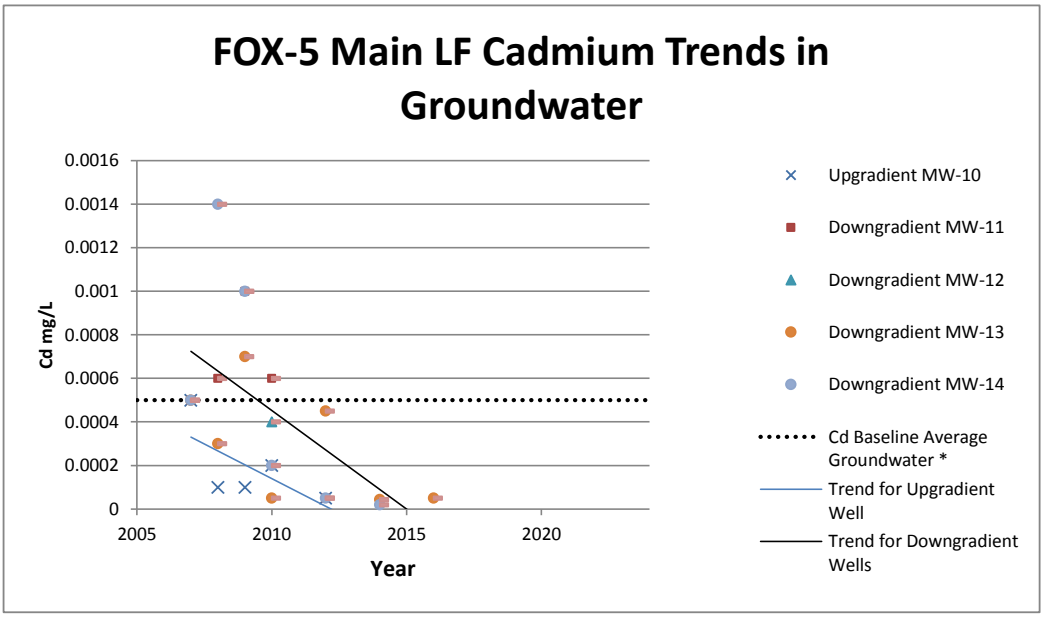
Where results are below detection, half of the detection limit has been used in the charts.





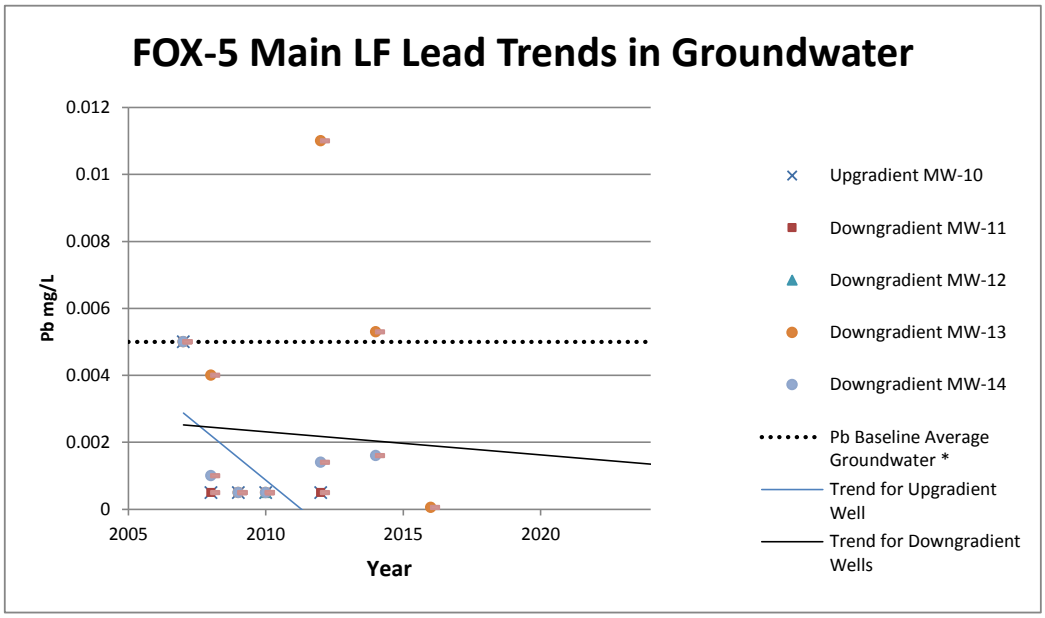
FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



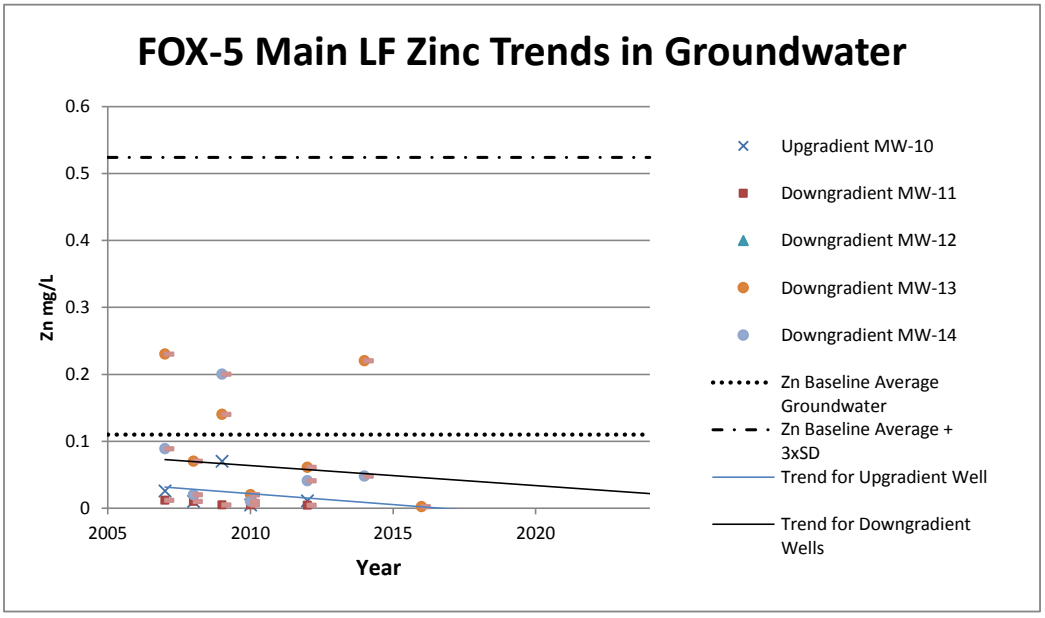


*Cd Baseline SD = 0

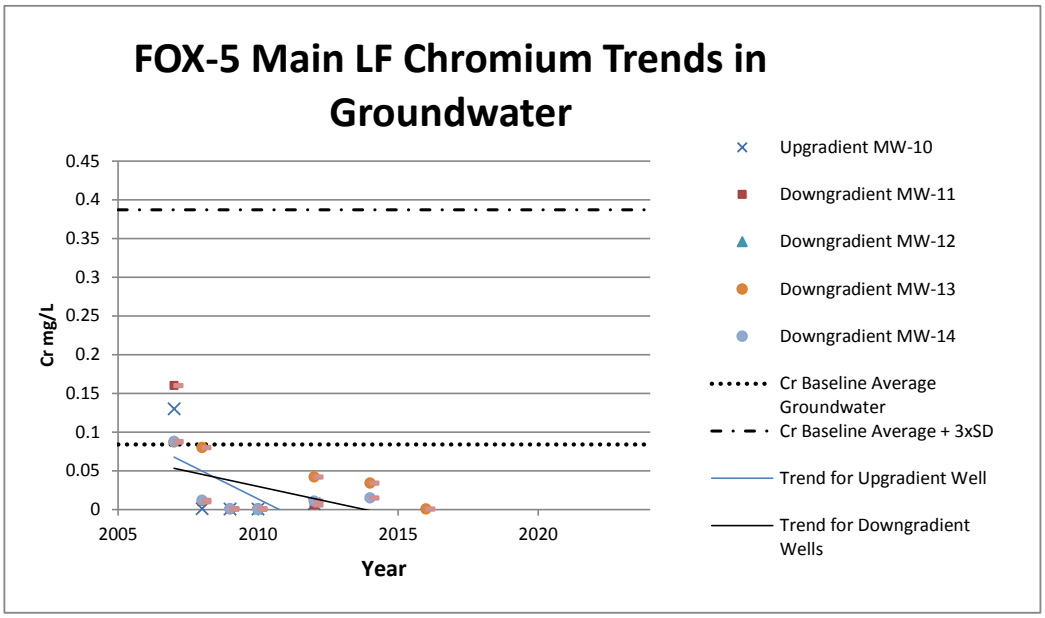
FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

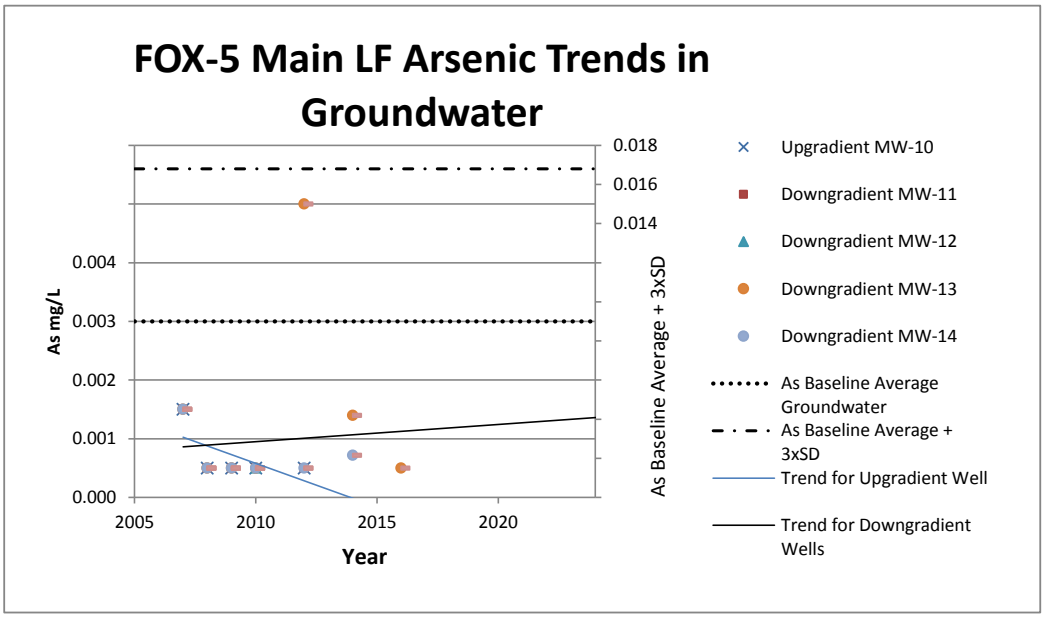


* Pb Baseline SD = 0

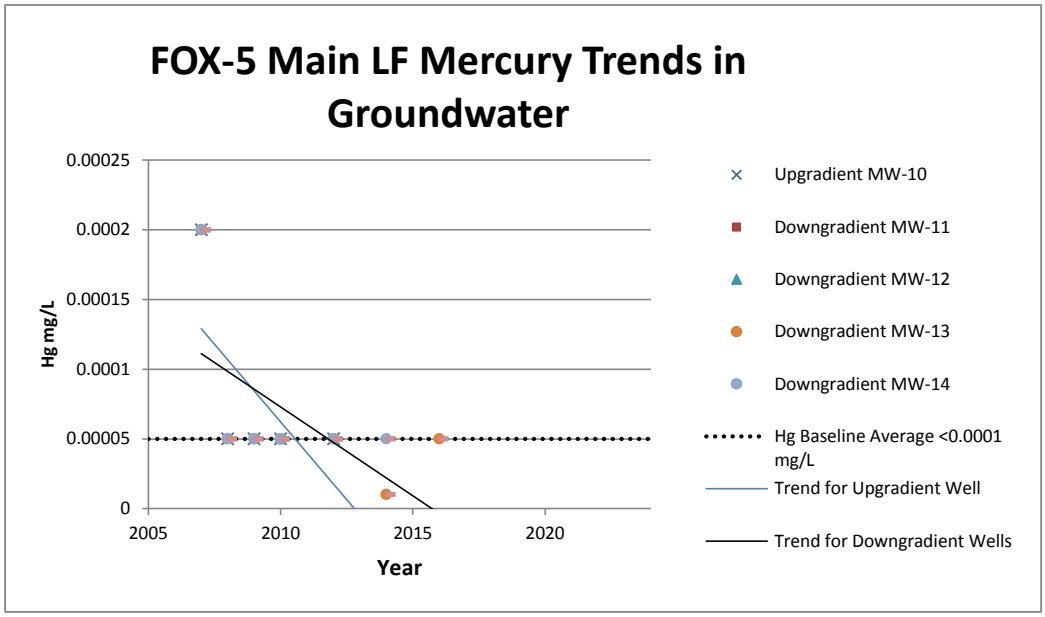


FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

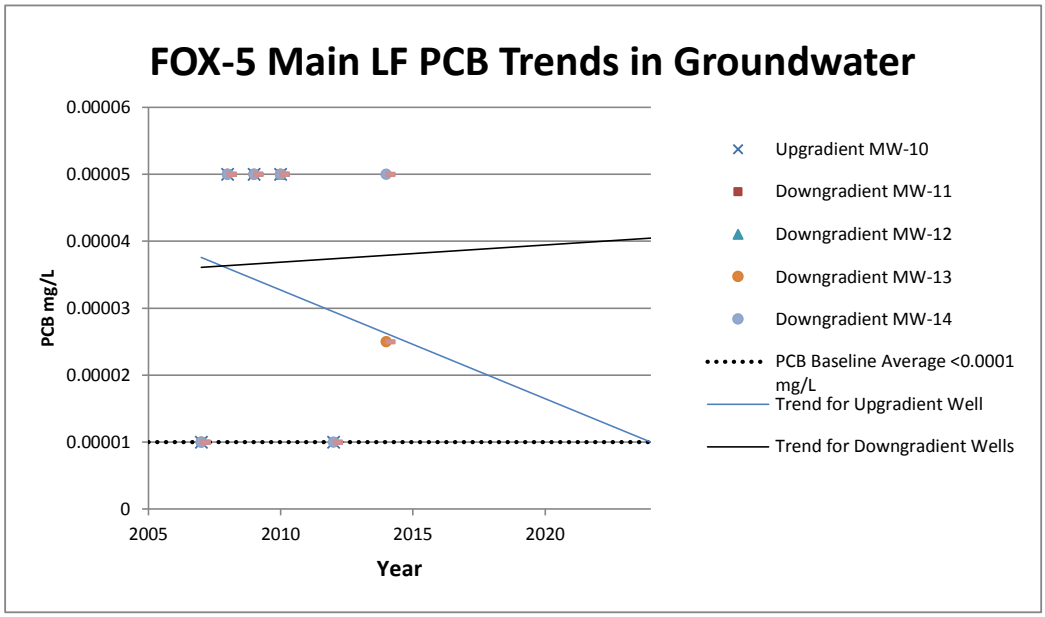




FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples

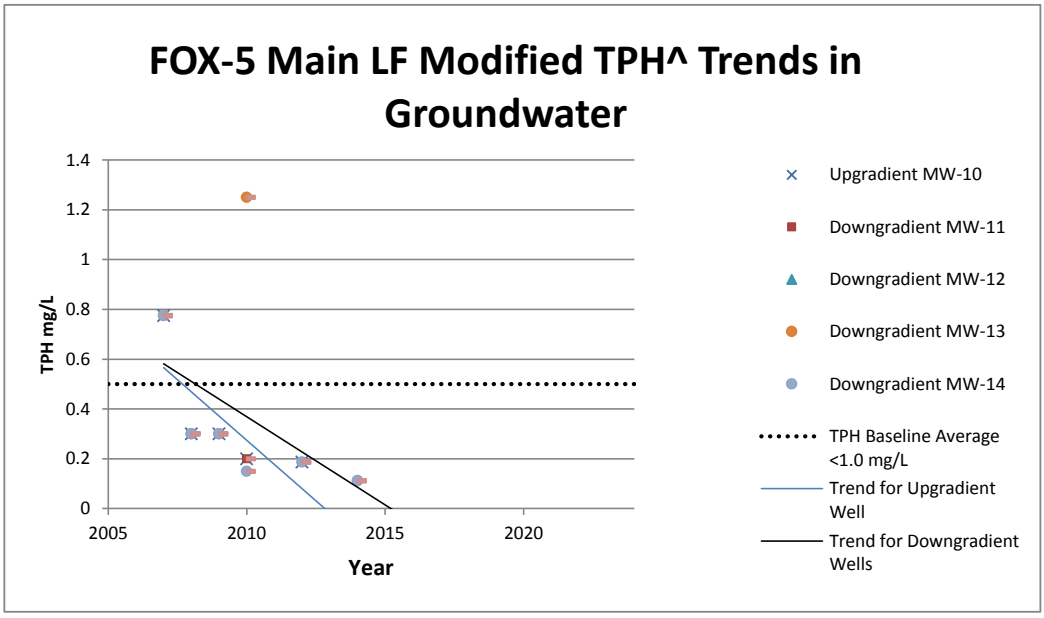


* Hg Baseline Average SD = 0
All Hg results below detection. Trend line reflects changes in detection limits.



* PCB Baseline Average SD = 0

FOX-5 Main Landfill Graphs of Trends for Inorganic Elements, PCBs and TPH in Groundwater Samples



* TPH Baseline Average SD = 0

^ Baseline samples from 2002 were analyzed as TPH, results from 2003 and later are Sum of PHC F1-F3 fractions.

FOX-5 Qikiqtarjuaq (Broughton Island) Station Non-Hazardous Waste Landfill Soil Analytical Summary 2007 - 2024

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
Background Data - Average						10	5.3	4.0	1.0	5.0	46	19	1.93	0.5	0.001				5.0		
Baseline Data - Average						**8.6**	**5.0**	**5.0**	**1.0**	**10**	**35**	**20**	**1.8**	**0.10**	**0.003**				**299**		
Baseline Data - Standard Deviation						3.5	2.6	1.7	0.00	20.0	15	4.0	0.6	0.00	0.20				654		
Baseline Data Average + 3xSD						19	13	10.1	1.0	70	80	32	3.6	0.10	0.60				2261		
Detection Limit						<3.0	<5.0	<5.0	<1.0	<10	<15	<20	<1	<0.1	<0.003				<40		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																					
DEW Line Cleanup Tier I Criteria										*200*					*1*						
DEW Line Cleanup Tier II Criteria & Hydrocarbon Action Level						*100*	*100*	*50*	*5*	*500*	*500*	*250*	*30*	*2*	*5*				*2500*		
Monitoring Data																					
Upgradient																					
	MW-15 Surface																				
07-24776	MW 15	2007	1	Phase I	10	**12**	**9.0**	**6.5**	<1.0	<10	32	<20	1.5	<0.10	<0.0030	<10	4.4	< 9.0	14		
F509-15WA	MW-15	2009	3	Phase I	0-15	**18**	**17**	**10**	<0.5	7.0	**50**	**38**	**2.4**	<0.1	<0.02	<20	<20	<20	30		
12-19580	MW-15	2012	6	Phase I	0-10	**18**	**14**	**6.5**	<0.50	8.0	**49**	**30**	**2.5**	0.021	<0.020	<5.0	<10	<50	33		
F5-SA-MW-15-S	MW-15	2014	8	Phase II	0-15	**22**	**18**	**9.3**	<0.10	7.7	**58**	**38**	**3.1**	<0.050	<0.010	<10	<10	<50	35		
MW-15b	MW-15	2016	10	Phase II	0-15	**14.6**	**10.9**	**6.3**	<0.5	4.4	**37.1**	**30.8**	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-15 Depth																				
07-24778	MW 15	2007	1	Phase I	40	**11**	**8.2**	**5.9**	<1.0	<10	31	<20	1.1	<0.10	<0.0030	<10	4.5	< 9.0	14		
F509-15WB	MW-15	2009	3	Phase I	40-50	**15**	**16**	**8.0**	<0.5	3.0	**40**	**35**	1.6	<0.1	<0.02	<20	<20	<20	30		
12-19582	MW-15	2012	6	Phase I	40-50	**19**	**15**	**6.9**	<0.50	6.7	**50**	**33**	**2.5**	0.011	<0.020	<5.0	<10	<50	33		
F5-SA-MW-15-D	MW-15	2014	8	Phase II	40-50	**20**	**16**	**8.2**	<0.10	6.1	**51**	**33**	**2.7**	<0.050	<0.010	<10	<10	<50	35		
MW-15a	MW-15	2016	10	Phase II	30-40	**17**	**12.4**	**7**	<0.5	5.6	**41.1**	**33.2**	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Station Non-Hazardous Waste Landfill Soil Analytical Summary 2007 - 2024

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-16 Surface																				
07-24770	MW 16	2007	1	Phase I	10	**9.2**	<5.0	<5.0	<1.0	<10	**40**	<20	1.4	<0.10	<0.0030	<10	6.0	10	21		
F509-16WA	MW-16	2009	3	Phase I	0-15	**39**	**15**	**7.0**	<0.5	**23**	**88**	**36**	**3.0**	<0.1	<0.02	<20	<20	34	54		
12-19584	MW-16	2012	6	Phase I	0-10	**14**	**9.6**	4.9	<0.50	**16**	**63**	**23**	**2.6**	0.014	**0.03**	<5.0	81	180	264		
F5-SA-MW-16-S	MW-16	2014	8	Phase II	0-15	**16**	**5.4**	3.3	0.11	**11.0**	**67**	12	**2.2**	<0.050	**0.022**	<10	<10	<50	35		
MW-16a	MW-16	2016	10	Phase II	0-15	**19.4**	**7.7**	**6.3**	<0.5	**19.8**	**103**	19.7	<1.0	<0.1	<0.05	<7	18	59	80.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-16 Depth																				
07-24772	MW 16	2007	1	Phase I	40	**64**	<5.0	<5.0	<1.0	<10	**44**	<20	<1.0	<0.10	<0.0030	<10	53	390	**448**		
F509-16WB	MW-16	2009	3	Phase I	40-50	**17**	**19**	**10**	<0.5	**19**	**88**	**43**	**3.1**	<0.1	<0.02	<20	213	118	**341**		
12-19586	MW-16	2012	6	Phase I	40-50	**15**	**9.8**	**5.2**	*13*	**29**	**78**	**24**	**3.3**	0.023	**0.12**	1200	770	100	**2070**		
F5-SA-MW-16-D	MW-16	2014	8	Phase II	40-50	**21**	**9.8**	**6.0**	0.14	**14.0**	**87**	**23**	**3.3**	<0.050	<0.010	<10	23	51	79		
Not sampled - refual	MW-16	2016	10	Phase II															#N/A		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
Downgradient																					
	MW-17 Surface																				
07-24790/91	MW 17	2007	1	Phase I	10	4.5	<5.0	<5.0	<1.0	<10	25	<20	<1.0	<0.10	<0.0030	<10	5.6	< 9.0	15		
F509-17WA	MW 17	2009	3	Phase I	0-15	**10**	**13**	**8.0**	<0.5	8.0	**48**	**29**	**4.1**	<0.1	<0.02	<20	<20	<20	30		
12-19588	MW 17	2012	6	Phase I	0-10	5.8	4.3	2.4	<0.50	6.1	28	9.0	**2.2**	<0.010	<0.020	<5.0	<10	<50	33		
F5-SA-MW-17-S	MW-17	2014	8	Phase II	0-15	**9.1**	**5**	3.2	<0.10	**13.0**	**43**	12	**2.6**	<0.050	<0.010	<10	<10	120	130		
MW-17b	MW-17	2016	10	Phase II	0-15	**8.9**	**7.5**	**5.2**	<0.5	8.1	**46.4**	17.1	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Station Non-Hazardous Waste Landfill Soil Analytical Summary 2007 - 2024

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-17 Depth																				
07-24792	MW 17	2007	1	Phase I	40	<3.0	<5.0	<5.0	<1.0	<10	18	<20	1.2	<0.10	<0.0030	<10	5.3	< 9.0	15		
F509-17WB	MW 17	2009	3	Phase I	40-50	8.0	**8.0**	**6.0**	<0.5	7.0	**41**	18	**3.1**	<0.1	<0.02	<20	<20	<20	30		
12-19590	MW 17	2012	6	Phase I	40-50	6.7	**5.2**	3.0	<0.50	7.4	33	11	**2.9**	<0.010	<0.020	<5.0	<10	<50	33		
F5-SA-MW-17-D	MW-17	2014	8	Phase II	40-50	8.2	**6.2**	4.0	<0.10	7.3	**41**	14	**2.9**	<0.050	<0.010	<10	<10	<50	35		
MW-17a	MW-17	2016	10	Phase II	30-40	7	**5.7**	4.2	<0.5	6	**40.1**	14.3	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-18 Surface																				
07-24786	MW 18	2007	1	Phase I	10	4.6	<5.0	**5.0**	<1.0	<10	31	<20	**1.9**	<0.10	<0.0030	<10	5.2	14	24		
F509-18WA	MW 18	2009	3	Phase I	0-15	**10**	**15**	**8.0**	<0.5	**12**	**46**	**33**	**3.8**	<0.1	<0.02	<20	<20	<20	30		
12-19592/93abc	MW-18	2012	6	Phase I	0-10	6.7	**5.2**	2.8	<0.50	5.9	30	11	**2.1**	<0.010	<0.020	<5.0	<10	<50	33		
F5-SA-MW-18-S	MW-18	2014	8	Phase II	0-15	**9.9**	**7.9**	4.5	<0.10	6.8	**43**	17	1.2	<0.050	<0.010	<10	<10	<50	35		
MW-18b (Dup Avg)	MW-18	2016	10	Phase II	0-15	7	**5**	4	<0.5	6	**37**	13	**2**	<0.1	<0.05	<6	<7	<29	21		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-18 Depth																				
07-24788	MW 18	2007	1	Phase I	40	6.1	<5.0	**5.1**	<1.0	**14**	34	<20	**1.8**	<0.10	<0.0030	<10	52	270	**327**		
F509-18WB	MW 18	2009	3	Phase I	40-50	6	**9.0**	**6.0**	<0.5	6.0	**36**	**20**	**3.0**	<0.1	<0.02	<20	<20	43	63		
12-19594/95abc	MW-18	2012	6	Phase I	40-50	4.9	3.9	2.2	<0.50	6.2	27	8.2	**2.0**	<0.010	<0.020	<10	<50	<50	55		
F5-SA-MW-18-D	MW-18	2014	8	Phase II	40-50	**10.1**	**6.55**	4.5	<0.5	6.5	**40.5**	17.5	1.6	<0.10	<0.05	<10	<10	<50	35		
MW-18a	MW-18	2016	10	Phase II	40-50	5.5	4.3	3.3	<0.5	6.8	29.7	10.7	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Station Non-Hazardous Waste Landfill Soil Analytical Summary 2007 - 2024

Sample ID	Location	Year	Monitoring Year	Monitoring Phase	Depth (cm)	Cu [mg/kg]	Ni [mg/kg]	Co* [mg/kg]	Cd* [mg/kg]	Pb* [mg/kg]	Zn [mg/kg]	Cr* [mg/kg]	As [mg/kg]	Hg* [mg/kg]	Total PCB* [mg/kg]	F1 C_6-C_{10} [mg/kg]	F2 C_{10}-C_{16} [mg/kg]	F3 C_{16}-C_{34} [mg/kg]	Modified TPH^ - Total C6-C34 [mg/kg]	TPH Identity	
																				% Fuel Oil	% Lube Oil
	MW-19 Surface																				
07-24780	MW 19	2007	1	Phase I	10	3.9	<5.0	<5.0	<1.0	<10	19	<20	1.4	<0.10	<0.0030	<10	5.5	< 9.0	15		
F509-19WA	MW 19	2009	3	Phase I	0-15	**10**	**13**	**8.0**	<0.5	6.0	**45**	**28**	**3.8**	<0.1	<0.02	<20	<20	<20	30		
12-19596	MW-19	2012	6	Phase I	0-10	6.4	**5.0**	2.6	<0.50	4.8	28	11	**2.2**	<0.010	<0.020	<5.0	<10	<50	33		
F5-SA-MW-19-S	MW-19	2014	8	Phase II	0-15	8.2	**6.2**	3.6	<0.10	6.2	**36**	14	**2**	<0.050	<0.010	<10	<10	<50	35		
MW-19b	MW-19	2016	10	Phase II	0-15	**8.7**	**6**	4.1	<0.5	7.2	33.4	15.1	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
																			#N/A		
	MW-19 Depth																				
07-24782	MW 19	2007	1	Phase I	40	5.4	<5.0	<5.0	<1.0	<10	25	<20	**2.4**	<0.10	<0.0030	<10	< 4.0	< 9.0	12		
F509-19WB	MW-19	2009	3	Phase I	40-50	**9.0**	**12**	**7.0**	<0.5	5.0	**40**	**27**	**3.6**	<0.1	<0.02	<20	<20	<20	30		
12-19598	MW-19	2012	6	Phase I	40-50	7.3	**5.7**	3.1	<0.50	5.4	33	13	**2.6**	<0.010	<0.020	<5.0	<10	<50	33		
F5-SA-MW-19-D	MW-19	2014	8	Phase II	40-50	8.4	**6.7**	3.8	<0.10	5.8	**36**	15	1.6	<0.050	<0.010	<10	<10	<50	35		
MW-19a	MW-19	2016	10	Phase II	40-50	7.3	**5.8**	3.8	<0.5	6	33.2	14.1	<1.0	<0.1	<0.05	<7	<4	<8	9.5		
		2021	15	Phase II															#N/A		
		2031	25	Phase II															#N/A		
				Phase III															#N/A		
																			#N/A		
																			#N/A		
																			#N/A		

Legend

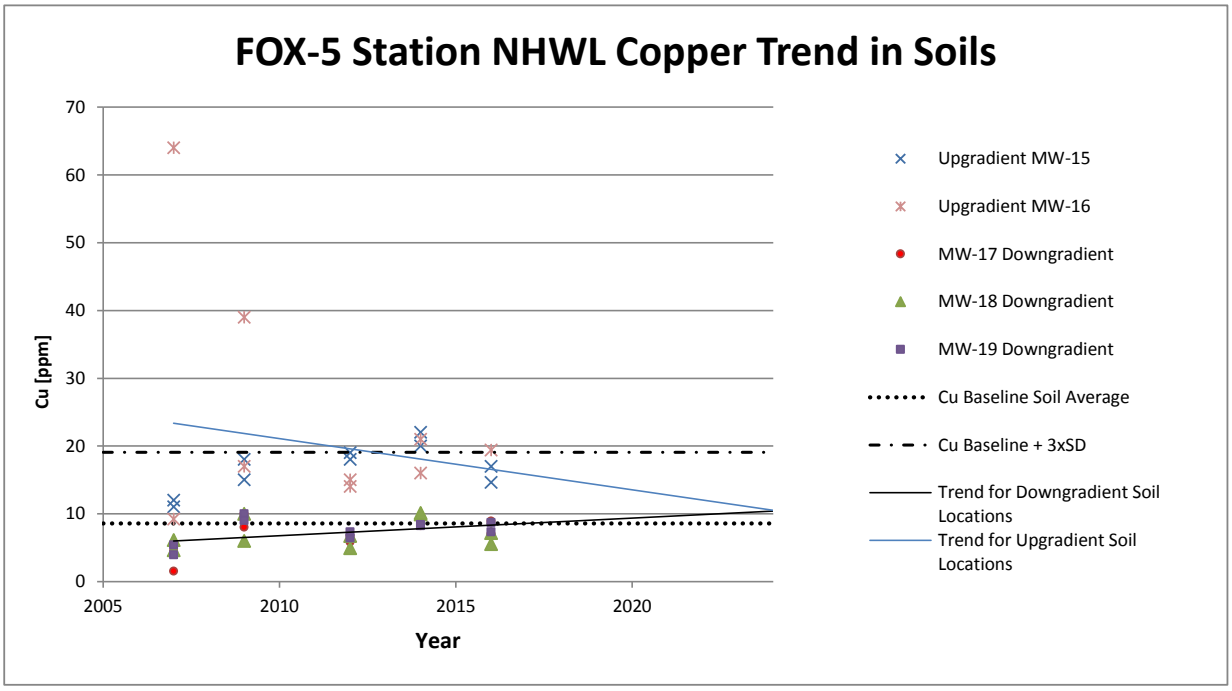
XX	sample exceeds background
XX	**sample exceeds baseline**
XX	*sample exceeds DLCU Tier I criteria*
XX	*sample exceeds DLCU Tier II criteria*

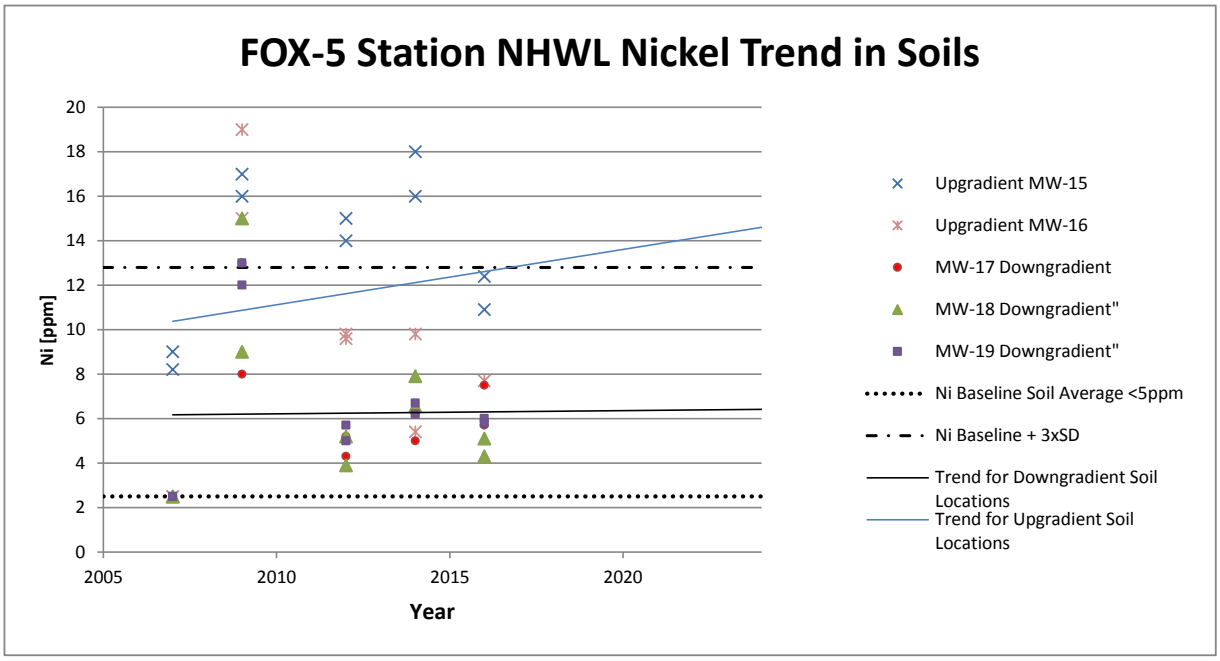
The Station Non-Hazardous Waste Landfill was visually assessed in 2008 and 2010 but soil and groundwater samples were not taken as per the monitoring contract.

^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

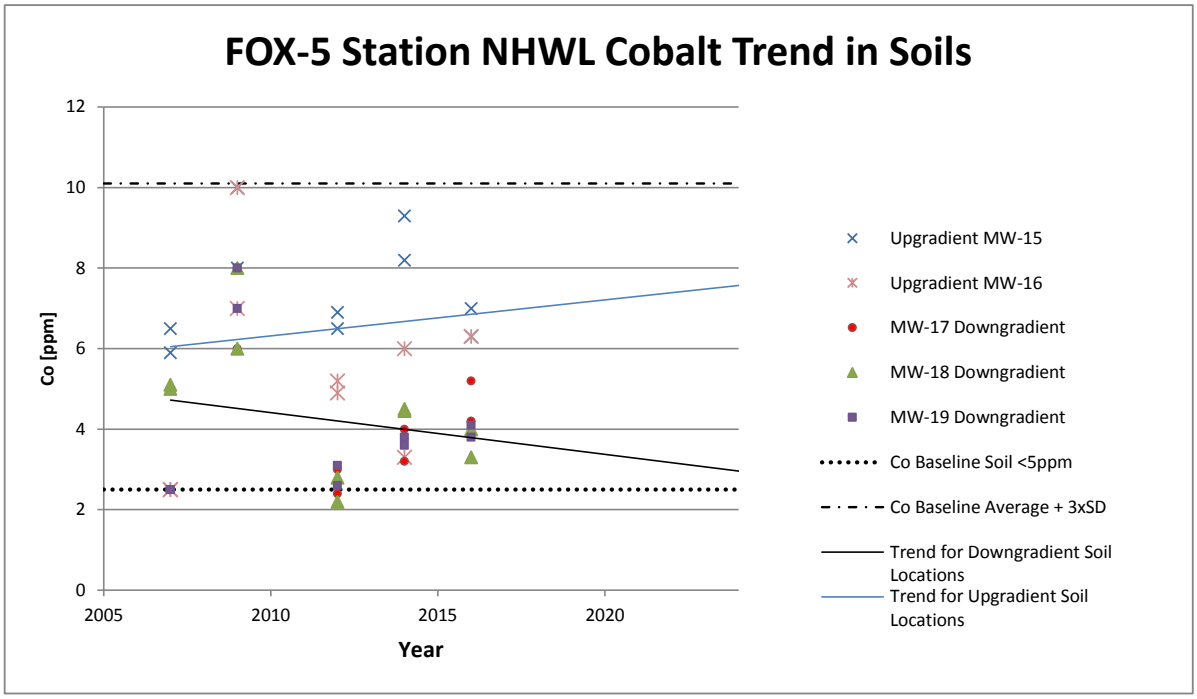
FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

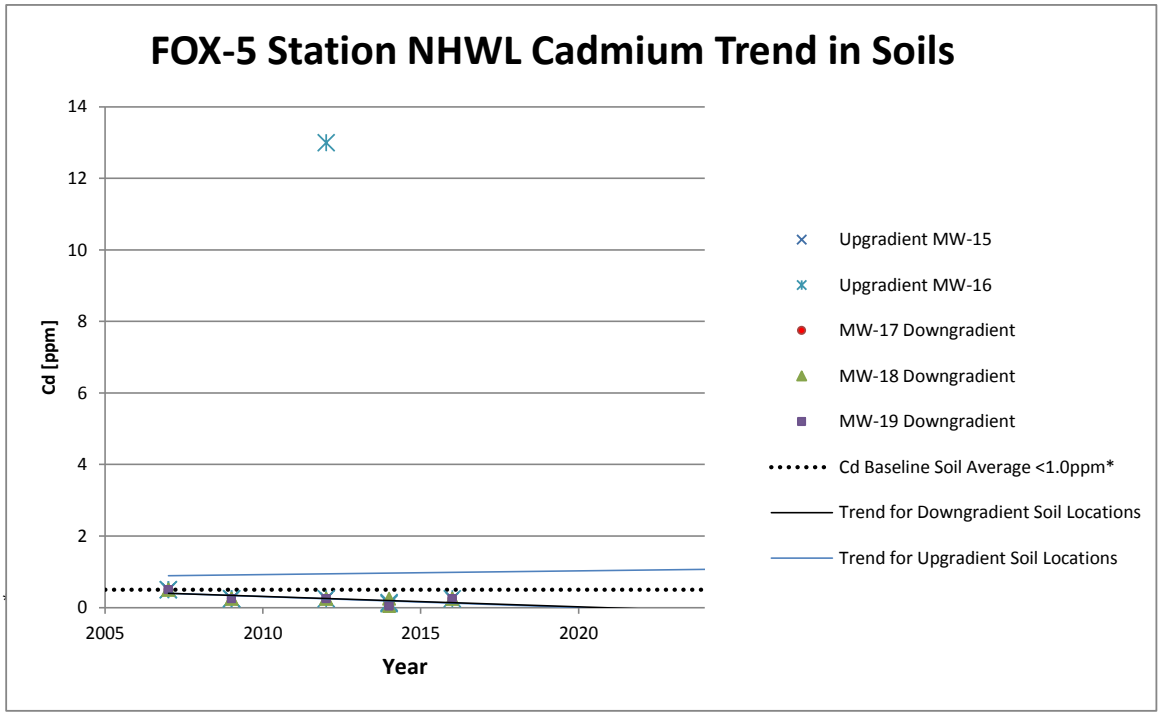
Where results are below detection, half of the detection limit has been used in the charts.





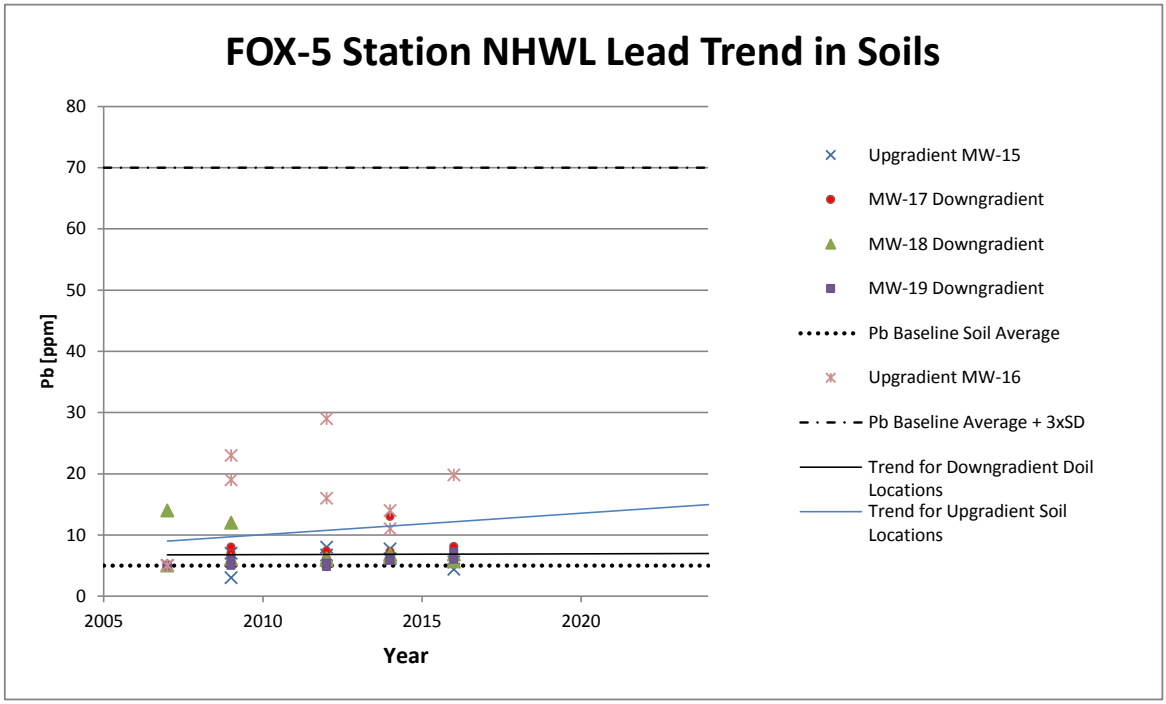
FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

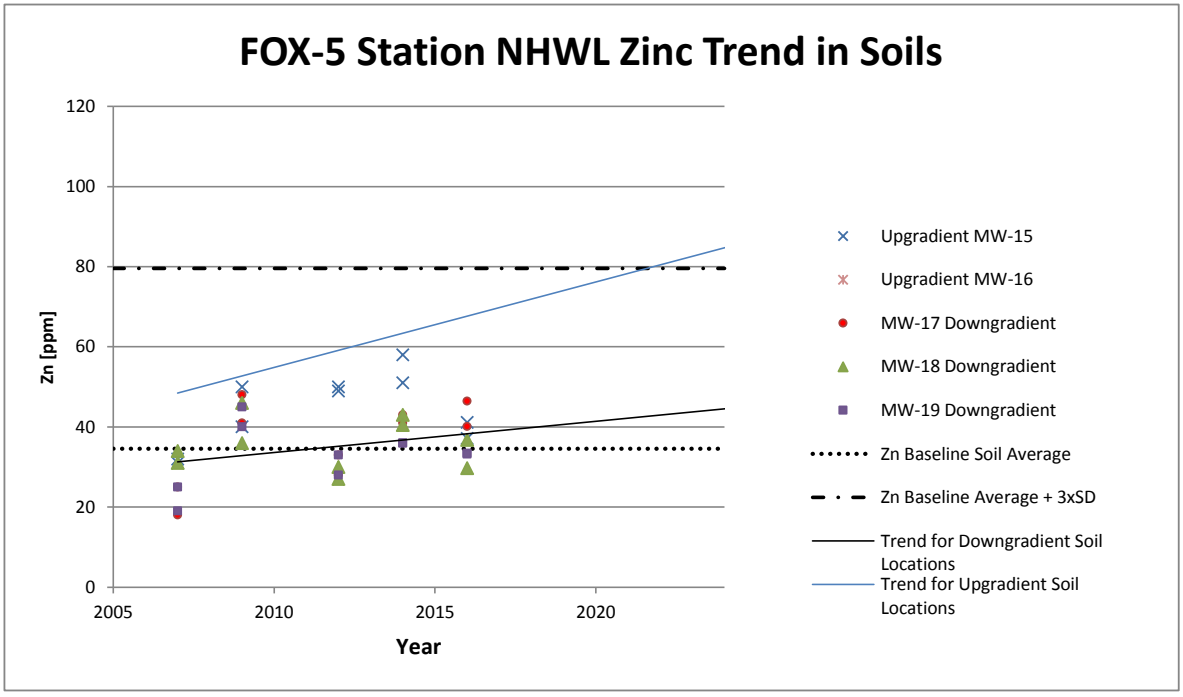




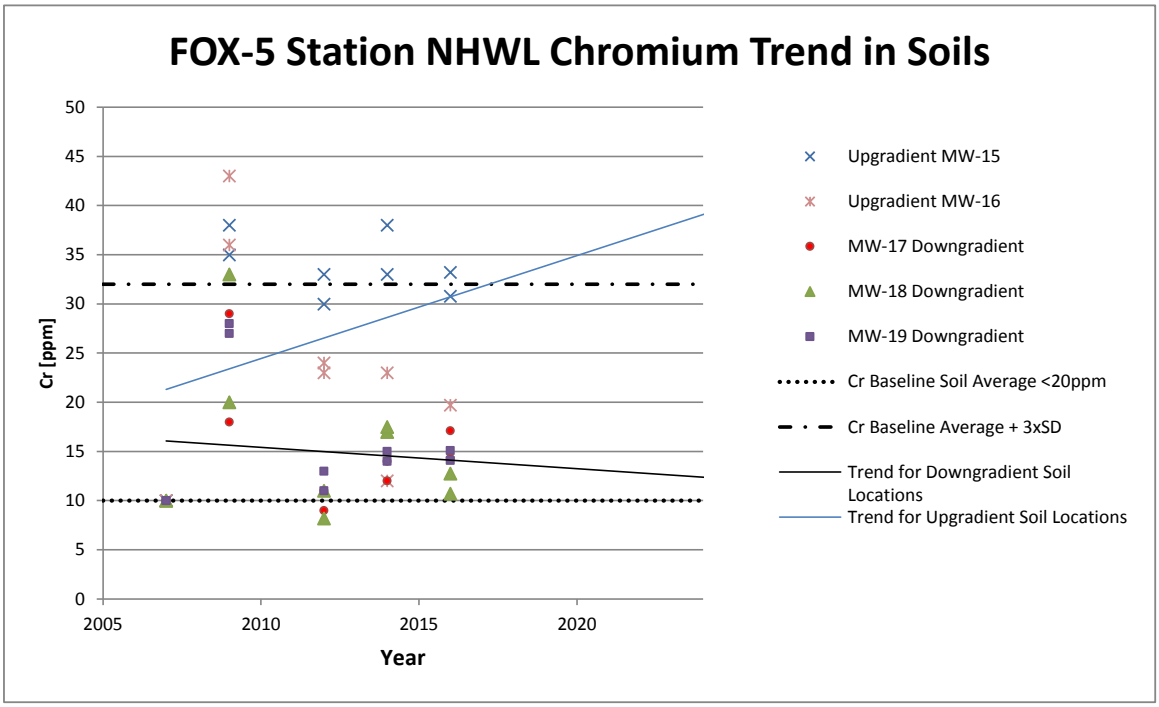
* Cd Baseline SD = 0

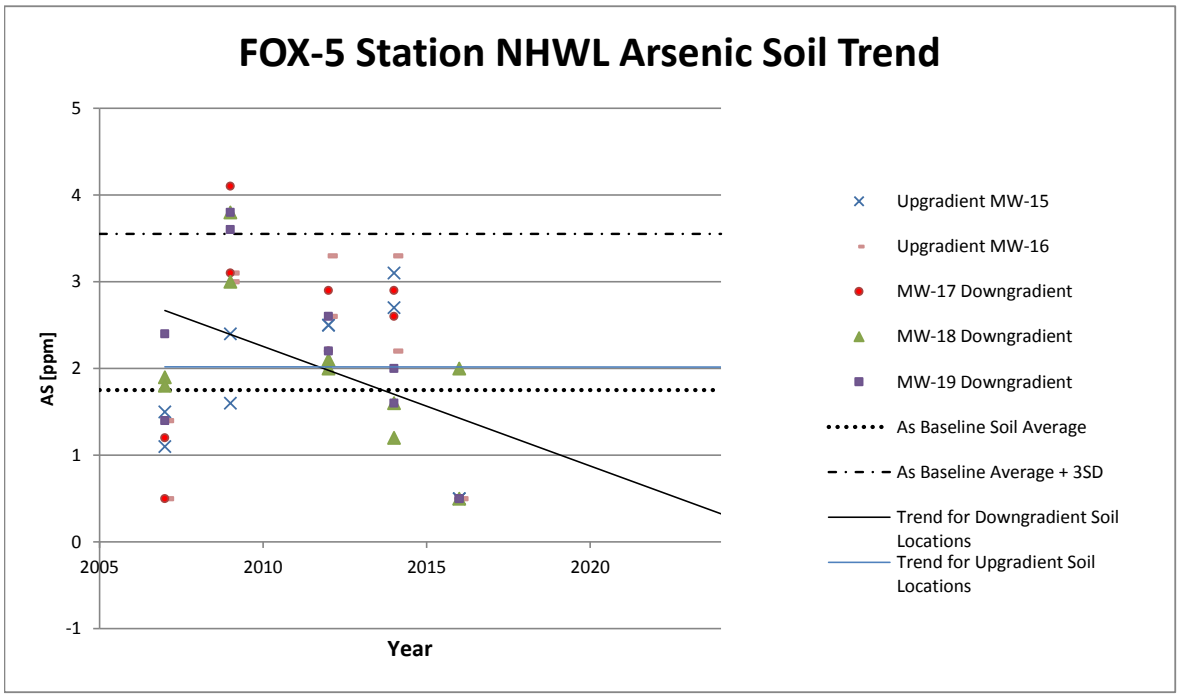
FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



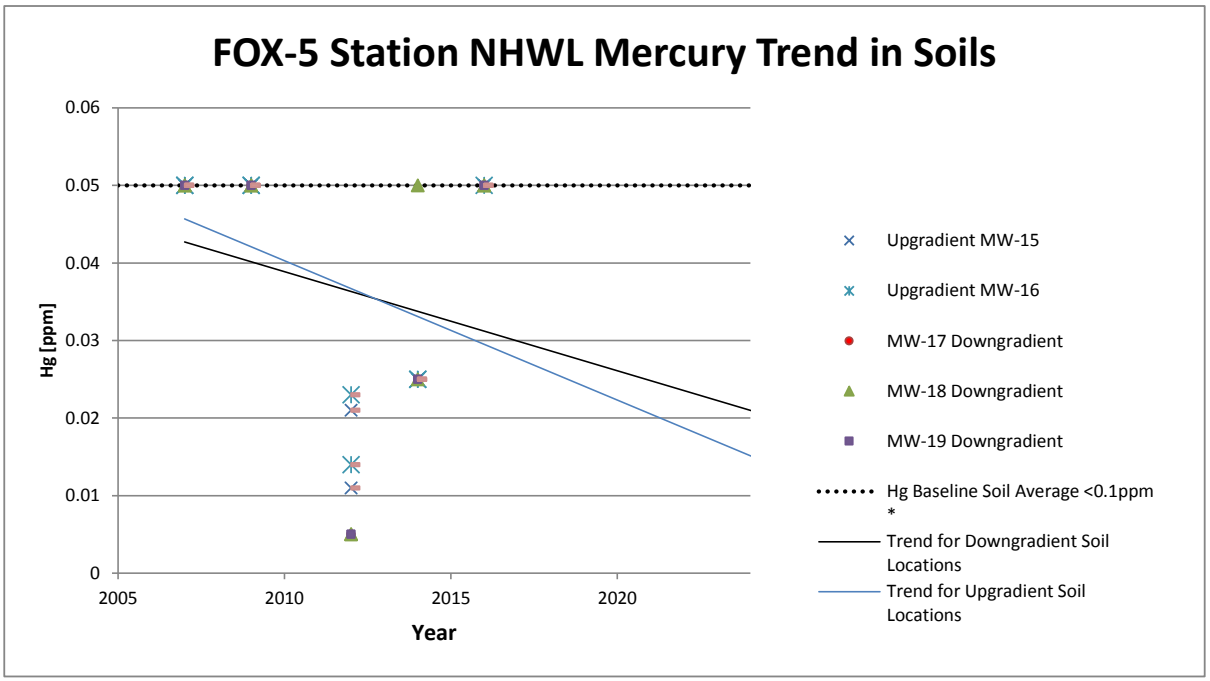


FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)

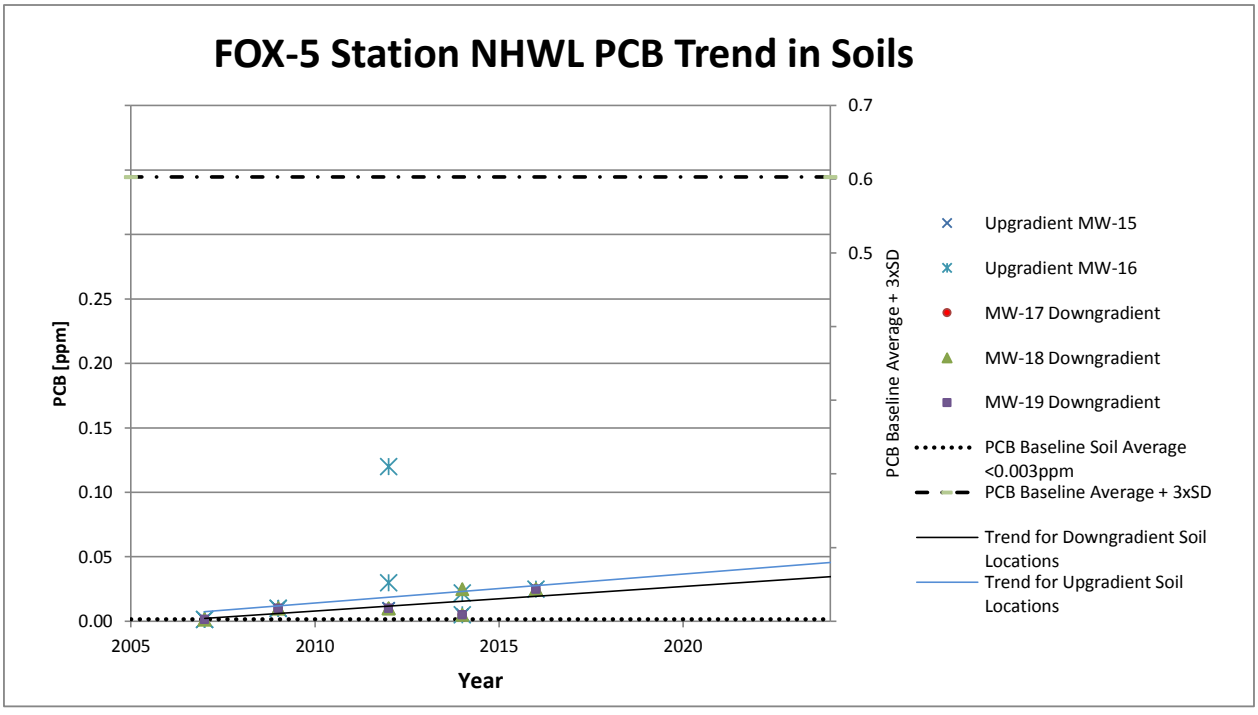




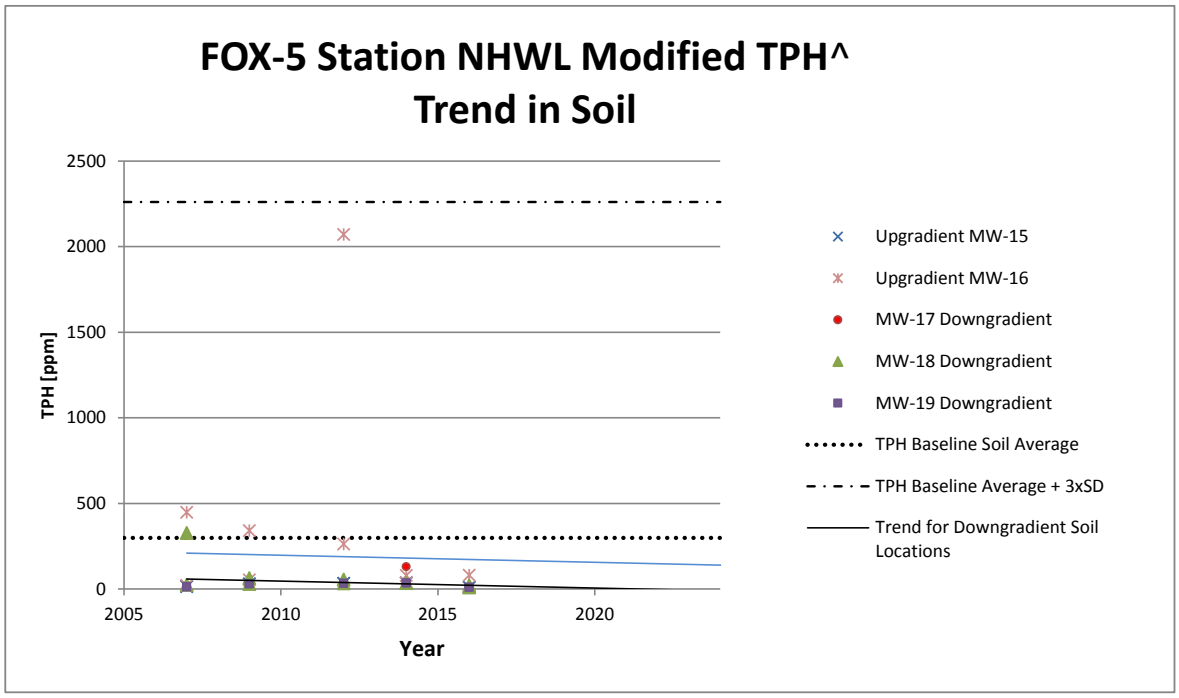
FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



* Hg Baseline SD = 0



FOX-5 Station NHWL Trends in Soil Inorganics, PCBs and PHCs (modified TPH)



^ Baseline samples from 2002 and earlier were analyzed as TPH, results from 2003 and later are Sum of PHC F1-F3 fractions

FOX-5 Qikiqtarjuaq (Broughton Island) Station NHWL - Summary of Groundwater Analytical Data

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu [mg/L]	Ni [mg/L]	Co* [mg/L]	Cd* [mg/L]	Pb* [mg/L]	Zn [mg/L]	Cr [mg/L]	As* [mg/L]	Hg* [mg/L]	Total PCBs* [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	Modified TPH - Total C6-C34 [mg/L]	TPH Identity	
																			% Fuel Oil	% Lube Oil
Baseline Data - Average					**0.036**	**0.075**	**0.010**	**0.001**	**0.01**	**0.097**	**0.116**	**0.003**	**0.004**	**0.00002**				**1**		
Baseline Data - Standard Deviation					0.019	0.037	0.01	0	0	0.075	0.084	0.002	0	0				0		
Baseline Data Average + 3xSD					0.0929091	0.1857273	0.04032727	0.001	0.01	0.32152961	0.3678217	0.009	0.004	0.00002				1		
Detection Limit					<0.0010	<0.0020	<0.0030	<0.0010	<0.010	<0.010	<0.0010	<0.0030	<0.00040	<0.000020				<1.0		
**** If baseline average was below the detection limit, the average has been modified to match the detection limit value.***																				
Monitoring Data																				
Upgradient															**Total TPH will appear when F1, F2, F3 fractions are entered**					
	MW-15																			
24779	MW 15	2007	1	Phase I	0.024	**0.160**	0.007	<0.0010	<0.010	0.052	**0.33**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
F509-15W	MW 15	2009	3	Phase I	<0.001	<0.005	<0.0002	**0.001**	<0.001	0.04	<0.001	<0.001	<0.0001	<0.0001	<0.2	<0.2	<0.2	0.300		
12-19545	MW-15	2012	6	Phase I	<0.010	<0.020	<0.0050	<0.00090	<0.010	0.032	0.03	<0.010	<0.00010	<0.000022	<0.025	<0.10	0.56	0.623		
F5-SA-MW-15	MW-15	2014	8	Phase II	0.001	0.009	0.000	<0.000020	0.000	0.020	0.02	<0.00020	<0.00001	<0.00005	<0.025	<0.1	<0.2	0.163		
MW-15	MW-15	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-16																			
24774	MW 16	2007	1	Phase I	0.031	0.060	0.009	<0.0010	<0.010	**0.12**	0.11	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
F509-16W	MW 16	2009	3	Phase I	0.003	<0.005	0.001	**0.001**	<0.001	0.09	0.002	<0.001	<0.0001	<0.0001	<0.2	0.2	0.2	0.500		
12-19546	MW-16	2012	6	Phase I	0.031	0.024	0.006	<0.00090	**0.012**	**0.82**	0.05	<0.010	<0.00010	<0.000050	<0.025	0.69	1.04	**1.743**		
F5-SA-MW-16	MW-16	2014	8	Phase II	**0.041**	0.020	0.009	0.001	**0.022**	**0.370**	0.05	**0.004**	0.000	<0.00005	<0.025	0.45	<0.2	0.563		
MW-16	MW-16	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	0.01	<0.001	<0.001	<0.0001	<0.00005	<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
Downgradient																				
	MW-17																			
24794	MW 17	2007	1	Phase I	0.011	0.038	<0.0030	<0.0010	<0.010	0.021	0.07	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
F509-17W	MW 17	2009	3	Phase I	0.004	<0.005	0.000	**0.003**	<0.001	0.020	0.004	<0.001	<0.0001	<0.0001	<0.2	<0.2	0.4	0.600		
12-19547	MW-17	2012	6	Phase I	0.005	0.012	0.001	<0.00010	0.001	0.006	0.02	<0.0010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
No sample collected - insufficient water		2014	8	Phase II														#N/A		
MW-17	MW-17	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001		<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-18																			
24789	MW 18	2007	1	Phase I	**0.058**	**0.160**	0.003	<0.0010	<0.010	**0.120**	**0.32**	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
F509-18W	MW 18	2009	3	Phase I	0.009	<0.005	0.000	0.0004	<0.001	0.040	0.00	<0.001	<0.0001		<0.2			0.100		
12-10948	MW-18	2012	6	Phase I	0.013	0.025	0.001	<0.00010	0.001	0.026	0.05	<0.0010	<0.00010	<0.000023	<0.025	<0.10	<0.25	0.188		
No sample collected - insufficient water		2014	8	Phase II														#N/A		
Not sampled - dry	MW-18	2016	10	Phase II														#N/A		
		2021	15	Phase II														#N/A		

FOX-5 Qikiqtarjuaq (Broughton Island) Station NHWL - Summary of Groundwater Analytical Data

Sample ID	Location	Date	Monitoring Year	Monitoring Phase	Cu [mg/L]	Ni [mg/L]	Co* [mg/L]	Cd* [mg/L]	Pb* [mg/L]	Zn [mg/L]	Cr [mg/L]	As* [mg/L]	Hg* [mg/L]	Total PCBs* [mg/L]	F1 C_6-C_{10} [mg/L]	F2 C_{10}-C_{16} [mg/L]	F3 C_{16}-C_{34} [mg/L]	Modified TPH - Total C6-C34 [mg/L]	TPH Identity	
																			% Fuel Oil	% Lube Oil
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		
	MW-19																			
24784	MW 19	2007	1	Phase I	0.032	0.052	**0.013**	<0.0010	<0.010	**0.100**	0.11	<0.0030	< 0.00040	< 0.000020	< 0.050	< 0.50	< 1.0	0.775		
F509-19W	MW-19	2009	3	Phase I	<0.001	<0.005	<0.0002	**0.004**	<0.001	<0.01	<0.001	<0.001	<0.0001	<0.0001		<0.2	<0.2	0.200		
12-19549	MW-19	2012	6	Phase I	**0.058**	0.053	**0.011**	<0.00090	**0.013**	**0.130**	0.08	<0.010	<0.00010	<0.000020	<0.025	<0.10	<0.25	0.188		
F5-SA-MW-19	MW-19	2014	8	Phase II	0.022	0.017	0.007	0.000	0.008	**0.110**	0.04	0.003	<0.00001	<0.00005	<0.025	<0.100	<0.100	0.113		
MW-19	MW-19	2016	10	Phase II	<0.0005	<0.001	<0.0005	<0.0001	<0.0001	<0.005	<0.001	<0.001	<0.0001	<0.0005	<0.025	<0.100	<0.100	0.113		
		2021	15	Phase II														#N/A		
		2031	25	Phase II														#N/A		
				Phase III														#N/A		
																		#N/A		
																		#N/A		
																		#N/A		

^Note: Total Hydrocarbons (C_6-C_{34}) has been calculated by adding results for F1, F2 and F3.

The Station Non-Hazardous Waste Landfill was visually assessed in 2008 and 2010 but soil and groundwater samples were not taken as per the monitoring contract.

APPENDIX D

Photograph Log

Visual Inspection Photographs

Thermistor Photographs

Monitoring Well Photographs

Soil Sampling Photographs

PHOTOS

Photo 1: *FOX-5 – Middle Site NHWL / Tier II DF – East corner facing northwest (ATT3_Photo3.jpg)*

Photo 2: *FOX-5 – Middle Site NHWL / Tier II DF - North toe facing northwest (ATT4_Photo4.jpg)*

Photo 3: FOX-5 – Middle Site NHWL / Tier II DF - North toe facing west (ATT5_Photo5.jpg)

Photo 4: FOX-5 – Middle Site NHWL / Tier II DF - Northwest toe facing southwest (ATT6_Photo6.jpg)

Photo 5: FOX-5 – Middle Site NHWL / Tier II DF - West toe facing southwest (ATT7_Photo7.jpg)

Photo 6: FOX-5 – Middle Site NHWL / Tier II DF - Southwest toe facing east (ATT8_Photo8.jpg)

Photo 7: FOX-5 – Middle Site NHWL / Tier II DF - Southwest toe facing northeast (ATT9_Photo9.jpg)

Photo 8: FOX-5 – Middle Site NHWL / Tier II DF - South toe facing east (ATT10_Photo10.jpg)

Photo 9: *FOX-5 – Middle Site NHWL / Tier II DF - Southeast toe facing north – Previously observed settlement (Feature E) likely just rough grading (ATT11_Photo11.jpg)*

Photo 10: *FOX-5 – Middle Site NHWL / Tier II DF - Southeast toe facing northwest (ATT12_Photo12.jpg)*

Photo 11: FOX-5 – Middle Site NHWL / Tier II DF – Crest facing northeast towards VT-9 (ATT13_Photo13.jpg)

Photo 12: FOX-5 – Middle Site NHWL / Tier II DF - Crest facing northeast – Previously observed erosion channels (Feature F) were not observed in 2016 and could have been early self-armouring, north end of thin minor crack along crest edge (Feature O – not visible in photo) (ATT14_Photo14.jpg)

Photo 13: FOX-5 – Middle Site NHWL / Tier II DF - Crest facing north – Previously observed natural staining (Feature G) was not observed in 2016 and could have been moisture (ATT15_Photo15.jpg)

Photo 14: FOX-5 – Middle Site NHWL / Tier II DF - Crest edge facing northwest – Previously observed settlement (Feature J) considered rough grading (Acceptable) (ATT16_Photo16.jpg)

Photo 15: FOX-5 – Middle Site NHWL / Tier II DF - Crest edge facing southeast (ATT17_Photo17.jpg)

Photo 16: FOX-5 – Middle Site NHWL / Tier II DF - Crest edge facing southwest (ATT18_Photo18.jpg)

Photo 17: FOX-5 – Middle Site NHWL / Tier II DF - West crest edge facing northeast (ATT19_Photo19.jpg)

Photo 18: FOX-5 – Middle Site NHWL / Tier II DF – East toe facing north (ATT2_Photo2.jpg)

Photo 19: FOX-5 – Middle Site NHWL / Tier II DF - South crest edge facing southeast (ATT20_Photo20.jpg)

Photo 20: FOX-5 – Middle Site NHWL / Tier II DF - Crest surface facing east towards VT-11 - Previously ponded water (Feature B) not observed in 2016 (ATT21_Photo21.jpg)

Photo 21: FOX-5 – Middle Site NHWL / Tier II DF - Crest surface facing southeast towards VT-9 (ATT22_Photo22.jpg)

Photo 22: FOX-5 – Middle Site NHWL / Tier II DF - Crest surface facing northeast towards VT-12 (ATT23_Photo23.jpg)

Photo 23: FOX-5 – Middle Site NHWL / Tier II DF – South slope facing southeast – Feature C – Self-armouring erosion, multiple channels (Acceptable) (ATT43_Photo43.jpg)

Photo 24: FOX-5 – Middle Site NHWL / Tier II DF – South slope facing southeast – Feature C – Self-armouring erosion (Acceptable) (ATT42_Photo42.jpg)

Photo 25: FOX-5 – Middle Site NHWL / Tier II DF – Southeast crest surface facing southeast – Feature D – Vehicle tracks from trucks, quads and dirt bikes are present over most of the landfill surfaces (Acceptable) (ATT45_Photo45.jpg)

Photo 26: FOX-5 – Middle Site NHWL / Tier II DF – Crest surface facing northwest towards VT-11 (ATT48_Photo48.jpg)

Photo 27: FOX-5 – Middle Site NHWL / Tier II DF – Southeast corner facing southeast (ATT47_Photo47.jpg)

Photo 28: FOX-5 – Middle Site NHWL / Tier II DF – Northeast corner facing north – Previously observed natural staining (Feature G) not observed in 2016 may have been moisture (ATT50_Photo50.jpg)

Photo 29: *FOX-5 – Middle Site NHWL / Tier II DF – Northeast toe facing northwest – Moist ground but no ponded water at toe (ATT53_Photo53.jpg)*

Photo 30: *FOX-5 – Middle Site NHWL / Tier II DF – Northeast slope facing north – Feature H – Parallel cracking on slope (Acceptable) (ATT52_Photo52.jpg)*

Photo 31: FOX-5 – Middle Site NHWL / Tier II DF – Northeast slope facing north (ATT51_Photo51.jpg)

Photo 32: FOX-5 – Middle Site NHWL / Tier II DF – North slope facing northwest – Previously observed Feature M erosion channels have self-armoured (Acceptable) (ATT56_Photo56.jpg)

Photo 33: *FOX-5 – Middle Site NHWL / Tier II DF – North end crest surface facing northwest – Feature R – weathered tension crack about 5 m from crest edge (Acceptable) (ATT55_Photo55.jpg)*

Photo 34: *FOX-5 – Middle Site NHWL / Tier II DF – Northwest slope facing south – Feature A - self-armouring erosion channels (Acceptable) (ATT57_Photo57.jpg)*

Photo 35: FOX-5 – Middle Site NHWL / Tier II DF – South crest edge facing southeast – Feature N – minor settlement at crest edge (Acceptable) (ATT44_Photo44.jpg)

Photo 36: FOX-5 – Middle Site NHWL / Tier II DF – South slope facing southwest – Feature C – self-armouring erosion channels (Acceptable) (ATT46_Photo46.jpg)

Photo 37: FOX-5 – Middle Site NHWL / Tier II DF – Southeast slope facing northeast – Feature O – tension crack with sharp edges extending from toe to crest at corner of landfill and along crest edge (ATT49_Photo49.jpg)

Photo 38: FOX-5 – Middle Site NHWL / Tier II DF – Northeast crest facing northwest – Feature P – weathered tension crack about 4 m from crest edge (Acceptable) (ATT54_Photo54.jpg)

Photo 39: FOX-5 – Middle Site NHWL / Tier II DF – Northwest crest surface facing southeast – Feature Q – hydrocarbon staining not related to landfill performance (Acceptable) (ATT58_Photo58.jpg)

Photo 40: FOX-5 – Middle Site NHWL / Tier II DF – VT-9 (ATT61_Photo61.jpg)

Photo 41: FOX-5 – Middle Site NHWL / Tier II DF – VT-10 (ATT62_Photo62.jpg)

Photo 42: FOX-5 – Middle Site NHWL / Tier II DF – VT-11 (ATT60_Photo60.jpg)

Photo 43: FOX-5 – Middle Site NHWL / Tier II DF – VT-12 (ATT59_Photo59.jpg)

Photo 44: FOX-5 – Middle Site NHWL / Tier II DF – MW-5 – monitoring well (ATT63_Photo63.jpg)

Photo 45: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 before excavation (ATT68_Photo68.jpg)

Photo 46: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 after excavation (ATT69_Photo69.jpg)

Photo 47: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-5 after backfilling (ATT70_Photo70.jpg)

Photo 48: FOX-5 – Middle Site NHWL / Tier II DF – MW-6 – monitoring well (ATT64_Photo64.jpg)

Photo 49: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 before excavation (ATT71_Photo71.jpg)

Photo 50: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 after excavation (ATT72_Photo72.jpg)

Photo 51: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-6 after backfilling (ATT73_Photo73.jpg)

Photo 52: FOX-5 – Middle Site NHWL / Tier II DF – MW-7 – monitoring well (ATT65_Photo65.jpg)

Photo 53: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 before excavation (ATT74_Photo74.jpg)

Photo 54: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 after excavation (ATT75_Photo75.jpg)

Photo 55: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-7 after backfilling (ATT76_Photo76.jpg)

Photo 56: FOX-5 – Middle Site NHWL / Tier II DF – MW-8 – monitoring well (ATT66_Photo66.jpg)

Photo 57: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 before excavation (ATT77_Photo77.jpg)

Photo 58: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 after excavation (ATT78_Photo78.jpg)

Photo 59: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-8 after backfilling (ATT79_Photo79.jpg)

Photo 60: FOX-5 – Middle Site NHWL / Tier II DF – MW-9 – monitoring well (ATT67_Photo67.jpg)

Photo 61: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 before excavation (ATT80_Photo80.jpg)

Photo 62: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 after excavation (ATT81_Photo81.jpg)

Photo 63: FOX-5 – Middle Site NHWL / Tier II DF – Soil sampling location MW-9 after backfilling (ATT82_Photo82.jpg)

Photo 64: FOX-5 – Main Landfill – Drainage ditch, west of landfill, facing north – Feature H – erosion channel (Acceptable) (ATT34_Photo34.jpg)

Photo 65: FOX-5 – Main Landfill – Boulder rip rap on west slope facing southeast (ATT35_Photo35.jpg)

Photo 66: FOX-5 – Main Landfill – North toe facing southwest – Figure H – erosion channel along toe (Acceptable) (ATT36_Photo36.jpg)

Photo 67: FOX-5 – Main Landfill – Northeast slope with inclined thermistors facing south (ATT37_Photo37.jpg)

Photo 68: FOX-5 – Main Landfill – East crest surface facing southwest with boulder rip rap (ATT38_Photo38.jpg)

Photo 69: FOX-5 – Main Landfill – Southeast toe facing northwest with boulder rip rap slope in background – Feature F erosion channel along toe in foreground (Acceptable) (ATT39_Photo39.jpg)

Photo 70: FOX-5 – Main Landfill – South crest surface facing north with boulder rip rap (ATT40_Photo40.jpg)

Photo 71: FOX-5 – Main Landfill – Crest surface facing west, boulder rip rap with sand and gravel on top (ATT41_Photo41.jpg)

Photo 72: FOX-5 – Main Landfill – Feature A – Inclined thermistors facing VT-3 (ATT107_Photo107.jpg)

Photo 73: FOX-5 – Main Landfill – Steel rebar at east toe near MW-12 – Previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT109_Photo109.jpg)

Photo 74: FOX-5 – Main Landfill – Scattered metal debris at northeast toe near MW-11 - Previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT106_Photo106.jpg)

Photo 75: *FOX-5 – Main Landfill – Steel cable at east toe - Example of previously observed Features B, C and E which are not exposed waste materials but construction debris/remnants (Acceptable) (ATT111_Photo111.jpg)*

Photo 76: *FOX-5 – Main Landfill – East toe facing northeast – Feature D – south end of erosion channel along north east toe (Acceptable) (ATT110_Photo110.jpg)*

Photo 77: *FOX-5 – Main Landfill – South toe facing northeast – Previously observed cracking (Feature G) beyond rip rap at toe is not related to landfill performance (ATT112_Photo112.jpg)*

Photo 78: *FOX-5 – Main Landfill – Southwest toe facing northwest – Previously observed erosion (Feature H) around toe of landfill (Acceptable) (ATT104_Photo104.jpg)*

Photo 79: *FOX-5 – Main Landfill – West toe facing northwest – Feature I – metal debris exposed by erosion around toe of landfill (Acceptable) (ATT105_Photo105.jpg)*

Photo 80: *FOX-5 – Main Landfill – Northeast toe facing south – Feature D – north end of erosion channel along toe (Acceptable) (ATT108_Photo108.jpg)*

Photo 81: FOX-5 – Main Landfill – South toe facing southeast – Feature K – exposed shredded plastic debris around MW-10 (Acceptable) (ATT103_Photo103.jpg)

Photo 82: FOX-5 – Main Landfill – VT-1 – inclined 76 degrees to northeast (ATT117_Photo117.jpg)

Photo 83: FOX-5 – Main Landfill – VT-2 inclined 77 degrees to northeast (ATT118_Photo118.jpg)

Photo 84: FOX-5 – Main Landfill – VT-3 – inclined 70 degrees to northeast (ATT116_Photo116.jpg)

Photo 85: FOX-5 – Main Landfill – VT-4 – inclined 63 degrees to northeast (ATT119_Photo119.jpg)

Photo 86: FOX-5 – Main Landfill – VT-5 – inclined 84 degrees (ATT120_Photo120.jpg)

Photo 87: FOX-5 – Main Landfill – VT-6 – inclined 84 degrees (ATT115_Photo115.jpg)

Photo 88: FOX-5 – Main Landfill – VT-7 – inclined 85 degrees (ATT113_Photo113.jpg)

Photo 89: FOX-5 – Main Landfill – VT-8 – inclined 87 degrees (ATT114_Photo114.jpg)

Photo 90: FOX-5 – Main Landfill – MW-10 – monitoring well (ATT22_Photo22.jpg)

Photo 91: FOX-5 – Main Landfill – Soil sampling location MW-10 before excavation (ATT23_Photo23.jpg)

Photo 92: FOX-5 – Main Landfill – Soil sampling location MW-10 after excavation (ATT24_Photo24.jpg)

Photo 93: FOX-5 – Main Landfill – Soil sampling location MW-10 after backfilling (ATT25_Photo25.jpg)

Photo 94: FOX-5 – Main Landfill – MW-11 – monitoring well (ATT38_Photo38.jpg)

Photo 95: FOX-5 – Main Landfill – Soil sampling location MW-11 before excavation (ATT39_Photo39.jpg)

Photo 96: FOX-5 – Main Landfill – Soil sampling location MW-11 after excavation (ATT40_Photo40.jpg)

Photo 97: FOX-5 – Main Landfill – Soil sampling location MW-11 after backfilling (ATT41_Photo41.jpg)

Photo 98: FOX-5 – Main Landfill – MW-12 – monitoring well (ATT34_Photo34.jpg)

Photo 99: FOX-5 – Main Landfill – Soil sampling location MW-12 before excavation (ATT35_Photo35.jpg)

Photo 100: FOX-5 – Main Landfill – Soil sampling location MW-12 after excavation (ATT36_Photo36.jpg)

Photo 101: FOX-5 – Main Landfill – Soil sampling location MW-12 after backfilling (ATT37_Photo37.jpg)

Photo 102: FOX-5 – Main Landfill – MW-13 – monitoring well (ATT30_Photo30.jpg)

Photo 103: FOX-5 – Main Landfill – Soil sampling location MW-13 before excavation (ATT31_Photo31.jpg)

Photo 104: FOX-5 – Main Landfill – Soil sampling location MW-13 after excavation (ATT32_Photo32.jpg)

Photo 105: FOX-5 – Main Landfill – Soil sampling location MW-13 after backfilling (ATT33_Photo33.jpg)

Photo 106: FOX-5 – Main Landfill – MW-14 – monitoring well with previously observed wood debris (Feature E) that is not exposed waste (ATT26_Photo26.jpg)

Photo 107: FOX-5 – Main Landfill – Soil sampling location MW-14 before excavation (ATT27_Photo27.jpg)

Photo 108: FOX-5 – Main Landfill – Soil sampling location MW-14 after excavation (ATT28_Photo28.jpg)

Photo 109: FOX-5 – Main Landfill – Soil sampling location MW-14 after backfilling (ATT29_Photo29.jpg)

Photo 110: FOX-5 – Station Area NHWL – Overview photo, southeast of landfill, facing northwest (ATT24_Photo24.jpg)

Photo 111: FOX-5 – Station Area NHWL – Crest edge, south corner, facing northeast (ATT25_Photo25.jpg)

Photo 112: FOX-5 – Station Area NHWL – Crest edge, east corner, facing northwest – previously observed settlement (Feature F) considered rough grading (Acceptable) (ATT26_Photo26.jpg)

Photo 113: FOX-5 – Station Area NHWL – Crest edge, north corner, facing southwest (ATT27_Photo27.jpg)

Photo 114: FOX-5 – Station Area NHWL – Crest edge, west corner, facing southeast (ATT28_Photo28.jpg)

Photo 115: FOX-5 – Station Area NHWL – Northeast slope from north toe facing southeast (ATT29_Photo29.jpg)

Photo 116: FOX-5 – Station Area NHWL – Southwest slope from toe facing northeast (ATT30_Photo30.jpg)

Photo 117: FOX-5 – Station Area NHWL – Northeast slope from toe facing northwest (ATT31_Photo31.jpg)

Photo 118: FOX-5 – Station Area NHWL – Northwest slope facing southeast - Motorbike tracks on slope – Previously observed settlement (Feature Q) is likely rough grading and not significant (ATT32_Photo32.jpg)

Photo 119: FOX-5 – Station Area NHWL – Crest surface facing southeast – Previously observed vehicle tracks (Feature G) cover most of landfill surface and are not considered significant (ATT33_Photo33.jpg)

Photo 120: FOX-5 – Station Area NHWL – Crest in north corner facing northwest – Previously observed settlement (Feature A) may just be rough grading (ATT86_Photo86.jpg)

Photo 121: FOX-5 – Station Area NHWL – Crest surface facing northwest – Feature C – steel bolt (Acceptable) (ATT90_Photo90.jpg)

Photo 122: FOX-5 – Station Area NHWL – Northeast crest facing north – Previously observed settlement (Feature D) is very shallow and not considered significant (ATT89_Photo89.jpg)

Photo 123: FOX-5 – Station Area NHWL – Northeast slope facing northeast – Feature E – self-armouring erosion (Acceptable) (ATT88_Photo88.jpg)

Photo 124: FOX-5 – Station Area NHWL – Crest surface facing south – Feature G – tire tracks (Acceptable) (ATT84_Photo84.jpg)

Photo 125: FOX-5 – Station Area NHWL – Southeast slope facing northwest – Feature H – minor self-armouring erosion with fines washed down slope (Acceptable) (ATT94_Photo94.jpg)

Photo 126: FOX-5 – Station Area NHWL – Southeast slope facing northwest – Feature H – minor self-armouring erosion (Acceptable) (ATT96_Photo96.jpg)

Photo 127: FOX-5 – Station Area NHWL – Southeast slope near toe facing southwest – Feature I – minor settlement (Acceptable) (ATT95_Photo95.jpg)

Photo 128: FOX-5 – Station Area NHWL – Southeast toe facing northwest – Feature J – metal debris (Acceptable) (ATT83_Photo83.jpg)

Photo 129: FOX-5 – Station Area NHWL – Southwest crest surface facing northwest – Feature K – minor settlement (Acceptable) (ATT92_Photo92.jpg)

Photo 130: FOX-5 – Station Area NHWL – Southwest slope facing northwest – Feature L – minor weathered cracking (Acceptable) (ATT93_Photo93.jpg)

Photo 131: FOX-5 – Station Area NHWL – Southwest toe facing north – Feature M – bits of metal debris (Acceptable) (ATT91_Photo91.jpg)

Photo 132: FOX-5 – Station Area NHWL – Southwest toe facing northwest – Feature N – steel cable and bits of metal debris (Acceptable) (ATT102_Photo102.jpg)

Photo 133: FOX-5 – Station Area NHWL – Northwest slope northwest – Feature O – minor settlement (Acceptable) (ATT101_Photo101.jpg)

Photo 134: FOX-5 – Station Area NHWL – North crest surface facing northwest – Previously observed settlement (Feature O) on crest are very shallow depressions and not considered significant (ATT85_Photo85.jpg)

Photo 135: FOX-5 – Station Area NHWL – Northwest slope facing southeast – Feature P – minor self-armouring erosion (Acceptable) (ATT100_Photo100.jpg)

Photo 136: FOX-5 – Station Area NHWL – Northwest slope facing southwest– Feature Q – minor settlement (Acceptable) (ATT98_Photo98.jpg)

Photo 137: FOX-5 – Station Area NHWL – Northwest slope facing northwest – Feature R – minor weathered cracking (Acceptable) (ATT99_Photo99.jpg)

Photo 138: FOX-5 – Station Area NHWL – Northwest slope facing southeast – Feature S – self-armouring erosion channels (Acceptable) (ATT87_Photo87.jpg)

Photo 139: FOX-5 – Station Area NHWL – Northeast slope facing southeast – Feature E – self-armouring erosion channels (Acceptable) (ATT97_Photo97.jpg)

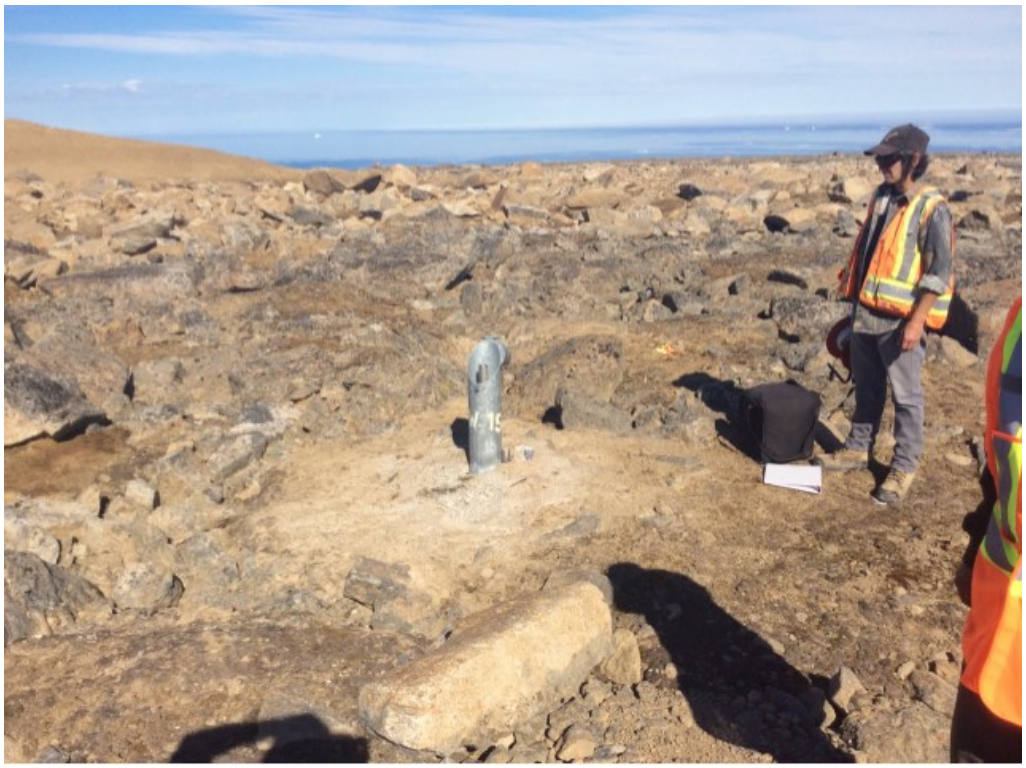


Photo 140: FOX-5 – Station Area NHWL – MW-15 – monitoring well (ATT2_Photo2.jpg)

Photo 141: FOX-5 – Station Area NHWL – Soil sampling location MW-15 before excavation (ATT3_Photo3.jpg)

Photo 142: FOX-5 – Station Area NHWL – Soil sampling location MW-15 after excavation (ATT4_Photo4.jpg)

Photo 143: FOX-5 – Station Area NHWL – Soil sampling location MW-15 after backfilling (ATT5_Photo5.jpg)

Photo 144: FOX-5 – Station Area NHWL – MW-16 – monitoring well (ATT7_Photo7.jpg)

Photo 145: FOX-5 – Station Area NHWL – Soil sampling location MW-16 before excavation (ATT6_Photo6.jpg)

Photo 146: FOX-5 – Station Area NHWL – Soil sampling location MW-16 after excavation (ATT8_Photo8.jpg)

Photo 147: FOX-5 – Station Area NHWL – Soil sampling location MW-16 after backfilling (ATT9_Photo9.jpg)

Photo 148: FOX-5 – Station Area NHWL – MW-17 – monitoring well (ATT10_Photo10.jpg)

Photo 149: FOX-5 – Station Area NHWL – Soil sampling location MW-17 before excavation (ATT11_Photo11.jpg)

Photo 150: FOX-5 – Station Area NHWL – Soil sampling location MW-17 after excavation (ATT12_Photo12.jpg)

Photo 151: FOX-5 – Station Area NHWL – Soil sampling location MW-17 after backfilling (ATT13_Photo13.jpg)

Photo 152: FOX-5 – Station Area NHWL – MW-18 – monitoring well (ATT15_Photo15.jpg)

Photo 153: FOX-5 – Station Area NHWL – Soil sampling location MW-18 before excavation (ATT14_Photo14.jpg)

Photo 154: FOX-5 – Station Area NHWL – Soil sampling location MW-18 after excavation (ATT16_Photo16.jpg)

Photo 155: FOX-5 – Station Area NHWL – Soil sampling location MW-18 after backfilling (ATT17_Photo17.jpg)

Photo 156: FOX-5 – Station Area NHWL – MW-19 – monitoring well (ATT19_Photo19.jpg)

Photo 157: FOX-5 – Station Area NHWL – Soil sampling location MW-19 before excavation (ATT18_Photo18.jpg)

Photo 158: FOX-5 – Station Area NHWL – Soil sampling location MW-19 after excavation (ATT20_Photo20.jpg)

Photo 159: FOX-5 – Station Area NHWL – Soil sampling location MW-19 after backfilling (ATT21_Photo21.jpg)

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