Appendix D

BAF-5 Resolution Island

Maintenance Assessment Report (AECOM, 2014)

1BR-RES0916

Public Works and Government Services Canada

BAF-5, Resolution Island Maintenance Assessment Report

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60304883 (503)

Date:

February 13, 2014

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February 13, 2014

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Dear Giselle:

Project No: **60304883**

Regarding: **BAF-5, Resolution Island Maintenance Assessment Report**

AECOM is pleased to provide the final report documenting the BAF-5, Resolution Island Maintenance Assessment. We thank you for the opportunity to complete this work on behalf of Public Works and Government Services Canada. If you have any questions or comments regarding the attached, please contact the undersigned at (780) 486-5922.

Sincerely,
AECOM Canada Ltd.

Greg Wright, M.Sc.
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Executive Summary

Resolution Island (BAF-5) is located off the southeastern tip of Baffin Island, at 61° 30' north latitude and 65° 00' west longitude and was constructed in 1954 as part of the Pole Vault system. The site was vacated as a Pole Vault station and a Strategic Air Command Communications (SACC) post by the United States Air Force (USAF) in 1972 and then used by the Canadian Coast Guard as a Long Range Navigation (LORAN) site until 1974. In 1985, a portion of the site was secured for use by the Department of National Defence (DND) as a Short Range Radar (SRR) station, where it still operated at the time of the 2013 investigation.

The BAF-5 site occupies an area of over three square kilometres (km^2) and consists of four areas: a main station, a lower station, a secondary antenna facility, and a barge landing area. The main station site is situated on top of a cliff at the northeastern end of Resolution Island, overlooking Brewer Bay. A 6 km long service road connects the main station summit area with other facilities at lower elevations. A smaller road, branching off the main road, just to the northwest of the Freshwater Lake, leads to a remote antenna facility on a second hilltop to the west of the main station summit. Approaches to the BAF-5 site are by sea at Brewer Bay and air by a runway located northwest of the summit.

The objective of AECOM's Maintenance Assessment at BAF-5 was to further evaluate potential remaining impacts and to develop remedial designs to mitigate and control risk to prevent significant adverse impacts to the environment. The field work for this assessment was conducted from August 17 to August 23, 2013 and consisted of the environmental assessment of suspected areas of remaining impacts, evaluation of existing dumps and landfills, audit of site demolition and hazardous waste, assessment of granular borrow, siting of potential landfills, and evaluation of site access.

The investigation and delineation of residual contaminated soil at BAF-5 was completed for the contaminants of concern listed in the INAC Abandoned Military Site Remediation Protocol (AMSRP). The contaminants of concern are: arsenic, cadmium, chromium, cobalt, copper, lead, nickel, zinc, polychlorinated biphenyls (PCBs) and petroleum hydrocarbons (PHCs). Topographic information was collected for the Furniture Dump and S1/S4 Valley source areas, migration pathways, and barrier locations, which will be combined with the Queen's University Analytical Services Unit's (ASU) delineation of residual PCB contaminated soil to develop a remediation design for the PCB barriers. AECOM identified localized residual contaminated soil at the North Slope Dump and at the Airstrip Landfill. Two isolated Tier II copper exceedances were identified in surface soils at the North Slope Dump. Additional investigation is recommended to delineate the Tier II copper contamination and estimate a contaminated soil volume. Tier II cadmium and cobalt was identified at the Airstrip Landfill. Additional investigation is recommended to delineate the Tier II cadmium and cobalt contamination and estimate a contaminated soil volume. Approximately 44 cubic metres (m^3) of Tier I and 2.5 m^3 of Tier II PCB contaminated soil was also identified at the Airstrip Landfill.

Six existing dumps/landfills were investigated during the Maintenance Assessment. All landfills constructed during the 1998 to 2006 remediation, as well as other previously identified dumps/landfills, were assessed with the exception of the Tier II Disposal Facility which did not require additional assessment. A landfill assessment including a geotechnical stability evaluation and environmental investigation was performed for landfills that are not currently part of the long term monitoring program, including the PCL Dump and the North Slope Dump. Environmental sampling focused on addressing areas of previously identified contamination. All existing dumps/landfills were considered low environmental risk due to the lack of contaminants, evidence of erosion and receptors, and were therefore recommended to be covered in place with additional granular fill. For health and safety reasons, excavation was not conducted in the dumps/landfills.

Based on the results of the demolition inventory approximately 1,292 m^3 of non-hazardous waste was identified. It should be noted that the non-hazardous debris volume from the existing dumps/landfills were not included in this estimate, as all of the dumps/landfills were considered low environmental risk and would not require excavation. The estimated quantity of hazardous demolition waste at the BAF-5 is 117 m^3.

Fourteen potential borrow areas were investigated at BAF-5 and 11 of the borrow areas contain material that is considered suitable for construction use. It is estimated that there is 98,000 m^3 of granular material available from these borrow areas. The most predominant soil types in the borrow areas is Type 1, Type 2, Type 3 and Type 6 Granular Fill. It is anticipated that sufficient volumes have been identified for maintenance purposes, although additional borrow sourcing during construction will be carried out if necessary.

Depending on the remedial options selected, a non-hazardous waste landfill may be constructed at BAF-5. Five proposed landfill locations were investigated during the Maintenance Assessment and were identified as suitable locations.

In general, the condition of the access roads ranges from very poor to good. The road tends to be in better condition in the vicinity of the Station Area. The worst road sections occur in the vicinity of the Freshwater Lake, where there are several washouts. Road repair will be required at BAF-5 in order to make the roads safe and accessible during maintenance construction activities.

Not all of the 2013 Maintenance Assessment action items could be investigated due to poor weather conditions and the limited time on site. Action items not covered in the 2013 assessment include: identifying and assessing additional borrow areas, quantifying surface debris, quantifying and characterizing site culverts, surveying the Beach Landfill, additional delineation of contaminated soil identified at the landfills and fuel storage area, as well as additional assessment of the PCB barriers. It is expected that these remaining information gaps can be addressed during the design phase using good engineering judgement and existing historical data.

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1. Introduction

Resolution Island (BAF-5) is located off the southeastern tip of Baffin Island, Nunavut (NU), at 61° 30' north latitude and 65° 00' west longitude, and occupies an area of over three square kilometres (km^2). BAF-5 was constructed in 1954 as part of the Pole Vault system, providing a link between the Distant Early Warning (DEW) Line and military bases in southern Canada and the United States. The site was vacated as a Pole Vault station and a Strategic Air Command Communications (SACC) post by the United States Air Force (USAF) in 1972 and then used by the Canadian Coast Guard as a Long Range Navigation (LORAN) site until 1974. In 1985, a portion of the site was secured for use by the Department of National Defence (DND) as a Short Range Radar (SRR) station, where it still operated at the time of the 2013 investigation. Between 1997 and 2006, environmental remediation works were completed to bring the site into legal compliance with respect to the Canadian Environmental Protection Act (CEPA) and Fisheries Act legislation.

Historical reviews and a site visit in 2012 had identified a number of areas where additional sampling, assessment and inspection were recommended to evaluate post remediation conditions. From August 17 to August 23, 2013, AECOM completed a Maintenance Assessment at BAF-5. This assessment consisted of the environmental assessment of suspected areas of residual polychlorinated biphenyls (PCBs), petroleum hydrocarbon (PHC) and metals impacts, evaluation of existing dumps and landfills, audit of site demolition and hazardous waste, assessment of granular borrow, siting of potential landfills, and evaluation of site access. The objective of this work is to fill the existing information gaps in order to complete design and specifications for additional remedial work.

1.1 Scope of Work and Report Organization

The Resolution Island (BAF-5) Remediation Information Review and Risk Evaluation (AECOM, 2013) identified the need for a Maintenance Assessment of the site to further evaluate potential remaining impacts and to develop remedial designs to mitigate and control risk to prevent significant adverse impacts to the environment. The goal of the Maintenance Assessment was to maintain and manage the identified risk items, not to revisit work that has been completed previously.

The scope of work for the Maintenance Assessment at BAF-5 includes the following:

- Quantification of residual PCB, PHC and metals impacted soils remaining at various areas across the site
- Evaluation of the level of containment and geotechnical stability of existing dumps and landfills, and collection of the necessary information to complete any required maintenance work
- Identification and characterization of potential granular sources that may be used for maintenance work on-site
- Identification and evaluation of potential locations for disposal of demolition waste
- Evaluation of the condition of existing site access roads
- Identification of the buried debris limits at existing dumps and landfills
- Identification of the type and volume of wastes remaining on-site, including debris generated from demolition of remaining site infrastructure as well as debris remaining across the site
- Completion of a detailed topographic survey

The report has been structured as follows:

- Section 2: background information related to site remediation, including property issues, years of assessment, and the remediation protocols
- Section 3: assessment of potential residual contamination at the PCB barriers, PCL Dump drainage, North Slope Dump drainage, and beach fuel tanks
- Section 4: assessment of the existing dumps and landfills on site
- Section 5: assessment of demolition and hazardous waste materials including all existing on site structures
- Section 6: granular borrow assessment including existing borrow areas, new borrow areas identified during the maintenance assessment and potential bedrock quarry locations
- Section 7: potential landfill siting areas identified during the maintenance assessment
- Section 8: assessment of site access including an assessment of the airstrip, roadways and beach access
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- Appendix A: figures representing the site
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2. Background

2.1 Site Description

The BAF-5 site consists of four areas: a main station, a lower station, a secondary antenna facility, and a barge landing area. The main station site is situated on top of a cliff at the northeastern end of Resolution Island, overlooking Brewer Bay. A 6 kilometre (km) long service road connects the main station summit area with other facilities at lower elevations. A smaller road, branching off the main road, just to the northwest of the Freshwater Lake, leads to a remote antenna facility on a second hilltop to the west of the main station summit. Approaches to the BAF-5 site are by sea at Brewer Bay and air by a runway located northwest of the summit.

2.2 Ecological Receptors and Traditional Land Use

The climate at Resolution Island is classified as sub-Arctic marine and there is considerable moisture in the form of rain, snow and fog. The mean annual temperature is -7.9 degrees Celsius (°C); with an average high temperature of 2.9°C during the summer season (July to September). Extremes in temperature range from -40°C during the winter months to 20°C during the summer. Annual precipitation normals for this area are 40 centimetres (cm) of rain and 130 cm of snow.

The site, like much of the island, is situated on Canadian Shield bedrock. Terrain is rolling to steep, with high cliffs dropping to sea level situated along the east, south and southwest coasts of the summit. The ground surface throughout much of the site is exposed bedrock, with isolated pockets of till in lower-lying areas. Vegetation is limited to locations in gullies and other low-lying areas where sufficient soil is available for rooting.

Resolution Island has been identified as a denning area for polar bears and these animals are known to frequent the site. The island is also along the migration routes of whales. In addition, other marine mammals including seals and walruses are attracted to the area by the reported 49 different species of fish occurring in nearby waters. A potential shrimp fishery was previously investigated for the area. Nesting colonies for seabirds, such as the Thick-billed Murre and Black-legged Kittiwake are also reported to occur on this, and surrounding islands.

The nearest communities to Resolution Island are Iqaluit (approximately 310 km to the north-northwest), Kimmirut (approximately 300 km to the northwest) and Pangnirtung (approximately 510 km to the north). Inuit parties are known to hunt and fish in the area on occasion, but no permanent settlement exists on the island.

2.3 Site History

2.3.1 Property and Asset Transfers

BAF-5 was constructed in 1954 as part of the Pole Vault system which provided a communications link between the DEW Line and military bases in southern Canada and the United States. Since its construction, the site has operated as a Pole Vault facility, a Strategic Air Command Communications (SACC) post and a Canadian Coast Guard Long Range Navigation (LORAN) navigational aid facility. Two weather stations have also operated in the vicinity.

The site was vacated as a Pole Vault station by the USAF in 1972 and was abandoned by the Canadian Coast Guard as a LORAN site in 1974. In 1976, the assets at the site were sold to the Government of Nunavut (GN); formerly the Government of the Northwest Territories (GNWT), through crown assets disposal and the land reverted back to Aboriginal Affairs and Northern Development Canada (AANDC) for administration and control. In 1985, DND negotiated the use of an area of the old site as a military reserve for the construction of a new automated SRR as part of the new North Warning System (NWS), which was still in operation at the time of the 2013 investigation.

2.3.2 SRR Construction and DND Property Cleanup

Preliminary investigations were initiated at BAF-5 in 1987 to determine the extent of contamination at the site and the demolition work required prior to SRR construction. During the investigations, PCB -containing electrical equipment, unused transformer fluid, and PCB stained soils were found. Asbestos and miscellaneous chemicals were identified at the old station.

Under a Memorandum of Understanding (MOU) between AANDC and DND signed in 1989, DND was only required to clean up the area of the site that was to be used for construction of the SRR. The cleanup requirements for the SRR construction were subsequently established and included the containerization of PCB contaminated soils and other hazardous chemicals. In 1989, PCB contaminated material was removed from the construction area by subcontractors of PCL Foundation Ltd. and stored in a secure building at the beach. Asbestos was bagged and landfilled at the summit, and hazardous chemicals were stored in vaults outside the PCB storage facility. A large quantity of unsecured PCB material and asbestos still remained on site outside of the SRR area during construction. The SRR construction began in 1990, following the demolition of a selected number of old buildings at the summit, and was completed in September 1994.

2.3.3 AANDC Property Assessment and Remediation

Environmental investigations conducted at BAF-5 between 1987 and 1990 triggered a series of additional environmental assessments. At the request of AANDC and Environment Canada, an environmental site assessment of BAF-5 was conducted in 1993 by the Environmental Sciences Group (ESG) of Royal Roads Military College. The intent of the investigations was to verify earlier findings and address gaps in knowledge with respect to the extent of contamination, to identify the impact of chemical contaminants on the Arctic ecosystem, and to provide realistic and practical recommendations for cleanup. Between 1993 and 1996, environmental work at the site was detailed in a set of reports entitled Environmental Study of a Military Installation at Resolution Island, BAF-5, completed by ESG and their colleagues at Queen’s University, the Analytical Services Unit (ASU). The reports described items such as site characteristics, history and previous investigations. Work at the site continued annually between 1996 and 2005, with the focus on additional delineation of contaminant impacts as needed, ongoing research into practical remediation or risk mitigation methods for contamination, and verification of remediation activities.

From 1997 onward, remediation work at the site was completed by a contractor, Qikiqtaaluk Corporation (QC), hired through a contribution agreement with AANDC. The scope of work included remediation of contamination as identified by ASU, demolition of structures no longer needed, disposal of non-hazardous waste and contaminated soil in landfills on-site, containerization and transport of hazardous waste off-site, and infrastructure improvements to support remediation activities. A three year plan to complete the work at the site was initiated in 2003 and remediation construction was essentially completed by 2005. Demobilization from the site occurred in 2006 with the removal of heavy equipment relating to the remediation project, removal of the mobile lab, and demolition of the camp. The monitoring program was initiated in 2006 and annual reports were produced until 2012.

2.4 Remediation Plan

2.4.1 Legal Compliance Requirements

The original project at Resolution Island was focused on bringing the site into legal compliance with respect to the CEPA and Fisheries Act legislation. The use and disposal of PCBs is governed by CEPA. Soils containing PCBs at concentrations in excess of 50 parts per million (ppm) are required to be treated in accordance with regulations for the storage of PCB material specified in the Act. BAF-5 site was in violation of CEPA, due to the high concentrations of PCBs known to be on site. The Fisheries Act requires that no deleterious substance be introduced into waters frequented by fish. Due to the site's proximity to the ocean and suspicion of contaminants leaching into the nearby marine environment, it was necessary that the contaminants entering the water course be addressed.

The remediation plan for Resolution Island was eventually revised to remediate the site according to a combination of Canadian Council of Ministers of the Environment (CCME) guidelines, DEW Line Clean-Up (DLCU) criteria and protocol and site-specific criteria, discussed in the sections that follow.

2.4.2 Remediation Protocols

2.4.2.1 Dew Line Clean Up

Contaminated Soil:

The Dew Line Clean-Up Criteria (DCC) includes provision for identification of contaminants in the following three categories: CEPA, Tier II, and Tier I. The Tier I and Tier II criteria were developed specifically for the Canadian Arctic to address persistent contaminants which have the potential to impact the Arctic ecosystem. CEPA level soil applies only to PCBs and defines concentrations that are defined and regulated as hazardous. Tier II criteria are concentrations of metals and PCBs that are considered an environmental risk to potential receptors and at sufficiently high concentrations that there is a potential for contaminant migration at surface or depth. Tier I criteria apply only to PCBs and lead; soil contaminated at this level is only considered an environmental risk if at surface, with concentrations sufficiently low as to not result in migration from the source area. Table 1 below outlines the DCC for each of the contaminant levels and identifies the remedial requirements.

Table 1. Soil Clean Up Criteria

Contaminant Designation	Description	Remedial Requirements
Tier I Contaminated Soil	Soils containing concentrations of any or all contaminants listed as follows: • Lead...............200 to 499 ppm • PCBs..............1 to <5 ppm	Excavate and place in an engineered non-hazardous waste landfill or cap in place with a minimum of 0.3 m of fill.
Tier II Contaminated Soil	Soils exceeding concentrations of any or all contaminants listed as follows: • Arsenic...........30 ppm • Cadmium........5 ppm • Chromium.......250 ppm • Cobalt............50 ppm • Copper...........100 ppm • Lead...............500 ppm • Mercury..........2 ppm • Nickel.............100 ppm • Zinc................500 ppm • PCBs..............≥5 ppm;<50 ppm	Excavate and remove from direct contact or impact with the Canadian Arctic ecosystem either by containerization and disposal at a southern landfill site or landfilling on-site at a specially designed facility.
CEPA	Soils contaminated with PCBs ≥50 ppm.	Containerize and dispose of off-site at a licensed disposal facility

Existing Dumps and Landfills

The DLCU protocol classifies existing dumps and landfills according to three different types, with three corresponding remedial requirements:

Class A: Landfills that are located in unstable and eroding areas should be excavated and waste and soil contents classified and disposed of accordingly as non-hazardous waste, hazardous waste, or contaminated (CEPA, Tier II or Tier I)

Class B: Landfills that show evidence of leachate or have the potential for generating leachate should be retro-fitted with leachate containment/control measures, or should be excavated

Class C: Landfills that are suitably sited, show no evidence of leachate, and are not susceptible to erosion but have exposed debris should be covered and graded

The assessment of landfills to classify them according to the above criteria is comprised of an environmental assessment to identify any soil contamination or evidence of contaminant migration from the dump area, and a geotechnical assessment to identify erosion or other stability concerns.

Demolition and Debris

In terms of hazardous waste classification, the DLCU protocol defers to the definitions of materials classified as dangerous goods under the Transportation of Dangerous Goods Act and Regulations (TDG) and/or regulated substances under CEPA. This includes PCB-containing equipment (or soil), PHCs, solvents, batteries, mercury-containing equipment, asbestos, radioactive materials, refrigerants, and waste capable of generating leachate that exceeds applicable leachate criteria (such as lead painted waste).

Prior to demolition, hazardous materials found in the buildings must be removed, and packaged in accordance with TDG Act and Regulations for shipment off-site and disposal at a licensed hazardous waste facility. Non-hazardous waste may be landfilled on-site in an engineered landfill.

Similar to demolition waste, site debris should be collected, sorted according to non-hazardous and hazardous, and disposed of accordingly.

Overall Site Stabilization

As part of the cleanup, areas disturbed in past operations and by cleanup activities should be graded to restore natural drainage where possible. These areas include former or new borrow pits, landfill/dump areas; areas disturbed by demolition, and contaminated soil excavation areas.

2.4.2.2 CCME Canada Wide Standard for Petroleum Hydrocarbons

The CCME Canada Wide Standard (CWS) for PHCs was introduced in 2001. The CCME CWS is laid out in three tiers, each of which incorporates a different amount of site specific information. Tier I levels are used when the proponent accepts the base assumptions and parameters in the Tier 1 exposure scenario. Tier 2 levels may be generated and used when site conditions exist that significantly modify the exposure and risk scenarios. Tier 3 levels are based on site-specific assessment and management of risks.

The DLCU protocol initially did not include PHCs. In 2002, AANDC developed a Contaminated Sites Program Management Framework which followed recommendations in the Treasury Board Federal Contaminated Sites Policy. CCME Guidelines were to be followed unless site conditions, land use, receptors, or exposure pathways differ from the protocols used to develop the Guidelines. This was added to the DLCU protocol and adopted at Resolution Island in 2002.

Tier 2 remediation criteria were determined to reflect conditions at Resolution Island. This was originally done for the F2 fraction in coarse grained surface soils, but has since been expanded to include other PHC fractions. Table 2 shows the Tier 2 remediation criteria derived specifically for Resolution Island; criteria are presented in respect to proximity in metres (m) from water bodies and the remediation criteria are outlined in ppm.

Table 2. CCME Petroleum Hydrocarbon Tier 2 Derived Remediation Criteria

CCME Fraction	Tier 2 Remediation Criteria (ppm)
F1 >55m to water body	15,000
F2 >55m to water body	8,000
F3 >55m to water body	18,000
F4 >55m to water body	25,000

2.4.3 2003 Remediation Plan Summary

Prior to development of the 2003 Remediation Plan, the following tasks were completed as part of the original compliance project, as summarized in the Resolution Island Project Description and New Remediation Plan (ASU 2003):

1. PCB containing oil and electrical equipment was removed from site
2. PCB contaminated soil, containing approximately 2.5 tons of PCBs, was excavated
3. Buildings were demolished, including PCB contaminated concrete slabs
4. Asbestos was removed from site buildings
5. Contents of hundreds of barrels were consolidated or destroyed
6. Two large dumps were excavated: the Furniture Dump and the Beach Dump

Table 3 summarizes the major remedial work tasks identified in the 2003 Remediation Plan.

Table 3. Summary of Major Tasks of 2003 Remediation Plan

Area	Remediation Plan
S1/S4 Buildings and Valley	• Install permanent PCB barriers • Complete additional analysis of PCBs in concrete of Building S4 • Remove asbestos cladding on antenna structures • Excavate contaminated soil
Core Camp Vicinity **(DND Helipad, PCL and North Slope Dumps)**	• Close two non-hazardous waste landfills • Demolish the core camp • Remove temporary PCB barrier for offsite disposal
Maintenance Area	• Demolish Maintenance Complex Buildings • Remove debris from toe of dump • Remove incinerators and equipment • Containerize CEPA soil in storage facility • Construct Tier II Landfill • Excavate hydrocarbon contaminated soil • Incinerate waste grease/fuel • Excavate contaminated soil
Airstrip	• Remediate dump • Excavate CEPA contaminated soil • Cover dump with 0.5 m fill
Beach Area	• Excavate remaining debris in dumps • Empty Building B2 and line for CEPA soil • Excavate oily soil from Barrel Cache Valley and cottongrass area • Consolidate hazardous waste for offsite disposal • Excavate hydrocarbon contaminated soil by POL tanks • Close non-hazardous waste landfill
S1/S4 Beach Area	• Install permanent PCB barrier
Other	• Produce gravel • Incinerate or ship waste grease/fuel from remaining barrels • Establish waterline from lake to camp • Wrap creosote timbers in polyethylene for disposal in non-hazardous landfill

2.4.4 Criteria Considered for Maintenance Assessment

Part of the scope of the Maintenance Assessment was to confirm that all locations of impacted soil had been addressed in previous remediation efforts. Criteria used to identify impacted soil were the site-specific criteria, which are derived from the following sources:

Site-Specific Soil Guidelines:

- CEPA - PCBs
- DLCU – metals
- CCME CWS – PHCs

Criteria for surface water were obtained from the water license for the operating site (Licence Number: 1BR-RES0916; valid 2009-2016), as outlined in Table 4.

Table 4. Water Licence for BAF-5 General Discharge Parameters

Parameter	Maximum Allowable Concentration (µg/L)
pH	6 to 9 (pH units)
Oil and Grease	5,000
Arsenic (total)	100
Cadmium (dissolved)	10
Chromium (dissolved)	100
Cobalt (dissolved)	50
Copper (dissolved)	200
Lead (dissolved)	50
Mercury (total)	0.6
Nickel (dissolved)	200
PCB (total)	1,000
Zinc (total)	500
Benzene	370
Toluene	2
Ethylbenzene	90

Source: *Nunavut Water Board, Water Licence Number: 1BR-RES0916*, issued June 10, 2009

Collectively, these soil and groundwater guidelines will be referred to as the Site-Specific Criteria for the purpose of this 2013 Maintenance Assessment report.

3. Assessment of Potential Residual Contamination

The primary objective of the 2013 contaminated soil investigation is to quantify residual impacted soils remaining at various areas across the site in order to provide the information required to define the environmental risk, to identify whether any additional remediation is required and if so, to design the remediation program. In general, the assessment of contaminated soil areas includes consideration of the interaction between the environmental risk factors, namely, the contaminant sources, migration pathways, and receptors.

The 2013 Maintenance Assessment focuses on the delineation of previously identified PCB contamination and assessment of areas suspected of hydrocarbon impacts. These areas of potential contamination include the PCB Barriers, PCL Dump Drainage, North Slope Dump Drainage, Airstrip Landfill, and Beach Fuel Tanks. The environmental investigation of the PCB barriers was completed by ASU, and will be summarized by ASU in a standalone report. Only a brief description of the work undertaken at these areas in 2013 is included in the following subsections. The investigation of potential residual contamination at the Airstrip Landfill is presented in conjunction with the engineering assessment of the landfill in Section 4.6.

The results of the contaminated soil delineation are described in the following sections, specifically where exceedances were detected. Complete summaries of the analytical results for the sample locations shown on the site drawings can be found in Appendix B.

3.1 Methodology

The investigation and delineation of contaminated soil at BAF-5 was completed according to the gaps identified in the Resolution Island Information Review and Risk Evaluation (AECOM, 2013). A sampling plan identifying potential soil samples locations and analytical requirements for each of the potentially contaminated areas was developed prior to the site investigation using satellite imagery and aerial photos to tailor the plan to the existing terrain. Assessment of residual impacts were completed in a manner that accurately captured the extent of soil versus bedrock in each affected area and provided accurate information regarding volume, contaminant concentrations, and environmental risk in terms of remaining contaminant load at the source area, migration potential and any downgradient receptors.

In locations with known or suspected PCB, metals and/or PHC impacts, samples were collected from surface and shallow depths. Generally, delineation of potential impacts was completed according to a grid pattern, modified to suit the terrain as necessary, with appropriate sample spacing for the overall size of the affected area. Where appropriate, AECOM collected additional delineation soil samples, some of which were placed on hold at the laboratory in the event the analyzed samples did not provide complete delineation.

Samples were collected with a metal shovel or trowel that was cleaned between samples with a “soil wash” or wiped, as required. Samples were obtained below any surface vegetation, surface cobbles and/or debris, and were generally collected at 0.3 m below ground surface (mBGS) intervals. Deeper samples were obtained at approximately 0.5 mBGS in select locations. Soil collected was placed directly into laboratory supplied jars for PHC/PCB analysis and bags for metals analysis. The jars were completely filled (no headspace) and the samples kept cool until/during shipment to the laboratory, as specified. A tag with a numerical identifier was placed where samples were obtained to allow the position to be surveyed, and to mark location of the samples during future maintenance activities. The identifier on each tag corresponds to a test pit number. Sequential tags were placed where more than one sample was taken at any particular location. Field duplicates were collected for approximately 10% of samples, given a separate numerical label and submitted to the laboratory. A review of quality assurance and quality control (QA/QC) for field and laboratory methodologies is provided in Section 9 and Table B.10 in Appendix B.

Delineation of PHC impacts was completed using the Indian and Northern Affairs Canada (INAC) Arctic PHC Evaluation Process, which is a component of the INAC Abandoned Military Site Remediation Protocol (AMSRP) (2009). The methodology is based on total petroleum hydrocarbon (TPH) criteria, with identity broken down according to two types: Type A and Type B. Type A is composed of heavier, less mobile hydrocarbons (such as lubricating oil) and includes the F3 and F4 hydrocarbon fractions, while Type B is composed of the lighter, more mobile fractions such as those encountered in fuel oil and includes the F1, F2 and F3 hydrocarbon fractions. The dominant hydrocarbon type is defined by the percentage of the sum of F3 and F4 relative to the sum of F1 to F4 (total TPH). For Type A contaminated soil, the sum of F3 plus F4 must be greater than 70% of the total TPH concentration and the F2 concentration must be less than the F4 concentration. Residual PHC contaminated was investigated in three separate locations: one of the PCL Dump drainage pathways, the North Slope Dump Drainage and the Beach Fuel Tanks.

All soils with PCB concentrations of 50 ppm or higher are classified as PCB Waste under CEPA (CEPA 1999). Their handling and disposal are governed by these regulations, which include a requirement for off-site disposal at a licensed facility. All soil with metal or PCB concentrations exceeding the DCC (but with PCB concentrations below CEPA) will be either disposed of off–site or encapsulated on site.

The options for addressing contaminated soils that exceed the Site-Specific Criteria but do not fall under the jurisdiction of CEPA (not PCBs) will be evaluated using the AMSRP (INAC 2009). Where multiple contaminants are present in the soils (co-contaminated), the most conservative remedial option that addresses both contaminant types will be applied.

3.2 PCB Barriers

During remediation, it was recognized that some of the PCB contaminated soil was trapped in fractured bedrock or located on very steep terrain that could not be accessed for logistical or safety reasons and therefore, complete excavation of PCB contaminated soils did not occur. The soil remaining after excavation was loose and subject to erosion, particularly during spring runoff or during a summer storm. In order to control PCB migration, it was decided that permanent barrier systems were required as a long term solution. ASU was contracted to conduct the necessary research, design, and development of barrier systems to be used on Resolution Island. Three barriers were subsequently installed: the Furniture Dump, S1/S4 Valley, and S1/S4 Beach barriers.

The implemented PCB barrier systems generally consist of a lined funnel formed by rock gabions (or natural formations) and a permeable reactive barrier (PRB) gate containing filters of various sizes. Coarse sediment is trapped in the funnel, while finer material is collected by the filters in the PRB. The S1/S4 Valley barrier system also includes Curlex^{TM} traps upgradient of the PCB barrier, consisting of geosynthetic material wrapped around steel/wood frames. The Curlex^{TM} traps were designed to limit sediment movement and promote revegetation in the S1/S4 drainage pathway. The long term monitoring plan for the site includes the monitoring of each of the PCB barriers, consisting of the inspection of each barrier and repair, if necessary. Sediment collected by the barriers is to be excavated and/or used filters that need to be replaced are to be removed and placed into plastic drums. Sub samples from the collected sediment are obtained and submitted to a laboratory for PCB analysis. Soil samples are to be collected from the clean cells, which were established beyond the barriers. Monitoring of the barriers commenced in 2006 and has been completed on a yearly basis since that time, with the exception of 2012, due to logistical (weather) problems.

The 2012 Remediation Information Review and Risk Evaluation (AECOM, 2013) identified the need for a long term plan for managing residual PCB impacts at the PCB barrier areas. ASU was tasked with delineating contaminated soil at the PCB barriers and developing a barrier decommissioning plan. AECOM's scope of work for the PCB Barriers included completing a topographic survey of the source areas, migration pathways, and barrier locations.

To confirm that all necessary information would be gathered to translate the decommissioning plan into a design, it was intended that there be some cross-over of time on-site between ASU staff and the AECOM Maintenance Assessment team. Due to logistical issues during the 2013 field program, the cross-over took place in the form of a meeting between the Maintenance Assessment team and an ASU representative in Iqaluit, NU.

3.2.1 Furniture Dump PCB Barrier

The Furniture Dump originally contained old office furniture, metal cabinets, piping, barrels, wooden debris and electrical components. The Furniture Dump and its drainage pathway were excavated in 1999, which included the removal of transformers containing PCBs and the removal of all soil with PCB concentrations exceeding 1 ppm from the dump and its drainage pathway. Large areas of exposed boulders were washed and vacuumed using an industrial vacuum truck. PCB impacted materials and soil were removed from the site and disposed at an appropriate licensed disposal facility.

Although a large excavation was opened beneath the Furniture Dump, some PCBs were inaccessible. To control PCB contamination, an experimental wooden barrier was designed and constructed in 2003. In 2005, this barrier was replaced by one constructed of stainless steel. The detailed construction of the Furniture Dump Barrier is documented in the select photographs included in Appendix C.2.

In 2011, the drainage pathway from the excavated Furniture Dump to the Furniture Dump Barrier was further investigated and delineated. ASU estimated that 5 to 10 cubic metres (m^3) of soil contaminated with PCBs at the CEPA level remained in the drainage pathway. The CEPA-level PCB contaminated soil trapped at the Furniture Dump indicates that there is a significant source area remaining. The inability to effectively capture or contain the source is considered the highest risk remaining at the site, requiring the continued regular monitoring and maintenance of the barriers, and the need for a PCB storage facility at the site.

ASU has proposed that the Furniture Dump drainage pathway be excavated, the existing barrier be rebuilt, and a new barrier close to the original source be built to mitigate further movement of any remaining contamination. To assist with specifying additional maintenance work, ASU’s scope of work for the Furniture Dump Barrier during the 2013 field season included the following:

- Sampling and analysis of sediment trapped in the barrier and at the water and soil monitoring points
- Sampling and analysis of additional samples of the liner system to determine the extent and concentration of PCBs in the liners
- Analysis of samples collected from the geosynthetic clay liner (GCL) for mass and swell index to determine the appropriate design modifications for the new furniture dump barrier
- Measuring and assessing the drainage pathway to determine requirements for the two new barriers
- Providing implementation plans for installing the barriers to AANDC

A topographic survey of the Furniture Dump source areas, migration pathways, and barrier location was completed by the Maintenance Assessment team surveyor. The topographic information, combined with ASU’s delineation of residual contaminated soil and implementation plan will be used to develop a remediation design for the Furniture Dump, its drainage pathway, and the new PCB barrier.

3.2.2 S1/S4 Valley PCB Barrier

Two barrier systems intercept the drainage pathway that extended from the summit of the site and ultimately drained into the ocean. The S1/S4 Valley Barrier is near the top of the cliff and the S1/S4 Beach Barrier is close to the ocean. PCBs remain in fractures in the bedrock and small isolated pockets of soil above the S1/S4 Valley Barrier where the terrain was too steep to safely excavate soil in the area. To control PCB contamination in this drainage pathway, a barrier was designed and constructed. The current condition of the S1/S4 Valley Barrier is documented in select photographs included in Appendix C.2.

Based on the annual monitoring between 2006 and 2011, it appears that the PCB source at the S1/S4 area is substantially depleted and there is significantly less potential for ongoing migration. As such, the risk associated with this area is low.

Given the significant revegetation of the valley and the concentration and volume of sediment in the S1/S4 Valley barrier, ASU has proposed that the gate portion of the barrier be simplified and all liners removed, minimizing monitoring and maintenance requirements in the S1/S4 valley. ASU's scope of work for the S1/S4 Valley Barrier during the 2013 field season included the following:

- Sampling and analysis of the PCB content of the liners in the S1/S4 Valley Barrier, which will also be used to predict the levels of PCB contamination in the S1/S4 Beach Barrier liner system
- Inspecting and monitoring of the barrier
- Sampling and analysis of sediment trapped in the barrier and sampling and analysis of water and soil at monitoring points
- Monitoring and inspection of the Curlex^{TM} traps set up in the valley and inspection of the vegetation in the valley
- Sampling and analysis of the liner system at the barrier to determine the extent and concentration of PCBs in the liners
- Analysis of samples collected from the GCL of the Valley barrier for mass and swell index in order to further assess the stability of the liners
- Provide implementation plans for the barrier removal or reconstruction to AANDC

A topographic survey of the S1/S4 Valley source areas, migration pathways, and barrier location was completed by the Maintenance Assessment team surveyor. The topographic information, combined with ASU's delineation of residual contaminated soil and implementation plan, will be used to develop a remediation design for the S1/S4 Valley drainage pathway and PCB barrier.

3.2.3 S1/S4 Beach PCB Barrier

As mentioned in the previous subsection, the S1/S4 Beach Barrier is located adjacent to the ocean. The S1/S4 Valley drainage pathway flows down the S1/S4 Valley and over a steep cliff to the S1/S4 Beach. CEPA contaminated soils that could not be excavated during the site remediation remain at the end of the S1/S4 Valley, and on the initial steep slopes of the cliff at the S1/S4 Beach. To control PCB contamination of the marine environment, a barrier was designed and constructed.

Based on the annual monitoring between 2006 and 2011, similar to the S1/S4 Valley, it appears that the PCB source at the S1/S4 area is substantially depleted and there is significantly less potential for ongoing migration. As such, the risk associated with this area is low.

ASU has proposed that the S1/S4 Beach Barrier remain in place, following the excavation of contaminated sediments and replacement of used filters. If the barrier is to be decommissioned in the future, the area needs to be delineated to determine current PCB concentrations of the soils and the movement of the CEPA contaminated soils need to be assessed. Results of past soil sampling programs suggest that PCB contaminated soils are migrating towards the beach area via surface runoff following freshet and precipitation events. ASU's scope of work for the S1/S4 Beach Barrier during the 2013 field season included the following:

- Inspecting and monitoring the barrier
- Sampling and analysis of sediment trapped in the barriers and sampling and analysis of water and soil at the barrier monitoring points
- Sampling and analysis of soil and comparison to earlier maps to determine if the CEPA contaminated soils are migrating
- Assessing the high-density polyethylene (HDPE) liner from the Beach Barrier to estimate PCB uptake by the beach permeable reactive barrier (PRB)
- Providing implementation plans for the barrier decommissioning to AANDC

Due to logistical constraints, the Maintenance Assessment team did not investigate the S1/S4 Beach Barrier in 2013. Consequently, no photographs or survey information was collected by AECOM in this area. ASU's delineation of residual contaminated soil and implementation plan will be used to develop a remediation design for the S1/S4 Beach drainage pathway and PCB barrier.

3.3 PCL Dump Drainage

3.3.1 General Description

The PCL Dump was excavated to bedrock in 2005, removing the Tier I and Tier II PCB soil within the extents of the dump. The drainage pathway from the dump was a long, narrow, fairly well-defined drainage course, which contained a thin, intermittent layer of Tier I PCB contaminated soil. Since the source of the contamination had been removed, it was proposed that only the soil in the drainage course where there is significant depth, and areas where it can readily be excavated and loaded directly into a truck, should be removed. The excavation was therefore terminated 20 m from the edge of the cliff, although Tier I contamination is expected to continue over the remaining 20 m. Since the Tier I contaminated soils were never excavated or regraded, it is likely that this contamination still exists down the face of the cliff.

AECOM's scope of work for the PCL Dump Drainage for the 2013 assessment included the following actions:

- Document the full extent of the remaining impacts in terms of lateral extent, volume of soil, and contaminant mass
- If necessary, assess the potential for excavation by hand or covering with fill

3.3.2 Results of Assessment

The soil in the PCL Dump drainage pathway consists mainly of a thin layer of soil overlaying bedrock. The drainage pathway is approximately 90 m long and 2 m wide. In the few pockets of soil that exist, soil is an average depth of approximately 10 cm. In the largest pocket of soil in this area, the soil reaches an approximate depth of 40 to 50 cm. Assuming a soil depth of 10 cm along the length of the channel, it is estimated that the drainage channel contains approximately 9 m^3 of soil. This is likely a conservative estimate given that the channel has been excavated to bedrock in most areas.

Soil samples were collected in four distinct drainage pathways leading from the PCL Dump to assess for potential contamination. This included the previously excavated drainage pathway where Tier I contaminated soils were suspected to exist, as well as three unexcavated drainage pathways. Eight samples were collected to assess the soil conditions in the three unexcavated drainage pathways. In the previously excavated drainage pathway, five samples were collected at approximately 30 m intervals from the toe of the PCL Dump to near the cliff edge.

All samples from the PCL Dump drainage pathways were analyzed for PCBs. Although no PHC staining or odours were noted during the investigation, there was a hydrocarbon boom present at the toe of the PCL Dump near the north-most drainage pathways; therefore, samples in this drainage pathway were also analyzed for PHCs. The results of the investigation did not identify any impacts above criteria for either PCBs or PHCs. PHC concentrations were elevated, but below the site specific criteria. Analytical results for these samples are presented in Table B.1 in Appendix B. Sample locations at the PCL Dump Drainage are shown in Figure 5 in Appendix A.

3.3.3 Recommendations

Based on the sample results of the 2013 Maintenance Assessment, no additional contaminated soil was identified at the PCL Dump drainage. No further work is recommended for this location. The Tier I PCB concentrations that were suspected to remain in the previously excavated drainage pathway were not encountered.

3.4 North Slope Dump Drainage

3.4.1 General Description

During remediation, a small area of Tier II copper contaminated soil was found and excavated at the North Slope Dump. Tier I PCB contaminated soils were also found at the North Slope Dump. No regrading was done to cover the Tier I contaminated soil, so it is likely that this contamination remains at the surface. In addition to Tier II and Tier I contamination detected, it was identified in early assessment reports that there are widespread PHC impacts (based on visual and olfactory evidence) downgradient of the dump. The extent of PHC impact was never assessed and may pose an ongoing risk, in particular since PHCs will increase the mobility of PCBs.

AECOM’s scope of work for the North Slope Dump Drainage for the 2013 assessment included the following actions:

- Document the full extent of the remaining Tier I impacts in terms of lateral extent, volume of soil, and contaminant mass
- Assess PHC impacts, particularly related to ongoing PCB mobilization

3.4.2 Results of Assessment

Soil downgradient of the North Slope Dump consists mainly of a thin layer of soil on bedrock. The soil in this area is composed of two main areas. The area closest to the toe of the dump is approximately 1,600 m^2 and has an approximate soil depth of 10 cm, resulting in a soil volume of approximately 1,600 m^3. This area is mostly covered by small pieces of wood debris (see Photo No. 25 in Appendix C.5). The second area is approximately 32 m^2 and has an approximate soil depth of 50 cm, resulting in a soil volume of approximately 16 m^3.

Five soil samples were taken downgradient of the North Slope Dump, in the suspected area of residual contamination. The samples were analyzed for the DCC suite of metals, PCBs, and PHCs. The results of the metals analysis identified two exceedances: samples 13-258 and 13-259 exceeded the DCLU Tier II criterion of 100 milligrams per kilogram (mg/kg) for copper, with concentrations of 130 ppm and 120 ppm, respectively. The copper concentration in sample 13-257, which was obtained between the two exceeding samples at the same depth (0 to 10 cm), was within guidelines. The copper impact at these two locations appears to be localized. The PCB results were below the applicable criteria at all sample locations. PHC results indicated that there were elevated PHC concentrations downgradient of the North Slope Dump; however, all sample results were below the Site-Specific Criteria. Analytical results for these samples are presented in Table B.1 in Appendix B. Sample locations at the North Slope Dump Drainage are shown in Figure 5 in Appendix A.

3.4.3 Recommendations

Additional delineation of the Tier II copper contamination at the North Slope Dump is recommended in order to quantify the volume of Tier II soil. Additional delineation in the vicinity of samples 13-258 and 13-259 will be required during future maintenance activities.

3.5 Beach Fuel Storage Facility

3.5.1 General Description

The AANDC Beach Fuel Storage Facility consists of eight above ground, horizontal steel tanks that were installed in 1998. The capacity of each tank is 32,000 litres (L), resulting in a total fuel system capacity of 256,000 L. The tanks are supported by a metal skid on the ground and all associated piping is above ground. The fuel storage system has not been in service since 2008. Originally, the AANDC Beach Fuel Storage Facility was tied into the adjacent NWS fuel system, providing fuel to a nearby helicopter pad. NWS separated the two fuel systems in 2010/2011. The volume of fuel remaining in these tanks was not investigated during the 2013 Maintenance Assessment, but previous reports indicate an approximate volume of 30,000 L of fuel remaining in the system.

ESG completed a Phase II Environmental Site Assessment for the North Warning System Office (NWSO) in 2009. Type B PHC contamination was detected near the AANDC Fuel Storage Facility at one sample location (09-29704) with a concentration of 17,000 ppm. ESG also noted staining on the ground in this area, which they attributed to a recent spill during maintenance of the line. Type B PHCs were detected below criteria at sample location 09-29702, near the tanks. The sample locations analyzed by ESG in 2009 were revisited during the 2013 Maintenance Assessment.

AECOM's scope of work for the Beach Fuel Storage Facility for the 2013 assessment included the following actions:

- Investigate previous sample locations and collect samples at the same locations as necessary
- Document any visual/olfactory evidence of PHC contamination or absence thereof

3.5.2 Results of Assessment

As noted during the 2012 fuel system inspection, there were no signs of leaks along the piping or pipe manifold. All valves were verified as closed. However, there were no tags present that indicated that the system is not in service and the valves are locked (i.e. tagged out). The connection to the delivery and distribution piping network has been disconnected and the piping capped off. No indication of any active or previous leaks along the piping course or at any of the connections was noted. Visual inspection of the tank perimeter and interstitial space noted no indications of active or previous leaks.

Sample 13-262 was collected at the same location as ESG sample 09-29704, within the upper 30 cm of soil. PHC odours were observed from the soil during sample collection. Analytical results for sample 13-262 indicated a Type B PHC concentration of approximately 5,730 mg/kg. Although this exceeds the standard DLCU criterion of 2,500 mg/kg, it remains below the Site-Specific PHC criterion of 8,000 mg/kg.

Sample 13-263 was collected at what was assumed to be the same location as ESG sample 09-29702. No observations of odour or staining were made, and analytical results for sample 13-263 indicated a Type B PHC concentration of approximately 110 mg/kg, significantly below the applicable criteria.

3.5.3 Recommendations

PHC impacts are present in this area; however, the limited sampling completed during the Maintenance Assessment did not identify contaminant concentrations exceeding the Site-Specific Criteria. It is recommended that the tanks should not be used in the future and should be decommissioned, then removed during future maintenance activities. If possible, the tanks should be taken off DND property prior to decommissioning in order to limit the time spent within the DND-owned parcel. At this time, it is recommended that a larger scale investigation and delineation of potential PHC contamination be completed, including the collection of depth samples (>0.5 m) in the vicinity of the fuel tanks.

4. Assessment of Existing Dumps and Landfills

The following are the existing on-site landfills:

- Camp Landfill
- PCL Dump
- North Slope Dump
- SRR Construction Landfill
- Tier II Disposal Facility
- Maintenance Dump
- Airstrip Landfill
- Beach Landfill

The goal of the 2013 Maintenance Assessment, with respect to the existing dumps and landfills, was to collect sufficient information to prepare proper record drawings for all remaining dumps and landfills at the site. This required a geophysical survey to identify the buried debris limits and a topographic survey to document these limits. The survey also included identification of monitoring locations.

The Tier II Disposal Facility is an engineered landfill for which complete as-built records exist. No additional work was completed for this location as part of this assessment and it is therefore not included in this Maintenance Assessment report.

Of the landfills noted above, five are included in the long term monitoring program: the Camp Landfill, Tier II Disposal Facility, Maintenance Dump, Airstrip Landfill and Beach Landfill. For these landfills, the Maintenance Assessment sampling focused on addressing areas of previously identified contamination. Samples from additional locations were collected, but a landfill assessment program, including a geotechnical stability evaluation and environmental investigation, was not undertaken for landfills that are currently being monitored under the long term monitoring program. A landfill assessment including a geotechnical stability evaluation and limited environmental investigation was performed for landfills that are not currently part of the long term monitoring program, including the PCL Dump and the North Slope Dump. A visual assessment was performed for the SRR Construction Landfill.

A description of each landfill and a summary of the assessment results are provided in the following sections. Details of the geotechnical assessment of each landfill are provided in Table 5, at the end of Section 4. Figures in Appendix A outline the estimated boundaries of each landfill according to a combination of historical records, geophysical survey and visual observations. Each area of soil contaminated in excess of site criteria is identified by coloring the sample number with which the contamination type is associated.

4.1 Methodology

Upon arrival on site, each of the potential buried debris locations was ground-truthed to confirm that geophysical surveys were required, and if so, the geophysical survey boundaries were laid out on the ground with pin flags. The geophysical survey was completed using a GSM-19 Overhauser Effect Gradiometer with integrated GPS. The total field and vertical magnetic gradient survey data were collected at 0.5 second intervals as the operator walked over areas suspected of containing buried metallic debris. The magnetic survey data was used to identify the size and configuration of the buried debris. The magnetic anomaly perimeters were also laid out in the field with pin-flags to identify the buried debris lobes at an existing dump area prior to the commencement of the intrusive investigations. Each anomaly perimeter was modified as required in areas where metallic surface debris was situated within the surveyed area. It should be noted that the equipment was calibrated to detect magnetic anomalies only.

For the existing site dumps or landfills for which long term monitoring locations did not exist (Camp and Beach Landfills) or where the long term monitoring locations needed to be modified (Maintenance Dump), soil samples were collected up and downgradient of the anomalies to investigate the buried debris location as a potential contaminant source. Downgradient concentrations of naturally occurring inorganic elements (inorganics), were compared with upgradient concentrations, as well as average concentrations for all buried debris assessment samples at the site, to identify potential contaminant migration away from the lobes. The INAC AMSRP defines “concentrations elevated with respect to background”, as concentrations in excess of three times the mean background concentration. Therefore, where a downgradient concentration was three times the concentration of the background, it was flagged as potential evidence of contaminant migration and required further investigation in terms of its location, whether there was continued evidence of contaminant migration further downgradient, and whether there were multiple elevated contaminants. Unless there was an upgradient source (whose inputs would be captured by the upgradient sample), any anthropogenic contaminants (originating from human activity) detected in downgradient samples, was considered evidence of contaminant migration.

Where potential residual contamination was suspected based on the 2013 Information Review and Risk Evaluation (PCL Dump, North Slope Dump, Airstrip Landfill), samples were collected to identify and delineate contamination. To help in establishing the environmental risk a particular buried debris area poses, information regarding downgradient aquatic and terrestrial habitat was noted, as well as physical characteristics that affect the potential for contaminant migration. The geotechnical stability of the buried debris location was also assessed, as was evidence of, or potential for, erosion or slope failure at each location. A topographic survey was completed at each landfill.

Sample locations are identified on the figures in Appendix A and a landfill assessment summary is provided in Table 5. The analytical results are summarized in Appendix B and laboratory certificates of analysis are included in Appendix E.

4.2 Camp Landfill

4.2.1 General Description

The Camp Landfill is located at the station area, south of the existing SRR facility. There is good access to the Camp Landfill using the existing access roads in the vicinity of the station area. The Camp Landfill was constructed in 1998 to contain building demolition debris, empty barrels and other debris from around the site. In previous reports, the Camp Landfill has been described as having two distinct lobes: the West Camp Landfill and the East Camp Landfill. Long term monitoring of the Camp Landfill consists of visual inspection and stability evaluation.

Similar to all existing dumps and landfills at the site, with the exception of the Tier II Soil Disposal Facility, there are no compiled as-built drawings for the Camp Landfill. There are no clear records of the full scope of remedial work completed at the Camp Landfill; there are no as-built or record drawings identifying the exact location and lateral extent of the landfill, what work was completed, and the conditions that were left at the close of remediation. This is particularly problematic for the asbestos waste placement location at this landfill, which is known to have been constructed in 1998.

The constructed non-hazardous waste Camp Landfill appears to have been tied into existing bedrock outcrops for containment. However, based on photos during waste placement, the landfill does not appear to be “engineered”. As-built descriptions for the asbestos cell of the Camp Landfill note that containment berms were placed, however a photo of the berm during construction suggests that the granular fill was simply dumped between bedrock outcrops and not placed in lifts or compacted. There was no mention of the placement of containment berms elsewhere for this landfill, and information about the final cap placement indicated that there was no specific compaction effort; the granular material was considered sufficiently compacted by overlying traffic. Much of the debris appears to have been shredded prior to placement in the landfill, with the exception of large metal materials such as pipes or pieces of dismantled fuel tanks. Based on a review of demolition waste placed in the Camp Landfill and the apparent lack of compacted perimeter berms, there is a risk for contaminant migration from this facility.

The 2012 visual inspection of the Camp Landfill identified a large area of settlement and debris exposure near the west end. The area had multiple sinkholes, with the result that the overall cap in the area appeared to be collapsing. Large debris pieces and large voids were visible at the surface. The west end also appeared to be a seep for lateral subsurface water flow. Based on these factors, the sinkholes are expected to worsen and expose more debris, further compromising the landfill integrity.

AECOM's scope of work for the Camp Landfill for the 2013 assessment included the following actions:

- Complete a geophysical and topographic survey of the area
- Following the geophysical survey, collect soil samples upgradient and downgradient of the landfill to assess the potential for contaminant migration
- Complete an engineering assessment to identify the need for additional waste and fill compaction, surface capping, and positive drainage development to improve the performance of the deteriorating cap at the Camp Landfill

4.2.2 Results of Landfill Assessment

According to the limited as-built information available, the Camp Landfill can be divided into west and east portions. As shown in Appendix H, the geophysical survey of this area indicated an inconsistent buried debris mass, with the area in the centre showing no signs of buried metal debris. This suggests that the assumed landfill extents are relatively accurate. The infrastructure present on the northeastern side of the landfill, including the Cold Store Warehouse (S16) and the Camp Fuel Tank could have contributed to the anomalies noted in this area. At the time of the Maintenance Assessment, DND had several large crates stored on the landfill surface, which were assumed to be related to SRR upgrades. The crates contained metallic materials, and therefore resulted in a false positive geophysical reading in the centre-southwest area of the landfill. Mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey.

Following the geophysical survey, soil samples were collected. As shown in Figure 5, one upgradient (13-202) and four downgradient soil samples (13-200, 13-201, 13-203 and 13-204) were collected to assess the potential for contaminant migration from the Camp Landfill. The samples were analyzed for the DCC suite of metals and PCBs. No PHC staining or odours were noted during the investigation and there was no reason to suspect PHC impacts in the sampling program. The analytical results of the investigation did not identify any impacts or exceedances above criteria for metals that were analyzed or PCBs. The concentrations of metals and PCBs in all of the downgradient samples collected from the toe of the Camp Landfill were less than three times the background values, with the exception of samples 13-201, 13-203, and 13-204. The total PCB concentration of 0.75 mg/kg in sample 13-201 is greater than three times the upgradient concentration of 0.18 mg/kg. The zinc concentration of 200 mg/kg in sample 13-203 is greater than three times the upgradient concentration of 48 mg/kg. The cadmium concentration of 1.50 mg/kg in sample 13-204 is greater than three times the upgradient concentration. These slightly elevated concentrations could indicate contaminant migration; however, additional monitoring events would be required to confirm stable trends over a period of time. Visible iron oxide staining was present in this area, but appeared to be the result of natural mineral oxidation at the seep. Analytical results for these samples are presented in Table B.1 in Appendix B.

The condition of the Camp Landfill itself was consistent with the conditions noted in the 2012 Landfill Monitoring Report (AECOM, 2013). A consistent issue has been the topographic lows between the landfill edge and adjacent bedrock, which have resulted in seepage and ponding of water. The surface is uneven resulting in localized settlement, ephemeral water ponding, and minor erosion; however, most of the noted features are not significantly affecting the landfill performance, with the exception of the large area of settlement and debris exposure near the west end. Large debris pieces and large voids were visible at the surface. The area also appears to be a discharge point for lateral subsurface water flow. Based on these factors, it was previously determined that the sinkholes are likely to worsen and expose more debris, further compromising the landfill integrity. The overall landfill performance was classified in 2012 as marginal, and this classification is consistent with 2013 observations.

4.2.3 Recommendations

Consistent with the 2012 Monitoring Report (AECOM, 2013), the noted features at the Camp Landfill are not significantly affecting landfill performance, with the exception of the large area of settlement near the west end. Settlement in this area is likely due to poor debris and intermediate fill compaction. Based on these factors, the sinkholes are likely to worsen and expose more debris over time, further compromising landfill integrity.

Based on the results of the geotechnical and environmental assessment, the Camp Landfill is considered to be of low risk and the remedial recommendations are to address drainage issues and place additional granular fill. If the Camp Landfill is to be extended as a Non-Hazardous Waste Landfill (NHWLF) for the construction maintenance, monitoring wells should be installed around the perimeter of this landfill to facilitate the collection, sampling, and testing of groundwater for future monitoring. The elevated concentrations of PCBs, zinc and cadmium encountered in samples 13-201 13-203 and 13-204, respectively, could suggest contaminant migration. Future monitoring of these soil locations is recommended to evaluate whether there are stable trends for these parameters.

4.3 PCL Dump

4.3.1 General Description

The PCL Dump is located at the station area, east of the Camp Landfill. There is good access to the PCL Dump using the existing access roads in the vicinity of the station area; however, access to the base of the slope will require improvement. Aside from contaminated soil remediation, it is not clear what remedial work was completed at the PCL Dump. The 1997 conceptual design notes that only the middle one of the three dump lobes was to be excavated. Subsequent reports discuss removal of debris and some excavation of buried debris, but whether this was completed at all lobes or only the middle is unknown. There was no mention of capping any remaining debris in any as-built information. Much like the Camp Landfill, the remaining conditions at this dump site needed to be recorded to identify the remaining risk associated with it, and to determine the extent of contaminated soil left downgradient.

AECOM's scope of work for the PCL Dump for the 2013 assessment included the following actions:

- Complete a geophysical survey to confirm the ongoing presence of buried debris and a topographic survey of the area
- If debris is present, assess the containment and geotechnical stability of the dump

4.3.2 Results of Landfill Assessment

The geophysical survey of this area indicated an inconsistent buried debris mass. Geophysical anomalies were identified in the north portion, including the northern slope, of the lower shelf area. The northern slope had several geophysical anomalies. Visual observations suggested that uncompacted fill had been pushed over the remaining debris, which was insufficient for a stable cover. One geophysical anomaly on the north slope was likely caused by a partially buried I-beam. Mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey.

In general, containment at the PCL Dump is unknown. There is a small seasonal drainage channel running from the access to the east, which could potentially erode the landfill and/or infiltrate to mobilize contaminants. Soil samples collected in the vicinity of the PCL Dump were to investigate the potential residual contamination in the drainage pathway, as discussed in Section 3.3. No additional samples were collected at the PCL Dump to assess potential contaminant migration or to establish long term monitoring locations.

4.3.3 Recommendations

Based on the geotechnical assessment, the PCL Dump is considered to be low risk and remedial recommendations are to remove surface debris, address drainage issues and place additional granular fill.

4.4 North Slope Dump

4.4.1 General Description

The North Slope Dump is located at the station area, north of the PCL Dump. There is good access to the North Slope Dump using the existing access roads in the vicinity of the station area; however, access to the base of the slope is difficult. Similar to the PCL Dump, the extent of remediation, aside from contaminated soil excavation completed in this area, was not known. It appears that some buried debris was left in place at this location, but there was no mention of any capping or stabilization of debris. Furthermore, in terms of contaminants, previously completed assessment of the area noted widespread PHC impacts downgradient of the dump, but the area does not appear to have been sampled for PHC contamination. As such, the potential risk associated with the remaining buried debris, as well as the Tier I soil that was left in place, has not been characterized.

AECOM’s scope of work for the North Slope Dump for the 2013 assessment included the following actions:

- Complete a geophysical and topographic survey of the area
- Inspect the remaining dump area for containment (existing cap and geotechnical stability) and for potential ongoing migration of PHCs (and possibly PCBs)

4.4.2 Results of Landfill Assessment

The geophysical survey of this area identified a geophysical anomaly in the central portion of the dump area. Low intensity anomalies were identified in the northern portion of the dump, which can likely be attributed to surficial debris in the area. Mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey.

Soil samples collected in the vicinity of the North Slope Dump were to investigate the potential residual contamination in the drainage pathway, as discussed in Section 3.4. No additional samples were collected at the North Slope Dump to assess potential contaminant migration from the landfill contents or to establish long term monitoring locations.

Differential settlement was identified in areas of the North Slope Dump. Multiple rills were also noted throughout the cover of the dump, suggesting that erosion is impacting the existing landfill cover.

4.4.3 Recommendations

While there are numerous small erosional features and areas of differential settlement at the North Slope Dump, the features are all relatively minor and are not expected to compromise the landfill integrity in the short term. Based on the results of the geotechnical assessment, the remedial recommendations for the North Slope Dump are to remove surface debris and place additional granular fill on the cover and side slopes.

4.5 SRR Construction Landfill

4.5.1 General Description

The 1994 Environmental Study of a Military Installation at Resolution Island, BAF-5, Volume 1 (ESG 1994) report noted a landfill built into the slope upgradient of a graded area at the east end of the Maintenance Area. The landfill is not present in 1987 and earlier air photos; however, it is quite clear in more recent satellite imagery. ESG (ESG 1994) notes that this location was previously referred to as the “Summit Road Dumpsite” and was used by PCL Foundation Ltd. to dispose of demolition debris during SRR construction. There is good access to the SRR Construction Landfill using the existing access roads.

Similar to other landfills on the BAF-5 site, there is the risk that hazardous waste was disposed of within the SRR Construction Landfill. During the time of clean-up and removal of hazardous waste from facilities prior to SRR construction, the 1989 Environment Canada inspection noted, in discussing the work completed by the DND contractor, that “the contractors did not realize that materials such as soil, floor coverings, and wooden floors which are contaminated with PCBs are considered as PCB materials and must be removed and properly stored,” and “some of the buildings which were demolished and burned probably contained PCBs.”

There has been no detailed monitoring or overall assessment completed at the SRR Construction Landfill. The limited information available does not indicate any presence of downgradient contamination originating from this landfill. One soil sample was collected at the toe of the SRR Construction Landfill in 1993 by ESG, but no contaminant impacts were detected. According to previous assessments, the staining and soil contamination detected further downgradient of this area pre-dates the SRR Landfill. It should be noted that while the SRR Construction Landfill appears to be either partially or wholly within the road reserve boundaries, any potential contamination migrating from the SRR Construction Landfill could affect downgradient off-reserve areas.

AECOM’s scope of work for the SRR Construction Landfill included the following actions:

- Survey the landfill to identify its position with respect to the DND reserve to identify any potential assessment requirements to be completed under the AANDC program
- Assess the landfill from a geotechnical perspective by assessing the existing cap for stability and effectiveness of containment

4.5.2 Results of Landfill Assessment

The SRR Construction Landfill is located on a slope off the north edge of the road between the Maintenance and Upper Site areas. The geophysical survey of this area indicated the presence of large magnitude anomalies relative to the anomalies at the other landfills on the site. Visual observations suggested that large cobbles and boulders had been pushed over debris at this location to form the landfill cover. The top of the slope was also capped with finer sandy gravel materials. Large metal objects buried beneath the boulder cover were evident at this location. Representative mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey.

In general, containment at the SRR Construction Landfill is unknown. The large boulders covering much of the landfill are very permeable and would allow precipitation and surface runoff to percolate through the landfill. Large debris pieces and large voids were observed visible in several locations.

The placement and relative stability of the debris and capping system is also unknown. The 2013 visual inspection of the SRR Construction Landfill identified areas of localized settlement (sinkholes) and debris exposure throughout the landfill cover. Poorly placed and exposed debris will degrade over time and result in additional settlement and debris exposures, further compromising landfill integrity. From an overall geotechnical stability perspective, the SRR Construction Landfill appeared to be performing adequately. Due to the uncertain land tenure, no soil samples were collected during the maintenance investigation.

4.5.3 Recommendations

Based on the results of the geotechnical assessment, the SRR Construction Landfill is considered to be low risk and the remedial recommendations would be to remove surface debris and place additional granular fill to stabilize the capping system. Due to the construction challenges associated with placing cover on a slope of this nature, consideration could also be given to complete or partial excavation the SRR Construction Landfill.

To fully assess the risk of this landfill, a comprehensive assessment of this landfill is recommended using the Waste Disposal Area (WDA) Evaluation Matrix from the AMSRP. Additional investigation would be required to accurately assess landfill containment from an environmental perspective. This investigation would include an overall assessment of contaminant migration from the buried material through the collection of surface and depth soil samples upgradient and downgradient of the landfill. Evidence of contaminant migration from buried material would affect the recommended remedial action for the SRR Construction Landfill. A detailed topographic survey for SRR Construction Landfill would also be required.

4.6 Maintenance Dump

4.6.1 General Description

The Maintenance Dump is located west of the existing Tier II Disposal Facility. There is good access to the Maintenance Dump using the existing access roads. Prior to remediation, the Maintenance Dump contained exposed non-hazardous debris, as well as a small drainage pathway leading from the dump that was contaminated with cobalt at concentrations exceeding Tier II levels. Remediation of the Maintenance Dump included the removal of the visual debris that formed the actual Maintenance Dump, excavation and disposal of the contaminated material from the drainage channel in the Tier II Landfill. The area was covered with clean fill and regraded to promote positive drainage. Long term monitoring of the Maintenance Dump includes groundwater sampling and analyses at the two monitoring wells, surface soil sampling and analyses at the two soil monitoring points, and a visual inspection, including an evaluation of stability.

The 2012 Landfill Monitoring Report (AECOM 2013) identified partially buried debris at the Maintenance Dump that had not been capped and was subject to instability (drainage issues and localized steep terrain). The debris was never properly capped as the overall surface was very uneven, with a steep grade in places. Runoff was visibly passing through the buried debris and discharging at the toe by the former Tier II soil area.

The Tier II excavation area has a very uneven surface with topographic lows, suggesting that either no backfilling or grading took place following excavation or that backfilled material was not compacted.

The monitoring locations were quite far removed from the actual dump location, and were apparently positioned to monitor the Tier II Disposal Facility rather than the Maintenance Dump itself. A review of soil and groundwater monitoring data for the dump suggested that there might be ongoing migration of cobalt; however, given the monitoring locations, this might be attributed to residual impacts from past migration (surrounding the former Tier II area). Despite the lack of containment and potential ongoing migration, the existing landfill condition was evaluated as a low potential environmental risk when scored according the AMSRP landfill evaluation protocol (AECOM 2013).

AECOM's scope of work for the Maintenance Dump for the 2013 assessment included the following actions:

- Complete a geophysical and topographic survey of the area
- Assess the requirements for capping of debris and drainage re-routing once the geophysical survey has identified the buried debris limits
- Collect soil samples closer to the dump to assess the potential for contaminant migration

4.6.2 Results of Landfill Assessment

The Maintenance Dump comprises two distinct lobes: East Lobe and West Lobe. The East Lobe was located adjacent to the Tier II Disposal Facility, and the West Lobe was located to the southwest of the East Lobe. The geophysical survey of the Maintenance Dump noted two relatively large magnitude anomalies, which correspond to the locations of the East Lobe and West Lobe, confirming these are buried debris areas.

One anomaly (MD-Upper) was noted immediately west of the existing Tier II Disposal Facility. The buried debris area did not seem to be well-defined by the geophysical survey; however, based on the placement of cover material observed on site and observation of partially buried debris in several locations, the limits of the East Lobe were defined. MD-Upper did not appear to extend into the flat areas to the west of the Tier II Disposal Facility.

The other anomaly (MD-Lower) was located in an area of partially buried debris, southwest of the first anomaly. The geophysical survey provided well defined limits of the buried debris in the West Lobe.

Surface debris was present at both locations, which was accounted for the interference in the geophysical survey. Identification of the extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey.

Following the geophysical survey, soil samples were collected upgradient and downgradient of the East Lobe. As shown in Figure 7, one upgradient (13-214) and three downgradient samples (13-246, 13-247 and 13-248) were collected to assess the potential for contaminant migration from the Maintenance Dump. The samples were analyzed for the DCC suite of metals and PCBs. No PHC staining or odours were noted during the investigation and there was no reason to suspect PHC impacts in the sampling program. The results of the investigation did not identify any exceedances for metals that were analyzed or PCBs. The concentrations of metal and PCBs in all of the downgradient samples collected from the toe of the Maintenance Dump were less than three times the background value, suggesting no concerns with respect to potential contaminant migration. Analytical results for these samples are presented in Table B.4 in Appendix B.

Three samples were collected downgradient of the West Lobe to investigate potential contaminant migration from this area. The samples were also analyzed for the DCC suite of metals and PCBs. No PHC staining or odours were noted during the investigation and there was no reason to suspect PHC impacts in the sampling program. The concentrations of metals and PCBs in all of the downgradient samples were less than three times the background values, with the exception of sample 13-216, with a zinc concentration of 210 mg/kg. The zinc concentration of 210 mg/kg remains well within the DCC criteria of 500 mg/kg. This concentration likely represents natural background conditions. Zinc concentrations at the long term soil monitoring locations at the Maintenance Dump have fluctuated between 74 mg/kg and 223 mg/kg since the establishment of the monitoring locations in 2005 (AECOM, 2013). Analytical results for these samples are presented in Table B.4 in Appendix B.

Observations for the 2013 Maintenance Assessment for the Maintenance Dump were consistent with the findings of the 2012 Landfill Monitoring program (AECOM 2013). The West Lobe was characterized with uneven settlement and areas of exposed buried debris, with water ponding in low-lying areas (created by settlement). Runoff was visibly passing through the buried debris and discharging at the toe near the former contaminated soil excavation. Ponded surface water was observed west of this location.

4.6.3 Recommendations

Consistent with the 2012 Monitoring Report (AECOM, 2013), there is buried debris exposed at surface and an uneven surface with steep grades in places. From a post-construction monitoring perspective, the condition of the Maintenance Dump has been rated as unacceptable since there is effectively no buried debris containment. However, based on the assessment of the dump in terms of contaminant source, migration potential and receptors, it is considered to be a low potential risk to the environment. This is primarily due to the small size of the dump and the fact that most of the exposed/surficial debris has been previously removed.

Based on the results of the geotechnical and environmental assessment, the remedial recommendations for the Maintenance Dump are to remove surface debris, create positive drainage and place additional granular fill. Armouring of the landfill toe along the northern and southern edges would help mitigate potential erosion issues. The uneven surface of the Tier II excavation area should be reshaped to facilitate positive drainage.

4.7 Airstrip Landfill

4.7.1 General Description

The Airstrip Landfill is located north of the airstrip. There is good access to the Airstrip Landfill using the existing access roads; however, access to the base of the slope will require improvement. The remediation of the Airstrip Landfill involved the excavation of PCB contaminated soil, removal of surface debris and the addition of granular fill on the surface of the landfill. Long term monitoring of the Airstrip Landfill includes groundwater sampling and analyses at the four monitoring wells, surface soil sampling and analyses at the four soil monitoring points, and a visual inspection, including an evaluation of stability.

PCB contamination in the form of Tier I, Tier II and CEPA soil has been historically identified on the landfill surface and below the surface within the dump. CEPA soil was excavated, surface debris was removed, and the remaining buried debris and contaminated soil was to be capped with 0.5 m of fill; however, the final capping was never completed and it is suspected that the area that was capped does not have the full 0.5 m thickness of cover in place. It was also suspected that the area along the landfill slope, where there had been thick surface debris during the previous assessments, was never assessed for soil contamination. As such, the limits of the contaminated soil were never delineated at the northern end of the landfill, downslope of the crest. The 2012 Information Review and Risk Assessment (AECOM, 2013) identified the possibility that PCB contaminated soil was still exposed at the surface. Leaving identified Tier II contaminated soil in place and capping is not consistent with the AMSRP. Furthermore, the 2012 visual inspection identified geotechnical instability and ineffective containment at the landfill because of the incomplete capping. An area of lush vegetation was noted along the slope and toe of the landfill. The risk scoring for the landfill in 2012 ranked the Airstrip Landfill as a low potential environmental risk.

AECOM’s scope of work for the Airstrip landfill for the 2013 assessment included the following actions:

- Complete a geophysical and topographic survey of the area
- Assess the exposed landfill surface area (including the slope) for PCB contamination at surface
- Collect additional assessment samples close to the toe, particularly in the area of lush vegetation, to assess the possibility of contaminant migration
- Assess potential upgradient drainage re-routing options around the landfill to minimize the potential for migration of contaminants from the landfill
- Assess the requirements to complete the landfill capping, and to flatten and armour the slope

4.7.2 Results of Landfill Assessment

The geophysical survey of the Airstrip Landfill suggested that there was a large amount of buried debris at this location. As shown in Figure 8, the bulk of the buried debris appeared to be in the northwest portion of the landfill. There was also an isolated anomaly located to the southeast. Relatively accurate mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey. The engineering assessment of this area identified similar features that were identified during the 2012 landfill monitoring.

Following the geophysical survey, environmental samples were collected in an evenly spaced manner close to the toe, particularly in the area of lush vegetation north of the landfill toe, to thoroughly assess whether there has been contaminant migration. Five samples (13-222 to 13-225 and 13-255) were collected in the area of lush vegetation which were analyzed for the DCC suite of metals and PCBs. Tier II exceedances for cadmium, cobalt, copper, nickel and zinc were reported for sample 13-225, collected in the upper 10 cm of soil at the northern end of the lush vegetation. A Tier II exceedance for nickel was also reported for sample 13-224, collected in the upper 10 cm of soil southwest of sample 13-225. It is likely that the elevated levels of copper, nickel and zinc can be attributed to natural sources. Tier II levels of copper and nickel have historically been encountered in soil samples taken at the Airstrip Landfill long term monitoring locations, including the post construction monitoring that took place in 2012. Analytical results for these samples are presented in Table B.5 in Appendix B

Twenty-four samples (13-218 to 13-222 and 13-226 to 13-245) were collected on the exposed landfill slope and surface to assess the exposed landfill surface for PCB contamination. All samples were analyzed for PCBs and select samples were analyzed for the DCC suite of metals. Although there were no exceedances of DCC metals in the samples analyzed, the results of the investigation identified one Tier II PCB exceedance. Sample 13-236, collected in the upper 10 cm of soil near the top of the landfill slope had a reported PCB concentration of 6.2 mg/kg. Samples in the vicinity of sample 13-236 had PCB concentrations less than the detection limit. The PCBs in soil at sample 13-236 is most likely localized. Analytical results for these samples are presented in Table B.5 in Appendix B.

4.7.3 Recommendations

Capping that was completed at the Airstrip Landfill was not very effective for prevention of debris exposure and precipitation infiltration. The cap did not cover much of the landfill, leaving the downgradient slope and toe area open, with exposed debris and no protection against infiltration of surface water.

Consistent with the 2012 Monitoring Report (AECOM, 2013), the landfill performance is rated as unacceptable because there is effectively no containment of landfill contents and the downgradient slope is too steep to be stable over the long term. However, based on an assessment in terms of contaminant source, migration potential and receptors, it is considered a low potential risk to the environment. Based on the results of the geotechnical and environmental assessment, the Airstrip Landfill is considered to be low risk and the remedial recommendations are to remove surface debris and contaminated soil and place additional granular fill.

Additional delineation of the soil contamination related to the Tier II cadmium and cobalt concentrations in sample 13-225 is recommended to confirm the volume of contaminated soil at this location. As mentioned previously, the Tier II copper, nickel and zinc concentrations detected in the 13-224 and 13-225 are considered to be naturally occurring and no further investigation is recommended. The Tier II PCB exceedance identified at sample 13-236 is considered to be isolated, and should be excavated at the next maintenance event. The contaminated soil volume was estimated by taking into the consideration of adjacent samples that reported non-detect PCB results. The contaminant plume is assumed to have reduced PCB concentrations as it radiates from the source area (sample 13-236). Assuming an impacted area of 156 m^2 and depth of 30 cm, the estimated PCB contaminated soil volume at sample 13-236 is approximately 44 m^3 of Tier I PCB contaminated soil and 2.5 m^3 of Tier II PCB contaminated soil. A testpitting program that includes the collection of soil samples closer to sample 13-236 could be undertaken prior to excavation to confirm this contaminated soil volume.

4.8 Beach Landfill

4.8.1 General Description

The Beach Landfill is located west of the beach landing area. There is good access to the Beach Landfill using the existing access roads. The Beach Landfill is a non-hazardous landfill that was constructed in 1999 to accommodate non-hazardous demolition waste associated with the Resolution Island remediation activities. Asbestos was placed at the northeast tip of the landfill, and creosote timbers were disposed of within a polyethylene lined cell at the southwest tip of the landfill. Based on the as-built drawings, the landfill was completed in 2005. Long-term monitoring of the Beach Landfill includes visual inspection and stability evaluation.

Similar to all existing dumps and landfills, with the exception of the Tier II Soil Disposal Facility, there is no compiled as-built information for the Beach Landfill. There are no clear records of the full scope of remedial work completed at the Beach Landfill; there are no proper as-built or record drawings identifying the exact location and lateral extent of the landfill, what work was completed, and the conditions that were left at the close of remediation. The exact location of the asbestos waste cell at this landfill is also not known. Based on a review of demolition waste placed in the Beach Landfill and the apparent lack of compacted perimeter berms, there could be a risk for contaminant migration from this facility.

The following actions were recommended for the Beach Landfill:

- Complete a geophysical and topographic survey of the area
- Following the geophysical survey, collect soil samples upgradient and downgradient of the landfill to assess the potential for contaminant migration

4.8.2 Results of Landfill Assessment

The constructed non-hazardous waste Beach Landfill appears to have been tied into existing bedrock outcrops for containment to some extent. However, based on photos during waste placement, the landfill does not appear to be “engineered”. There is no mention of the placement of containment berms elsewhere for this landfill, and information about the final cap placement indicated that there was no specific compaction effort; the granular was considered sufficiently compacted by overlying traffic. Much of the debris appears to have been shredded prior to placement in the landfill, with the exception of sturdier materials, which reports suggested were not always cut or compacted.

While shredding the debris minimizes the potential for voids and settling, it increases the risk for contaminant migration from any potential hazardous or contaminated materials placed within.

The geophysical survey of the Beach Landfill identified a relatively consistent anomaly extending along a northeast to southeast direction (Figure 9). One isolated anomaly was noted in the southwest portion of the Beach Landfill. The visual observation of the landfill extents is consistent with the geophysical assessment of the area. Relatively accurate mapping of the landfill extents was achieved using a combination of visual observations and ground-truthing of the geophysical survey. Access to the Beach Landfill was determined to be good in all areas. Due to insufficient time on site, the Beach Landfill was not surveyed by the Maintenance Assessment team surveyor during the 2013 assessment.

Following the geophysical survey, soil samples were collected. As shown in Figure 9, one upgradient (13-266) and three downgradient samples (13-264, 13-265, and13-267) were collected to assess the potential of contaminant migration from the Beach Landfill. Samples 13-264 and 13-265 were collected downgradient of the southwest extent of the landfill and sample 13-267 was collected in the drainage pathway downgradient of the northeast extent of the landfill. The samples were analyzed for the DCC suite of metals and PCBs. No PHC staining or odours were noted during the investigation and there was no reason to suspect PHC impacts in the sampling program. The results of the investigation did not identify any exceedances for metals that were analyzed or PCBs. The concentrations of metals and PCBs in all of the downgradient samples collected from the toe of the Beach Landfill were less than three times the background value, suggesting no concerns with respect to potential contaminant migration. Analytical results for these samples are presented in Table B.6 in Appendix B.

A cursory assessment of the landfill found conditions much the same as the 2012 assessment – settlement, surface debris, ponding, and several sinkholes were still present.

4.8.3 Recommendations

Consistent with the 2012 Monitoring Report (AECOM, 2013), the Beach Landfill was still performing reasonably well. While there are numerous erosional features, the features are all relatively minor, appear to be mostly self-armouring, and are not expected to compromise the landfill integrity. One area showed a several incidences of minor settlement features (sinkholes) which are likely due to localized poor debris compaction and lack of intermediate fill placement during construction. None of the erosional features were significant. There are multiple locations of debris exposure. The results of collected soil samples did not indicate any concerns with respect to potential contaminant migration. Based on the results of the geotechnical and environmental assessment, the Beach Landfill is considered to be low risk and the remedial recommendations are to remove surface debris and place additional granular fill.

4.9 Landfill Assessment Summary

The results of the dump assessments are summarized in Table 5. Due to the extensive environmental investigations that have taken place at the site in previous years, the environmental sampling component of the Maintenance Assessment was limited to investigating areas of potential residual contamination based on available historical information and establishing long term soil monitoring locations at select landfills.

Table 5. Landfill Assessment Summary

	Camp Landfill	PCL Dump	North Slope Dump	SRR Construction Landfill	Maintenance Dump	Airstrip Landfill	Beach Landfill
Reference Figure	Figure 5	Figure 5	Figure 5	Figure 6	Figure 7	Figure 8	Figure 9
Reference Photos	Appendix C3	Appendix C4	Appendix C5	Appendix C6	Appendix C7	Appendix C8	Appendix C9
Samples Collected	13-200 to 13-204	13-205 to 13-213, 13-249 to 13-254	13-256 to 13-261		13-214 to 13-217, 13-246 to 13-248	13-218 to 13-245, 13-255	13-264 to 13-267
Presence of Contaminants	Future monitoring required to confirm contaminant containment.	No indication of impacts in drainage area.	Staining noted in the drainage area, which was sampled (long term monitoring locations not identified); Tier II copper exceedances in two locations. Additional delineation required. Oil staining noted in the north section by the toe; past remediation activities concluded that no further action was required.	No samples collected.	No indication of impacts. Elevated zinc concentration attributed to natural sources.	Tier II PCB exceedance in one isolated location. Tier II cadmium and cobalt in one sample in area of lush vegetation require additional delineation. Tier II copper, nickel and zinc in two samples attributed to natural sources.	No indication of impacts.
Presence of Exposed Debris	Surficial debris present in west portion of landfill, mostly between landfill surface and bedrock outcrop. Sinkhole in the west portion suggests poor compaction and a capping layer of 0.4 to 0.6m of fill.	Exposed debris present in south portion. Includes wood, plastic, rope, and various metal pieces, including a barrel. In the north portion, there is exposed debris at the lower area. Minor sinkholes noted throughout.	Various debris with radius <5 m is exposed along the toe. Bedrock is exposed in multiple areas downgradient of the dump. An area of scattered debris, consisting mostly of wood noted downgradient of the dump.	Various wood and metal debris observed on landfill surface. Large debris pieces and large voids were also observed in several locations.	Exposed debris is visible on the surface and side slopes of the main lobe and the south lobe. Debris consists of non-hazardous material including wood, metal pipe, cables.; asbestos tile and asbestos-containing wallboard previously noted as exposed (during 2012 landfill monitoring activities.	Surface debris and partially buried is visible on the surface and side slopes. The debris consists of metal pipe, cans, mechanical parts and domestic debris.	Exposed debris visible throughout landfill in areas of settlement. Some barrels exposed with visible voids beneath the larger waste suggest poor compaction of waste prior to capping.
Topography			South Area: relatively flat (maximum 1:1 slopes) Central Area: steep toe (approximately 2:1 slope in some areas) North Area: higher relief, gradually getting steeper at the north end with a 1:1 slope and a 4 to 5 m drop.	Steep side slopes (ranging from approximately 1H:1V to 2H:1V) abutting the access road connecting the Upper Site with the Maintenance Area.			
Cover Material	Overall surface is uneven with many small areas of settlement and ephemeral ponding. One large area where cap has settled exposing debris and large voids.	South area: thin cover (0.2 to 0.4 m) of well-graded sand and gravel with trace cobbles and boulders. North area: well-graded sand and gravel with some cobbles and occasional boulders.	South Area: One large sinkhole.	Landfill cover consists primarily of cobbles/boulders with finer cover material placed at top of slope. See photos in Appendix C.	Uneven settlement with sinkholes and exposed debris. Cover severely inadequate.	Poorly graded cover with insufficient fines, not thick enough, and does not cover the extent of the debris.	Cover is poorly compacted with numerous sink holes and erosion rills present throughout. Slumping and cracking on slope of landfill.
Vegetative Cover	Iron oxides have precipitated in the drainage emanating from the landfill where subsurface flow is discharging at surface. A biofilm (bacterial sheen) is visible on wet areas and there is moss growing in the area.	Little or no vegetation throughout cover and most of the drainage channel.	Little or no vegetative re-establishment.	None. Existing landfill cover will not support re-vegetation.	Patches of lush vegetation noted along main seepage location. Re-establishment of cover vegetation has commenced.	Boulders cover most of the cap surface, so little vegetative re-establishment has occurred. One type of vegetation noted at the lower slope and toe.	No re-establishment of vegetation on the landfill.
Evidence of Erosion and Settlement	West - Area of settlement and sinkholes on west perimeter has marginal cover and several areas of voids. - Saturated at west drainage end - Containment is being compromised by settlement in the west end. East - Generally good performance with little change in erosional features noted in the 2012 landfill monitoring - Sinkhole noted near D11 (2012 debris feature), new in 2013	South Area: - Collects surface runoff, drainage area includes some area around camp landfill and warehouse North Area: - Minor drainage channels and rills	South Area: - One large sinkhole. Central Area: - Exposed debris in eroded zones; slope failure at the toe – in the vicinity of two drainage channels. - Multiple drainage channels noted and differential settlement noted in several areas. North Area: - Multiple rills throughout this section, as well as a washout and a slope failure.	- Little to no erosion noted in 2013. - Settlement is present in some areas likely due to un-compacted debris (void spaces) and poor cover placement.	East Lobe - Drainage coming from Tier II Disposal Facility and bedrock outcrop on north side. - Low spots noted with ponding and ephemeral ponding, which drains west through West Lobe. West Lobe - Drainage from road ditch flows to south part of lobe where there is some pooling, then drains out to road. - Many areas of uneven settlement where surface water is ponding.	- Settlement is evident around bedrock outcrop midway down slope. - Wide erosion rills present at the crest and smaller rills observed down slope. - Bulging observed along southwest corner of slope and slumping observed along north edge of the slope.	- Sink holes are present throughout landfill cover, and ponding is occurring in these topographical low points. - Both rills and more significant erosion channels were noted, but most are at least partially self-armouring

	Camp Landfill	PCL Dump	North Slope Dump	SRR Construction Landfill	Maintenance Dump	Airstrip Landfill	Beach Landfill
Recommendations	Site is identified as a potential NHWLF location; if not selected, the following maintenance work is recommended: West side: Regrade with 0.75 m of Type 2 fill, with grading towards the west and southwest areas at 2 to 4%. Armour slopes or regrade to 6:1 (H:V) to minimize erosion. Grade drainage ditch running east to west along the north side of the landfill. East side: Regrade with 0.75 m of Type 2 fill. Tie material into bedrock and armour slope.	South Area: Regrade with 0.75 m of Type 2 fill and tie into bedrock. North Area: Regrade with 0.75 m of fill and armour slopes with Type 1 material.	South and Central Areas: Regrade with 0.75 m of Type 2 fill. North Area: Remove surface debris, but do not regrade. Add riprap to drainage path for erosion protection.	Additional investigation is required to assess the potential for contaminant migration from the buried debris material.	Site is identified as a potential NHWLF location; if not selected, the following maintenance work is recommended: East Lobe: Regrade with 0.75 m of Type 2 fill. West Lobe: Regrade with 0.75 m of Type 2 fill Armouring side slopes with Type 1 is recommended.	General: Regrade with 0.75 m of Type 2 fill (particularly western and northern slopes). Armour slopes with Type 1. North Slope: Type 2 material may have to be placed in lifts from the ground.	Regrade with 0.75 m of Type 2 fill.

5. Demolition and Hazardous Waste Audit

Facilities and structures inventoried for demolition include:

- Billboard antennas
- Circular dish structures west of antennas
- Generator building
- Monitoring camp shed (beside monitoring camp S20)
- Poured concrete foundation north of Radome building
- Building S09
- Building S10
- Building RD3 (Radome Building)
- Remote Antenna Building
- Covered walkway N2
- Beach Warehouse Building B2
- Monitoring camp S20
- Building N10
- Building north of N10
- Building S17
- Breezeway between building S16 and S17
- Building S16
- Building S18

Figure 4 shows the locations of the buildings and infrastructure at the Station Area. Figure 1 shows the location of the Remote Antenna Building.

5.1 Methodology

A full waste audit was completed as part of the 2013 Maintenance Assessment at BAF-5 to identify remaining waste types and volumes from all site infrastructure and debris, with the exception of the SRR infrastructure. The waste audit was completed in a manner that separated quantities by building to allow for a flexible demolition design. The investigation noted the construction details of each building or facility to be demolished and noted any anticipated disposal requirements. In addition, samples were collected and analyzed to confirm disposal requirement. The existing facilities were inspected according to the following activities:

- Inventory existing buildings and document building dimensions, construction materials, foundation type
- Identify and estimate quantities of hazardous and non-hazardous materials located within buildings
- Confirm presence and location of total lead and leachable lead in painted materials
- Confirm presence and location of PCB contaminated flooring in the beach warehouse building
- Identify asbestos containing materials
- Identify galbestos (tar and asbestos mixture) cladding
- Inventory all fuel tanks, confirm volume of contents and classify contents
- Confirm number, size and composition of roadway culverts

5.2 Demolition Assessment Results

Paint, asbestos and concrete samples were collected for analysis to determine the materials that would be classified as hazardous. Sampling completed during previous assessments suggests that the paint at the BAF-5 site was not amended with PCBs or that there were insufficient re-painting episodes to accumulate the typical high concentrations seen on other northern military sites. Therefore, paint samples collected during the 2013 Maintenance Assessment were not submitted for PCB testing.

A total of four paint samples were collected during the site investigation for leachable lead testing. Samples were collected on materials suspected to be painted with lead paint, based on information gathered during previous site investigations and visual observations on site. The sample location, paint colour, percent paint coverage and extent of painted substrate were noted for each sample. Paint samples were collected from buildings S10, S16 (two samples) and S18. Sample S10, collected from the painted metal wall in the S10 Building, was found to exceed the TDG guidelines for leachable lead. All other samples were below the TDG guidelines for leachable lead.

A total of 15 bulk samples of suspect asbestos containing building materials were collected throughout the Site, including vinyl floor tiles, pipe insulation, ceiling tiles, sheet vinyl flooring, parging cement and roof bitumen. A total of four samples were found to contain chrysotile asbestos, as listed below:

- Drywall joint compound in Building S9
- Pipe wrap insulation in Building S16
- 9”x9” vinyl floor tile in Building N10
- 9”x9” vinyl floor tile in the Radio Hill Building

Other potential asbestos-containing materials (ACM) were visually identified.

One concrete sample was collected from the floor of the Beach Warehouse (Building B2) and was analyzed for total PCB content. The sample results did not exceed the DCC or CEPA criteria for total PCBs.

A complete summary of the paint and asbestos test results are presented in Table B5 in Appendix B.

Table 6 presents the results of the demolition assessment.

Table 6. Demolition Assessment Results

Structure	Photo Reference	Quantity	Description of Components	Hazardous Material	Building Contents (During 2013 Survey)	Non-Hazardous (Crushed) (m^3)	Hazardous (Crushed) (m^3)	Comments
Billboard Antennas	Photo P1040371, P1040374 and P1040376	2	Galbestos siding, steel structure and poured concrete foundations	None	Not accessible due to damaged stairs/ladders	398.0	0	Galbestos siding in good condition. Structures to remain on site.
Circular Dishes West of Billboard Antennas	Photo P1040382, P1040385, P1040387 and P1040390	4	Steel dish structure with rectangular truss supports and poured concrete foundations	None	No contents observed	48.2	0	Structures to remain on site.
Generator Building 14.0 m L x 4.0 m W x 2.5.0 m H	NA	1	Welded steel construction on steel foundations	None	Two diesel powered generators and associated fuel tanks. Operational and in use at time of survey	7.9	0	Foundation to be regraded according to final site grading elevations. Diesel generators and fuel tanks will have to be decommissioned prior to demolition.
Former Monitoring Camp Shed (Beside S20) 3.0 m L x 3.0 m W x 3.0 m H	Photo P1040505 and P1040506	1	Wood and aluminum clad panels with fibreglass insulation on wood foundations	None	Miscellaneous tools, construction materials and shelving	7.2	0	Foundation to be regraded according to final site grading elevations.
Foundation North of Radome Building 23.0 m L x 11.0 m W x 1.2 m H	Photo P1040498 and P1040499	1	Poured concrete foundation walls and slab	None	Foundation only no building structure present	56	0	Foundation to be regraded according to final site grading elevations.
Building S09 22.0 m L x 8.0 m W x 3.2 m H on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding	Photo P1040366, P1040311, P1040328 and P1040329	1	**Building (S09)**					Footings to be regraded according to final site grading elevations. ACM is a non-hazardous material following abatement and can be disposed of in the NHWLF.
			Foundation	Creosote timbers	Six furnaces, mattresses, furniture, washing machines, dryers, plumbing fixtures and misc. electrical panel	5.54	11.5	
			Floor/Ceiling including beams and joists	ACM drywall joint compound throughout on interior walls and ceilings. Estimated approximately 20.0 m^2. Sample S9-001A.		65.5*	0	
			Walls (interior and exterior)			25.35	0.0	
			Misc. Mechanical and Piping	AC Unit (Refrigerant)		7.4	0.4	
			Shelving and furniture	None		1.0	0.0	
			Misc. Electrical	None		0.5	0.0	
Building S10 15.0m L x 8.0m W x 3.2m H on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding	Photo P20000, P1040335, P1040348 and P1040358	1	**Building (S10)**					Footings to be regraded according to final site grading elevations. Leachate toxic yellow/beige paint on aluminum paneling interior walls.
			Foundation	None	Miscellaneous furniture, mattresses, electrical, stoves, furnace, radio, plumbing fixtures and misc. electrical panels	5.5	0.0	
			Floor/Ceiling including beams and joists	Leachable lead paint sample (S10) Yellow/beige paint exceeded 5.0 mg/L. Paint is located throughout the structure on interior walls and ceilings. Some paint was flaking from walls with visible debris on floors.		40.6	11.6	
			Walls (interior and exterior)			21.5		
			Misc. Mechanical and Piping			2.6	0.0	
			Shelving and furniture			14.3	0.0	
			Misc. Electrical			1.5	0.0	
			Tanks	None		0.5	0.0	

Structure	Photo Reference	Quantity	Description of Components	Hazardous Material	Building Contents (During 2013 Survey)	Non-Hazardous (Crushed) (m^3)	Hazardous (Crushed) (m^3)	Comments
Radome Building RD3 10.0m L x 10.0m W x 7.5m H poured concrete foundation. Structural steel framed with steel siding.	Photo P1040497, P1040487 and P1040496	1	**Radome Building RD3**					8 - 45 gallon drums with unknown contents. Structure to remain on site.
			Foundation	None	Work benches, fuel cabinet, 2 - electric heaters (possible mercury switches), rubber hose and misc. tools/equipment.	30.0	0.0	
			Floor/Ceiling including beams and joists			8.5	0.0	
			Walls (interior and exterior)			8.0	0.0	
			Structural Steel - beams, columns and stairs			3.5	0.0	
			Interior equipment - hoses, benches, cabinets			2.8	0.0	
			Electric ceiling mount heaters			0.4	0.0	
			Miscellaneous Electrical & mechanical			0.5	0.0	
			Doors and windows			0.5	0.0	
Remote Antenna Building 12.0 L x 6.0m W x 3.2m H on poured concrete foundations. Structure is post and beam construction with aluminum cladding.	Photo, P1040428, P1040436, P1040437	1	**Radio Hill Building**					Foundation to be regraded according to final site grading elevations. 909 L AST and 200 L drums empty.
			Foundation	None	2 - 45 gallon steel drums, 1 - 909 L AST, electrical panels and misc. furniture.	19.8	0.0	
			Floor/Ceiling including beams and joists	ACM 9"x9" beige/brown vinyl tile located on interior stairs and platform. Estimated approximately $4.0m^2$. Sample S-RH001A.		15.6	0.0	
			Walls (interior and exterior)			13.0	0.0	
			Misc. Electrical			0.1	0.0	
			Misc. Mechanical and ductwork			2.7	0.0	
			Misc. Interior contents - beds, chairs & furniture	None		0.4	0.0	
			Misc. Concrete slabs	None		0.2	0.0	
			Tanks and drums	None		1.0	0.0	
Covered Walkway N2 105.0 L x 2.0m W x 3.2m H on preserved wood piers and concrete footings.	Photo P1040406, P1040408 and P1040409	1	**Covered Walkway N2**					Footings to be regraded according to final site grading elevations. Structure is structurally unsafe with approximately 50% collapsed.
			Foundation	Creosote timbers	No entry due to structural issues. Appeared empty from entrance.	8.3	3.8	
			Floor/Ceiling			20.7	4.0	
			Walls (exterior)	None		70.5	0.0	
			Misc. Electrical	None		0.3	0.0	
Beach Warehouse Building B2 30.0 L x 13.0m W x 6.0m H Steel frame on slab on grade.	Photo P1040411, P1040412, and P1040418 and P1040420	1	**Beach Warehouse B2**					35 - 45 Gallon drums with PCB soils. 34 - 45 gallon drums empty.
			Foundation	None	Wood pallets, 45 gallon drums (empty and full) and overhead doors	58.5	0	
			Structural Steel - beams, columns & purlins	None		13.6	0	
			Steel siding and roofing	None		1	0	
			Doors - Overhead and man doors	None		1.6	0	
			Misc. Wood and steel	None		3.3	0	
			Misc. Electrical	None		1	0	
			Drums (Full)	45 gallon drums with PCB soils (35)		0	9	
			Drums (Empty)	Empty 45 gallon drums (34)		0		
			Insulation blankets (walls and ceiling)	None		14.9	0	
Monitoring Camp S20 16.0 L x 8.0m W x 3.5m H on poured concrete foundations. Structure is post and beam construction with aluminum cladding.	Photo P1040500, P1040503, P1040508 and P1040516	1	**Monitoring Camp S20**					Foundation to be regraded according to final site grading elevations. 909 L AST, 1000 L Plastic Tank empty.
			Foundation	None	Bunk beds, furnace and bathroom fixtures	26.4	0	
			Floor/Ceiling including beams and joists	None		27	0	
			Walls (interior and exterior)	None		18.5	0	
			Misc. Electrical	Possible PCB light ballasts		0.2	0.01	
			Misc. Mechanical, ductwork and conduit	None		5.7	0	
			Misc. Wood	None		1.5	0	
			Tanks	None		2.7	0	

Structure	Photo Reference	Quantity	Description of Components	Hazardous Material	Building Contents (During 2013 Survey)	Non-Hazardous (Crushed) (m^3)	Hazardous (Crushed) (m^3)	Comments
Building N10 9.0m L x 9.0m W x 3.5m H on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding.	Photo P1040468, P1040469, P1040471, P1040479 and P1040458	1	**Building N10**					Footings to be regraded according to final site grading elevations. ACM duct insulation requires removal prior to disposal/demolition. 2,000 L steel tank (unknown contents) and associated piping.
			Foundation	Creosote timbers	Wet type transformers (empty), plumbing fixtures, radio equipment and ducting	1.8	4.6	
			Floor/Ceiling including beams and joists	None		28.3	0	
			Walls (interior and exterior)	None		13.5	0	
			Misc. Electrical	Possible PCB residue 3 transformers		1.5	1	
			Misc. Mechanical, ductwork and conduit	ACM overhead duct insulation. Estimated approximately 5.0m^2 in poor condition. Sample SN10-001A.		0.1	0.2	
			Misc. Wood			0.1	0	
Building North of N10 9.0m L x 9.0m W x 3.5m H on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding.	Photo P1040459, P1040461 and P1040462	1	**Building North of N10**					Footings to be regraded according to final site grading elevations.
			Foundation	Creosote timbers	Radio transmitter equipment throughout. Possible mercury switches and PCB ballasts/components. It has been reported that all PCB materials were removed during remediation activities (2003-2006); however, some PCB stickers may have been erroneously left in place. All potential PCB containing equipment must be inspected prior to disposal.	1.8	4.6	
			Floor/Ceiling including beams and joists	None		28.3	0	
			Walls (interior and exterior)	None		13.5	0	
			Misc. Electrical	None		1.5	0	
			Misc. Mechanical, ductwork, conduit and cable	None		5	0	
			Misc. Wood	None		0.1	0	
			Transmitter equipment	None		10	0	
Building S17 29.0m L x 11.0m W x 4.5m on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding.	NA	1	**Building S17**					Footings to be regraded according to final site grading elevations. 10 fluorescent fixtures throughout.
			Foundation	Creosote timbers	Misc. furniture, shelving and equipment.	11.64	6.62	
			Floor/Ceiling including beams and joists	None		121	0	
			Walls (interior and exterior)	None		40.18	0	
			Misc. Electrical	Possible Ballasts (PCBs) and Bulbs (Mercury vapour)		1	0	
			Misc. Wood (Shelving/furniture)			2.6	0	
Breezeway Between S16 and S17 26.0m L x 2.5.0m W x 3.0m on preserved wood piers and concrete footings with plywood and aluminum cladding.	Photo P4000	1	**Breezeway Between S16 and S17**					Footings to be regraded according to final site grading elevations.
			Foundation	Creosote timbers	Misc. furniture, shelving and electrical panels.	1.2	2.5	
			Floor /Ceiling including beams and joists			20.8	2.1	
			Walls (interior and exterior)	None		15.5	0	
			Misc. Electrical	Ballasts (PCBs) and Bulbs (Mercury vapour)		2	0.1	
			Misc. Wood (shelves and doors)			0.5	0	
			Misc. Mechanical	None		0.2	0	
Building S16 40.0m L x 12.0m W x 3.5m on preserved wood piers and concrete footings. Structure is post and beam construction with aluminum cladding.	Photo P4000	1	**Building S16**					Footings to be regraded according to final site grading elevations. ACM pipe wrap throughout building. In good shape at time of sampling. 26 fluorescent fixtures throughout.
			Foundation	Creosote timbers	Misc. furniture, filing cabinets, tools, flooring, plumbing fixtures throughout.	13.6	13.6	
			Floor/Ceiling including beams and joists	None		105.9	0	
			Walls (interior and exterior)	Ballasts (PCBs), Bulbs (Mercury vapour)		22.1	0	
			Misc. Electrical			1.5	0	
			Misc. Mechanical, ductwork, conduit and cable	Black ACM pipe wrap. Estimated approximately 20 lineal meters. Sample S-0002A.		2.5	0.4	
			Misc. Flooring			2.1	0	
			Misc. Wood & Furniture	None		3.8	0	

Structure	Photo Reference	Quantity	Description of Components	Hazardous Material	Building Contents (During 2013 Survey)	Non-Hazardous (Crushed) (m^3)	Hazardous (Crushed) (m^3)	Comments
Building S18 **22.0m L x 19.0m W x 9m on poured concrete perimeter foundation walls and concrete slab. Structure is post and beam construction with aluminum cladding and wood trusses.**	Photo P1040401, P1040403, 1040398, 1040396 and P3000.	1	**Building S18**					Foundations to be regraded according to final site grading elevations.
			Foundation	None	42 - 45 gallon drums (reportedly containing old gasoline), two overhead doors, metal ducting, plywood shelving and misc. tools.	10.3	0	
			Floor/Ceiling including beams and joists	Blue paint non-leachate toxic (S18 Metal)		203.2	0	
			Walls (interior and exterior)			0	41.4	
			Misc. Electrical	Mercury vapour in HIDLs		2.5	0	
			Misc. Mechanical, ductwork, conduit and cable	None		3.8	0	
			Drums/barrels/tanks	None		5.2	0	
			Misc. Wood & Furniture	None		2	0	
					TOTAL (Crushed) Volume	**1,292**	**117**	**Total volumes do not include the following structures which are to remain on site: Billboard Antennas, Circular Dishes West of Billboard Antennas and Radome Building (RD3)**

5.3 Hazardous and Non-Hazardous Waste Assessment Summary

Based on the volumes of the demolition inventory, the anticipated breakdown of hazardous versus non-hazardous debris at the BAF-5 site is as follows:

- The total volume of non-hazardous waste is estimated to be 1,292 m^3 (crushed)
- The total volume of hazardous waste is estimated to be 117 m^3 (crushed)

6. Granular Borrow Assessment

To address maintenance requirements at Resolution Island, granular material will be required for maintenance of existing dumps, possible construction of a non-hazardous waste disposal facility, potential construction of a PHC impacted soil treatment facility, and potential for upgrading or repairing existing roadways and the airstrip to support the maintenance program.

6.1 Methodology

The site investigation consisted of excavating shallow testpits using hand tools (pickaxe and shovel) and/or a Kubota mini-excavator to obtain representative samples at each potential borrow location. Testpit locations are shown on the figures included in Appendix A. Soil samples were collected from select testpits for laboratory index testing. The testpit depths varied from approximately 0.6 m to 1.3 m, and were typically terminated due to frozen ground, boulder, seepage and sloughing, or the excavator reaching its limits. The testpits were backfilled with excavated soils after completion.

Photographs were taken of each excavated testpit and other features of note. Selected site photographs are provided in Appendix C.

Laboratory testing was conducted on selected soil samples to determine the moisture and gradation of soil samples submitted. The laboratory testing generally included: determination of moisture content, density, and particle size distribution (sieve and hydrometer analysis). The laboratory test results are presented in Appendix D and are also shown on testpit logs in Appendix F.

6.2 Granular Material Types and Specifications

Various granular fill material types are required for construction of landfills, remediation of existing dumps and landfills, and repair of roads and airstrip. Specifications of six granular materials (Type 1 to 6 Granular Fills) required for different site remediation applications were developed by EBA Engineering Consultants Ltd. as part of the original DEW Line Clean Up Program for DND and DCC. The granular fill types were also adopted by AANDC for their abandoned military sites and can be used for the current project. The granular fill types applicable to the maintenance requirements at BAF-5 are described in the following subsections.

6.2.1 Type 1 Granular Fill

Type 1 Granular Fill typically consists of coarse gravel or cobble size material used for erosion protection on finished slopes or within drainage courses. The gradation requirements of Type 1 Granular Fill may vary significantly depending on the material availability and specific application. Type 1 Granular Fill can be obtained from screening of oversize material from other granular materials on site. It is recommended that the Type 1 Granular Fill consist of material with a maximum size of 600 mm and a minimum average rock size (D50) of 200 mm, as defined in the Specifications for Resolution Island Cleanup Project Tier II Landfill (UMA and EBA, 2003).

6.2.2 Type 2 Granular Fill

Type 2 Granular Fill is well graded sand and gravel with a trace of fines, and is to be used for construction of landfill berms and cover and regrading requirements. Type 2 material should be within the gradation envelope presented in Table 7.

Table 7. Type 2 Granular Fill Gradation Envelope

Particle Size (mm)	% Passing
150	100
25	70 to 100
5	45 to 80
0.425	5 to 45
0.08	2 to 25

Source: Specifications for Resolution Island Cleanup Project Tier II Landfill. Prepared for Indian and Northern Affairs Canada. (UMA and EBA, 2003)

6.2.3 Type 3 Granular Fill

Type 3 Granular Fill is selected material obtained from excavations or other sources approved by the Engineer, generally consisting of pit-run, screened stone, gravel or sand in an unfrozen state and free from rocks larger than 300 mm, waste, or other deleterious material. It is generally used for general site regrading and backfilling excavations. Type 2 Granular Fill may be designated by the Engineer as a suitable alternative for other material types and may be designated by the Engineer as a suitable alternative material for Type 3 Granular Fill.

6.2.4 Type 6 Granular Fill

Type 6 Granular Fill is generally used as an intermediate cover within landfills and is obtained from excavations or other sources generally consisting of gravel or sand in an unfrozen state and free of deleterious material. The maximum particle size of the material should be less than 150 mm with less than 8% of the material, by weight, passing 0.08 mm sieve.

6.3 Borrow Area Locations

A total of 14 borrow areas were evaluated during the 2013 Maintenance Assessment, including 10 previously utilized areas and four new areas. Several of the borrow areas contained oversized material (boulders). Screening of oversize material will likely be required. The oversized material may be suitable to process Type 1 material for erosion protection of landfill surfaces. The locations of the borrow areas and testpits are shown on the Figures 2 and 3 included in Appendix A. Each of the borrow areas are described in the following sections. A summary table of the findings correlating with each borrow area is located at the end of Section 6.4. Estimated borrow volumes presented in the following subsections do not consider wasting of poor quality or otherwise unsuitable material. It is anticipated that, where possible, existing disturbed areas will be utilized before exploiting undeveloped areas to minimize environmental impacts associated with the maintenance work.

6.3.1 Existing Borrow

6.3.1.1 Upper Airstrip Borrow Area 1

Upper Airstrip Borrow Area 1 is located on the south side of the east end of the airstrip, as shown on Figure 2. The area is accessible from the airstrip access road as well as the airstrip itself. The area includes an existing, excavated area, as well as a potential extension area towards the northeast. The southwest portion of the area, closest to the access road, has been previously excavated for granular material. There are two active drainage paths through this area.

No testpitting was done in this area because the terrain was too difficult for the Kubota.

The granular material in the Upper Airstrip Borrow Area 1 generally consists of saturated sand and gravel with some silt. The remaining waste piles to the southwest could be processed for Type 1 material. The existing borrow area could be expanded where there is a significant volume of scree along the mountain face that would be suitable for Type 1 granular material. Although the majority of Type 2 material has been depleted from this area, it is likely that this borrow area could be processed and developed to produce Type 1 material.

The volume of material that can be obtained from Upper Airstrip Borrow Area 1 is likely not a significant volume of material. The volume was not estimated during the maintenance assessment and is unknown given that the area was a former borrow pit.

6.3.1.2 Upper Airstrip Borrow Area 2

Upper Airstrip Borrow Area 2 is located on the south side of the west end of the airstrip as shown on Figure 2. The area is adjacent to the airstrip and could therefore be accessible from the airstrip, if necessary. The existing borrow area (the entire area identified on Figure 2) is depleted of granular material. However, immediately south of this area, over a bedrock outcrop and along a trail, there is a potential borrow area that should be further investigated.

No testpitting was done in this area due to the time restrictions of the 2013 investigation; however, based on the surficial deposit, it is likely that there is suitable Type 2 material in the area. This area should be explored further during future maintenance activities to verify the quantity and quantify the volume of granular material that could be obtained from Upper Airstrip Borrow Area 2.

6.3.1.3 Upper Airstrip Borrow Area 3

Upper Airstrip Borrow Area 3 is located north of the airstrip, as shown on Figure 2. The area gently slopes toward the northwest. The entrance road to the airstrip borrow appears to have been re-claimed during previous remediation activities however; it may be possible to source further material from it.

One testpit (TP13-01) was excavated on the entrance road to the borrow area to characterize the subsurface material and to determine groundwater conditions. Additional testpits were not excavated in this borrow area due to mechanical difficulties with the Kubota. Subsurface stratigraphy in TP13-01 consisted mainly of gravelly sand with trace silt and some cobbles. The material was moist and the testpit was terminated at 1.0 m due to frost. No water was encountered in the testpit. No samples were obtained for further laboratory analysis.

It appears that the borrow area is excavated to bedrock in approximately 75% of the area identified on Figure 2 as the Upper Airstrip Borrow Area 3. Therefore, there is a limited area for expansion in this area (approximately 25% of the area identified on Figure 1). Where accessible, the material in the borrow area appears to be well graded sand and gravel and could provide suitable Type 2 material. However, the yield would likely be quite low following removal of oversize material and construction of access to the borrow area.

The Upper Airstrip Borrow Area 3 covers an area of approximately 28,000 m^2 and only 7,000 m^2 is expected to contain suitable granular material. Assuming an average thickness of 0.75 m of material in this area, the estimated volume of granular material available in the Upper Airstrip Borrow Area 3 is approximately 5,000 m^3.

6.3.1.4 Lower Airstrip Borrow Area 1

Lower Airstrip Borrow 1 is located west of the airstrip, as shown on Figure 2. Although a large amount of the area has been depleted, there is room to expand. Most of the northwest area has available material, but the southern area by the road is near bedrock. The area outlined on Figure 2 shows the total area, including the potential expansion. The area immediately downhill and closest to the bedrock on the north side of the area is depleted. The southwest end of the borrow area may be accessible from the road; however, the significant slope may make access with rock trucks difficult. The borrow area is on a steep slope, but it appears as though the area generally experiences only seasonal surface water flow, as there are no permanent drainage channels in the area closest to the road. Despite this, managing water in this area will be critical during freshet. Drainage ditches could be constructed to manage the water table.

Three testpits (TP13-02 to TP-13-04) were excavated in Lower Airstrip Borrow Area 1 to characterize the subsurface material and to determine groundwater conditions. Subsurface stratigraphy in the borrow area consists mainly of gravelly sand with some cobbles and trace silt and is moist to wet. One sample was obtained from TP13-04 for further laboratory analysis.

The gradation for Lower Airstrip Borrow Area 1 has 12% silt/clay, 50% sand and 38% gravel. The grain size distribution curves of the sieve analysis results and gradation limits of granular fill types are shown on Figure 1 in Appendix G.

Most of the northwest area has available material; however, the southern area near the road is near bedrock. Lower Airstrip Borrow Area 1 is therefore likely not going to generate a significant amount of fill, due to the large area that has been previously depleted. Access to the area is difficult but would be shared between Lower Airstrip Borrow Area 1 and Lower Airstrip Borrow Area 3. A switchback or a steep road could be constructed through the depleted southern portion of Lower Airstrip Borrow Area 1 or a road could be placed along bedrock through Lower Airstrip Borrow Area 5.

The identified area is approximately 9,000 m^2 in size, approximately 4,000 m^2 of which could yield suitable granular material. Assuming an average thickness of 0.75 m of material, the material that can be obtained from this area is approximately 3,000 m^3.

6.3.1.5 Lower Airstrip Borrow Area 2

Lower Airstrip Borrow Area 2 is located southwest of the airstrip, adjacent to the west side of the road between the airstrip and the radio hill access, as shown on Figure 2. The area is not well defined and appeared to be mostly depleted of suitable borrow materials. There is a small area left with expansion potential in this borrow area. Drainage in the area is poor due and there is some ponding and small streams moving through the site.

The identified area is approximately 2,000 m^2 in size, based on the visually disturbed area. This borrow area is not considered suitable for further development.

6.3.1.6 Lower Airstrip Borrow Area 3

Lower Airstrip Borrow Area 3 is a large potential borrow area located west of the airstrip, as shown on Figure 2. The terrain is generally flat, with a gentle slope towards a small lake.

Four testpits (TP13-05 to TP13-08) were excavated in Lower Airstrip Borrow Area 3 to characterize the subsurface material and determine groundwater conditions. Subsurface stratigraphy in the borrow area consists mainly of gravelly sand with some cobbles and some silt and is moist to wet. No samples were obtained from Lower Airstrip Borrow Area 3 for further laboratory analysis.

Lower Airstrip Borrow Area 3 will likely be a key borrow area during future maintenance activities at the site. Access to the area may be difficult and require significant material if access is through Lower Airstrip Borrow Area 5. A switchback or a steep road could be constructed through Lower Airstrip Borrow Area 1 or a road could be placed along bedrock through Lower Airstrip Borrow Area 5. Water management will be an important consideration in future development of this area, and trenching to direct water and lower the water table will be required. In addition, there are some areas where wet and saturated material will have to be stockpiled early to allow drainage.

The identified area is approximately 28,000 m^2 in size. Assuming 75% of the area contains available material and assuming an average thickness of 1.0 m over this area, the volume of material that can be obtained from this area is approximately 21,000 m^3.

6.3.1.7 Freshwater Lake Borrow Area 1

Freshwater Lake Borrow Area 1 is located adjacent to the road that passes the south east portion on the Freshwater Lake, as shown on Figure 3. The area is quite large and gently slopes toward the southwest. Roughly 20% of the area is bedrock outcrops and appears as though approximately 65% of the available area has been excavated previously. The outline on Figure 3 represents the area investigated during the 2013 Maintenance Assessment. However, the area can be expanded further to the east past the corner of the road.

No testpitting was done in this area, but based on the remaining stockpiles, the material in this area is well-graded sand and gravel with some cobbles and trace silt. Most of the material is in the upper areas of the borrow area and would require access constructed in order to be extracted. The existing stockpiles in this area could be used as Type 1 and potentially Type 2, if processed and sorted. This area could be explored further during future maintenance activities to more accurately estimate the volume of material available if this area is chosen to be reopened.

The screened stockpile is located near the shore of Freshwater Lake, approximately 200 m southwest of Freshwater Lake Borrow Area 1. The stockpile was also investigated during the borrow assessment. The stockpile covers an area of approximately 500 m^2 and likely contains a volume of 500 to 1,000 m^3 of granular material.

The identified area at Freshwater Lake Borrow Area 1 is approximately 36,000 m^2 in size. Assuming 35% of the area is available granular material and an average thickness of 1 m, the volume of material that can be obtained from this area is approximately 13,000 m^3. Access to the remaining material within the borrow area is difficult.

6.3.1.8 Freshwater Lake Borrow Area 2

Freshwater Lake Borrow Area 2 is located north of the Freshwater Lake and west of the existing road, as shown on Figure 3. The area slopes south towards the lake and access to the area is from near the Freshwater Lake. It appears as though approximately one third of the area has been previously excavated and may have been a former crushing area. The access roadway has been reclaimed and would require significant upgrades to facilitate access by equipment.

No testpitting was done in this area due to the Kubota being unable to access the area. Observations made during the 2013 Maintenance Assessment suggest that both Type 2 and Type 1 Granular Fill could be obtained from the Lake Borrow Area 2. Although the area may generate suitable material, the granular requirements associated with constructing access to the area would likely mitigate yield.

The identified area is approximately 17,000 m^2 in size. Assuming two-thirds of the area is available with an average thickness of 0.75 m of material; the volume material that can be obtained from this area is approximately 9,000 m^3.

6.3.1.9 Access Road Borrow Area 1 (Beach)

Access Road Borrow Area 1 (Beach) is located north of the Beach Landfill, adjacent to the west side of the road, as shown on Figure 3. The borrow area slopes south and it appears as though the area is mostly depleted, with approximately 25% borrow remaining in the upper northern areas. The remaining borrow area is mostly depleted and the material is saturated.

No testpitting was done in this area due to the Kubota being unable to access the area. It does not appear that the area will generate a significant volume of material.

The identified area is approximately 7,000 m^2 in size, of which only 25% appears to have available borrow. The volume of material that can be obtained from Access Road Borrow Area 1 (Beach) was not estimated during the maintenance assessment and is unknown given that the material in this area was saturated at the time of the assessment.

6.3.1.10 Access Road Borrow 2 (Beach)

Access Road Borrow Area 2 is located along the access road between the Freshwater Lake Borrow Areas and the Beach Borrow Areas. This borrow area was not investigated during the 2013 Maintenance Assessment due to restricted time on site. Based on a visual assessment, the low lying borrow area was mostly depleted and saturated, with several drainage paths throughout the area. Access Road Borrow 2 (Beach) did not appear ideal for future use. If required, the area should be investigated during future maintenance activities.

6.3.2 New Borrow

6.3.2.1 Freshwater Lake Borrow Area 3

Freshwater Lake Borrow Area 3 is located east of the southern portion of Freshwater Lake, as shown on Figure 3. The area slopes southwest towards the lake and is well-drained.

One testpit, TP13-15, was excavated by hand in the Lake Borrow Area 3 to characterize the subsurface material and determine groundwater conditions. Subsurface stratigraphy in TP13-15 consisted mainly of moist, well-graded gravelly sand with some cobbles and trace silt. One sample was obtained from TP13-15 for further laboratory analysis.

The gradation for Freshwater Lake Borrow Area 3 has 12% silt/clay, 52% sand and 36% gravel. The grain size distribution curves of the sieve analysis results and gradation limits of granular fill types are shown on Figure 5 in Appendix G.

The identified area is approximately 4,000 m^2 in size, 80% of which is considered usable as borrow. Assuming an average thickness of 1 m of material, the material that can be obtained from this area is approximately 3,000 m^3.

6.3.2.2 Lower Airstrip Borrow Area 4

Lower Airstrip Borrow Area 4 is a large potential borrow area located on the east side of the road connecting the airstrip to the Freshwater Lake, near the junction of the Main Road and the Radio Hill Access road, as shown on Figure 2. The terrain is generally flat, with a gentle slope towards a small lake. There are drainage ditches present that were constructed during past construction activities, but there is still a high water table upgradient of the drainage area. Wet material should be expected below the depth of the drainage ditches, so access to the area during construction could be challenging.

Three testpits (TP13-12 to TP13-14) were excavated in Lower Airstrip Borrow Area 4 to characterize the subsurface material and determine groundwater conditions. Subsurface stratigraphy consisted mainly of moist, well-graded sand and gravel with some cobbles and some silt. Samples were obtained from TP13-12 and TP13-14 for further laboratory analysis.

The gradation for Lower Airstrip Borrow Area 4 has approximately 8 to 18% silt/clay, 46 to 50% sand and 32 to 46% gravel. The grain size distribution curves of the sieve analysis results and gradation limits of granular fill types are shown on Figures 3 and 4 in Appendix G.

Development of Lower Airstrip Borrow Area 4 requires a few important considerations. If this borrow area is used for future maintenance activities, significant water management will be required. Additional trenching will be required to direct water flow to the south and to lower the groundwater table in the area, but if this is done, material from some areas near the stream that passes through the borrow area will require time to dry. This can be accomplished by stockpiling material from this area prior to placement. The lower section of the borrow area is on a steeper grade. Access to the area is most feasible from the northern portion of the road, rather than the western portion of the road. Another development consideration is the presence of oversize material, which would require screening to produce Type 1 material. The south portion of the area along the cliff is also ideal for Type 1 material.

The identified area is approximately 30,000 m^2 in size. Assuming an average thickness of 0.75 m of material over the area, the material that can be obtained from this area is approximately 22,000 m^3.

6.3.2.3 Lower Airstrip Borrow Area 5

Lower Airstrip Borrow Area 5 is a potential borrow area located between Lower Airstrip Borrow Area A and Lower Airstrip Borrow Area 3, southwest of the airstrip, as shown on Figure 2. The area has some flat portions that would require ditching and drainage control, which will be critical during construction to prevent saturation of the material and flooding of the borrow area due to the existing low spots and minor drainage pathways.

Five testpits were excavated in Lower Airstrip Borrow Area 5 to characterize the subsurface material and determine groundwater conditions. Testpits TP13-09 to TP13-11 were excavated along the west edge of the borrow area, south of Lower Airstrip Borrow Area 3. Testpits TP13-17 and TP13-18 were excavated in the eastern portion of the borrow area, closer to the road. A steep hill separates this portion of the borrow area from the road. Subsurface stratigraphy consisted mainly of sand and gravel with some silt, some cobbles and occasional boulders. The material was wet to saturated throughout the borrow area. However, the material in the vicinity of TP13-17 and TP13-18 was significantly drier and appeared to be good material. Samples were obtained from TP13-10 and TP13-17 for further laboratory analysis.

The gradation for Lower Airstrip Borrow Area 5 has approximately 12 to 13% silt/clay, 45 to 52% sand and 36 to 42% gravel. The grain size distribution curves of the sieve analysis results and gradation limits of granular fill types are shown on Figures 2 and 6 in Appendix G.

The identified area is approximately 17,000 m^2 in size. Assuming an average thickness of 0.75 m of material, the material that can be obtained from this area is approximately 13,000 m^3.

6.3.2.4 Upper Beach Borrow Area

The Upper Beach Borrow Area is a potential borrow area located on the south side of the road, near the former road to the S1/S4 Beach Area. The use of the Upper Beach Borrow Area would require maintenance of the slope of the road. There is good access to the area from the existing roadway.

One testpit (TP13-15) was excavated in the Upper Beach Borrow Area to characterize the subsurface material and determine groundwater conditions. Subsurface stratigraphy of TP13-16 consisted mainly of moist, well-graded sand and gravel with some cobbles and some silt. One sample was obtained from TP13-15 for further laboratory analysis.

The gradation for Upper Beach Borrow Area has approximately 6% silt/clay, 41% sand and 31% gravel. The grain size distribution curves of the sieve analysis results and gradation limits of granular fill types are shown on Figure 5 in Appendix G. With screening, the material is likely acceptable as Type 2 Granular Fill.

The identified area is approximately 9,000 m^2 in size. Assuming an average thickness of 1.0 m of material, the material that can be obtained from this area is approximately 9,000 m^3.

6.4 Summary of Borrow Materials

The soil types encountered in the borrow areas generally include Type 1, Type 2, Type 3 and Type 6 Granular Fill materials. The Type 1 Granular Fill in the borrow areas consists mainly of “gravel and cobbles”. The Type 2, Type 3 and Type 6 Granular Fill in the borrow areas consists of variable proportions of sand and gravel and is classified as “sand and gravel”, “gravely sand”, etc. The fines content of Type 2 Fill is variable, but should generally be within the gradation limits. A summary of granular material that can be obtained from each potential borrow area is presented in Table 8.

Table 8. Summary of Granular Material Quantities

Borrow Area	Location	Type(1)	Estimated Quantity(2) (m^3)	Evaluation of Source
Upper Airstrip Borrow Area 1	South Side of East End of Airstrip	Type 1	Quantity of material not estimated during Maintenance Assessment.	Potential source. However, not a substantial volume of material is expected.
Upper Airstrip Borrow Area 2	South Side of West End of Airstrip	Type 1, 2, 3, 6	Old borrow area depleted. Potential expansion not investigated during Maintenance Assessment.	Potential source if existing borrow area is expanded. Potential expansion is accessible through depleted borrow area.
Upper Airstrip Borrow Area 3	North of Airstrip	Type 1, 2, 3, 6	5,000	Likely insufficient yield following removal of oversize material and construction of access.
Lower Airstrip Borrow Area 1	West of Airstrip	Type 1, 2, 3, 6	3,000	Potential source. Access to the area would be difficult.
Lower Airstrip Borrow Area 2	Southwest of Airstrip		Quantity of material not estimated during Maintenance Assessment	Not considered suitable for further development.
Lower Airstrip Borrow Area 3	West of Airstrip	Type 1, 2, 3, 6	21,000	Potential source and likely a key borrow area for future construction activities. Construction of access may be difficult and require a significant volume of material.
Freshwater Lake Borrow Area 1	Southeast portion of Freshwater Lake, including stockpile	Type 1, 2, 3, 6	13,000	Potential Source, Difficult to access remaining material in borrow area.
Freshwater Lake Borrow Area 2	North of Freshwater Lake	Type 1, 2, 3, 6	9,000	Likely insufficient yield due to the volume of granular material required to construct access.
Access Road Borrow Area 1	North of Beach Landfill	Type 1, 2, 3, 6	Quantity of material not estimated during Maintenance Assessment	Likely insufficient yield due to saturation of material.
Access Road Borrow Area 2	Beach Area		Not investigated during Maintenance Assessment	Likely insufficient yield based on visual assessment. Borrow area appears mostly depleted and saturated.
Freshwater Lake Borrow Area 3	East of South End of Freshwater Lake	Type 2, 3, 6	3,000	Potential source.
Lower Airstrip Borrow Area 4	Near Junction of Main Road and Radio Hill Access Road	Type 1, 2, 3, 6	22,000	Potential source and likely a key borrow area for future construction activities. Surface water management is required.
Lower Airstrip Borrow Area 5	Southwest of Airstrip	Type 1, 2, 3, 6	13,000	Potential source.
Upper Beach Borrow Area	Near Former Road to S1/S4 Beach Area	Type 1, 2, 3, 6	9,000	Potential source.
			Total	**98,000 m^3**

Notes:

(1) *Processing/screening may be required to obtain required granular material type.*

(2) *Estimated borrow volumes are bulk volumes including all material types and do not consider wasting of poor quality or otherwise unsuitable material.*

6.5 Potential Bedrock Quarries

To meet the required granular cover quantities for any maintenance work at Resolution Island, the potential for quarrying of bedrock was examined, given the past difficulties in finding suitable overburden material during remediation. For quarrying of bedrock for use as aggregate, the rock must not be acid-generating or metal leaching and should be of sufficient hardness to allow crushing to set gravel size fractions.

6.5.1 General Description

Potential quarry locations were selected on the basis of bedrock outcrop topography and proximity to potential work areas. Bedrock samples were collected by hammering and chipping away to allow for collection of an unweathered bedrock piece. Samples were described in terms of rock type and visible mineralogy, and submitted for paste pH, acid-base accounting (ABA) and metal leaching. Paste pH measures the existing pH of the material and is an indication of whether the material is currently generating acid. Acid-base accounting measures the acid generation potential (AP), the neutralization potential (NP), and subtracts the two to calculate a net neutralizing potential (NNP). In general, a positive NNP indicates that there is low risk that the material will be acid-generating. A ratio may also be used for evaluation: if the NP:AP is 3:1, then there is low risk of acid-generation; for ratios of less than 1:1, there is a potential for acid-generation; and for ratios between 3:1 and 1:1, there is uncertainty and additional testing is usually recommended. The metal leaching procedure is a 24-hr water leach method meant to measure the overall water quality and potential for release of metals from the crushed bedrock through exposure to neutral water; the intent is to have concentrations that are below the water quality guidelines for the site.

Three samples were collected from potential quarry areas: Camp Quarry (S13-01) at the monitoring camp area at the Upper Site; Site Access Road Quarry (S13-02), along the Station Area access road; and Landfall Quarry (13-03), at a second location along the Station Area access road, near the former landfarm.

The Camp Quarry consists of a long bedrock face, approximately 100 m long and 6 m high with some debris/boulders at the bottom. The road runs along base from the Furniture Dump PCB Barrier to the S1/S4 Valley PCB Barrier, and has a large pad available for crushing and stockpiling. Sample S13-01 was gathered from the inside face of a boulder detached from the face of the Camp Quarry.

The Site Access Road Quarry is a potential quarry located approximately 100 m downhill from the Tier II Disposal Facility on the south side of the road near a cliff. The area consists of a 3 to 4 m face of rock that is approximately 304 m long. The challenges are that this would be a dangerous location for equipment and there is room to work but a crushing area would have to be a distance away. Significant fill would be required to construct an access road to the quarry.

The Landfarm Quarry consists of a large face of rock above former landfarm location. This is directly south of the existing Tier II Disposal Facility, where access to the area would be relatively good.

6.5.2 Summary of Bedrock Geochemistry

Two of the samples obtained, Quarry 1 and Quarry 2, are described as quartz plagioclase garnet gneisses. The primary minerals present in the hand-dug samples are quartz and plagioclase, with some garnet and minor biotite. Sample Quarry 3 is described as a quartz plagioclase biotite garnet gneiss. The primary mineralogy is the same as with Quarry 1 and 2, but with an increased amount of biotite visible.

The paste pH values were all neutral indicating that the material is currently not generating acid. The metal leaching values were compared to the metal discharge criteria from the Resolution Island June 2009 water licence, and to a more recent water license issued for the remediation of Durban and Padloping Islands. The metal concentrations were all well below criteria and pH was neutral.

The NNP results from the ABA analyses are all positive numbers, however, the NP:AP ratios cannot strictly be calculated. This is because of the non-detectable concentrations of sulphur (total, as sulphate, and as sulphide), resulting in a non-detect value for AP. Similarly, inorganic carbon analysis yielded non-detectable concentrations (total and as carbonate), but a very low value was measured for NP. Assuming a concentration of half the detection limit for AP, the ratios are all greater than 3. Assuming a concentration of the detection limit, the Quarry 2 sample has a ratio value less than 3 (2). The non-detect or very low concentrations from the ABA testing are consistent with the rock descriptions above and the element concentrations in the metal leaching results, as the rock is composed primarily of silicate minerals. The leach results identify low alkalinity and sulphate concentrations, with sulphate likely the form of sulphur detected in the dissolved metals analysis. Based on these combined factors, as well as the paste pH values, the sampled bedrock is considered low risk for acid-generation.

In terms of physical suitability for quarrying, quartz and plagioclase are very hard minerals that will not be very susceptible to physical or chemical weathering and will generate competent material upon crushing. Garnet is approximately the same hardness, but is expected to chemically weather more rapidly than the quartz or plagioclase. Biotite is a very soft mineral and will weather quickly in a crushed product. However, the presence of the garnet and biotite minerals is not expected to affect the overall physical suitability of the material as aggregate because of their low proportions within the overall rock matrix.

7. Assessment of Proposed Landfill Locations

It is anticipated that the future maintenance activities at the site will incorporate a NHWLF for the disposal of demolition material and debris. Therefore, one component of the 2013 Maintenance Assessment was to identify potential landfill sites. To minimize borrow quantities to construct a landfill, existing landfills and dumps were assessed for feasibility of extension and creation of a new non-hazardous waste cell. Five potential landfill locations were identified at the BAF-5 site, and are described in the following sections. The potential landfill locations are identified on Figure 2 included in Appendix A.

7.1 Methodology

During site investigation planning, potential locations for a NHWLF were identified using available aerial photos of the site. These landfill locations were investigated during the field program, noting grade, surface hydrology, and vegetation cover. The potential landfill areas were assessed on a conceptual basis for the purpose of selecting the preferred location, once the demolition and debris volumes have been defined.

Information requirements investigated during the 2013 field program considered the following issues:

- ***Size of the Area*** - The selected area should be of sufficient size based on disposal facilities constructed on similar sites. In this regard, it is anticipated that a NHWLF will require a footprint in the order of 3,500 m^2.
- ***Foundation Conditions*** - The selected area should have suitable soil, groundwater and permafrost conditions for the facility under consideration.
- ***Drainage*** - The selected area should be in a location with limited surface water run-off or where surface run-off can be redirected away from the facility.
- ***Topography*** – The site should have relatively flat topography. In some cases, a uniformly but gently sloping ground surface may be preferable to achieve adequate drainage on final covers without raising gradient berms.
- ***Setback Distances*** – The selected area should have an appropriate setback distance from water bodies.
- ***Previous Contamination*** - The selected location should avoid or minimize the possibility of previously contaminated soil or sub-surface migration of contaminants below the facility where it may be detected in post-construction monitoring.
- ***Proximity to Work Areas*** - The selected area should be in close proximity to work areas (landfill excavation, demolition, contaminated soil excavation, etc.).
- ***Site Access*** – the selected site should have good access for construction equipment.
- ***Disturbed Areas*** - Preference should generally be given to previously disturbed areas to minimize the impact on the natural environment.

A description of each site under consideration with respect to the siting issues identified above is provided in the following sections.

7.2 Design Considerations for a Non-Hazardous Waste Landfill (NHWLF)

An NHWLF could be constructed to accept non-hazardous waste that primarily includes material from the demolition of existing structures, surface debris and any debris sorted out from landfill excavations. The majority of the waste would comprise: metal, concrete, treated and untreated wood and empty (cleaned) crushed barrels. Asbestos from demolition of buildings is considered to be non-hazardous if properly packaged, and therefore can be disposed of in the NHWLF. Creosote-coated timbers (utility poles) would be wrapped in plastic prior to their disposal in the NHWLF.

The landfill should be located in an area where concentrated surface water run-on does not occur, e.g., within the confines of a natural drainage course or where its construction could impede natural drainage. Ponding water resulting from construction activities should be avoided, as this may impact the thermal stability of the ground leading to post-construction settlement.

The landfill cover and berms can be constructed using the Type 2 Granular Fill available on site. The recommended gradation for Type 2 Granular Fill is provided in Section 6.2.2. All granular fill should be placed in horizontal lifts not exceeding 250 mm and compacted to a minimum of 95 percent of Standard Proctor Dry Density (ASTM D698). The landfill footprint should be graded and any organic material removed prior to fill placement. Grading should be minimized to avoid disturbance to the permafrost. Any boulders or oversize material should be pushed aside and wasted or saved for final armouring.

The berms should be constructed with minimum exterior side slopes of 3H:1V and minimum interior slopes of 1.5H:1V, and with a minimum final top width of 2 m. Staging berm construction to achieve the design height may be desirable until waste volumes have been better established towards the end of the clean-up operation. Doing so may allow the overall height of the landfill to be reduced by incorporating the top of the berm into the final cover. Unless the environmental assessment of the debris material would suggest that the environmental impact from leachate is unacceptable, the landfill cover does not need to be designed for freeze-back, and a minimum cover thickness of 1.0 m is acceptable. Depending on the final berm height, it should not be necessary to armour the Type 2 Granular Fill with Type 1 material.

Leachate is any liquid produced when water comes into contact with the waste contained within the NHWLF. Because the waste at BAF-5 would be in a dry condition, leachate contribution from decomposing or compressing debris would be negligible. Because the waste material is primarily non-putrescible and the environment within the landfill is non-acidic, the potential for the generation of hazardous leachate would be considered very low. The design objective would be to minimize the amount of water coming into contact with the waste by minimizing infiltration. This can be achieved by careful site selection and promoting surface water run-off through compacting and properly grading the final cover. Leachate collection would not be considered necessary.

Landfill gas generation is not considered to be a significant factor in the design of the NHWLF and gas collection/venting systems would not be considered necessary. The rate of decomposition of any biodegradable waste within the landfill cell and any associated gas generation will be extremely slow, compared with landfills in the south. The potential for gas generation and associated odours would be best controlled by minimizing infiltration of water into the landfill. Any gas that is generated would dissipate through the permeable cover soils.

Settlement of the landfill surface can lead to ponding and increased infiltration. To minimize this potential, large debris should be reduced in size such that the maximum lift of debris across the landfill cell is 0.5 m. Each lift of debris should be compacted with tracked equipment to reduce void space/size. Free draining intermediate fill (Type 6 Granular Fill) should be placed to a uniform thickness of 0.15 m thick across each lift of debris and worked into the underlying debris using track mounted equipment. The intermediate fill lift should be inspected to confirm that large void spaces have been filled. Additionally, the intermediate fill should be non-frost susceptible to reduce the potential for seasonal frost-jacking of debris. The final thickness of the debris and intermediate fill layers should not exceed 3 m.

7.3 Proposed Location 1: Camp Landfill Area

This area is located immediately west of the existing Camp Landfill, as shown on Figure 2. The area is relatively flat with only seasonal or rainfall drainage and can be easily accessed using the existing road network. The use of the Camp Landfill Area as a potential landfill siting would help mitigate cap integrity issues in the western portion of the existing Camp Landfill.

Although the area is relatively flat, there is a low point within the area that is generally soft and saturated, primarily comprising washed-out silt and fine sand.

Considering the site topography, access, and proximity to work area, this location is considered suitable for a NHWLF. The footprint of a NHWLF at this site will be confined to the limits defined by the existing bedrock outcrops to the north and south.

7.4 Proposed Location 2: East Expansion to Tier II Area

This area is located east of the Tier II Disposal Facility, as shown on Figure 2. Drainage coming from the SRR currently drains to the southeast, around the existing Tier II Disposal Facility. Advantages to this Proposed Location 2 are that it can be accessed using the existing road network, and that it can tie into existing structures. To the south, the proposed landfill could tie into the access roadway embankment, and to the north, the proposed landfill could tie into the bedrock outcrop.

The area is currently poorly drained with ephemeral and permanent ponding throughout the area. In the eastern portion of the area, towards the SRR Construction Landfill, there are several low-lying areas with permanent ponding. The ground in this area is composed of well graded sand and gravel, and the surface is soft in areas of ponding. This area would have to be regraded to facilitate drainage.

Considering the site topography, access, and proximity to work area, this location is considered suitable for a NHWLF. An expansion to the east of the Tier II Disposal Facility would likely require the relocation of two of the upgradient groundwater monitoring wells. In addition, the proximity to the SRR Construction Landfill may pose a challenge for construction, depending whether future remedial actions are undertaken at this landfill and under whose jurisdiction (AANDC or DND) they fall.

7.5 Proposed Location 3: West Expansion to Tier II (and Stabilization of Maintenance Dump)

This area is located west of the Tier II Disposal Facility, in the location of the existing Maintenance Dump, as shown on Figure 2. Some advantages to the site are that the location can be accessed using the existing road network, and that bedrock outcrops to the north and west would reduce fill requirements.

Considering the site topography, access, and proximity to work area, this location is considered suitable for a NHWLF with some regrading or placement of fill. The investigated area for this landfill will be confined to the limits defined by the existing bedrock outcrops to the north and west, and the Tier II Disposal Facility to the east.

7.6 Proposed Location 4: Former Landfarm South of Tier II Disposal Facility

This area is located south of the existing Tier II Disposal Facility and Maintenance Dump, as shown on Figure 2. This area meets the size and space requirements of the proposed NHWLF. The regraded former landfarm could potentially be stockpiled and used as intermediate fill in the NHWLF.

Proposed Location 4 has no bedrock outcrop or additional earth structure into which the landfill can be incorporated, which necessitates the use of more fill than other proposed location options. This location is also situated downslope of the majority of the site, so overland site drainage would have to be directed around the landfill.

Considering the site topography, access, and proximity to work area, this location is considered suitable for a NHWLF.

7.7 Proposed Location 5: Southeast of Airstrip Landfill (or Stabilization of Existing Landfill)

Proposed Location 5 is located in the vicinity of the existing Airstrip Landfill, as shown on Figure 2. Two potential options were identified in this area. One potential location is located north of the landfill and would include stabilization of the existing Airstrip Landfill. This area was determined to have severely limiting issues due to undulating ground and various exposed boulders and bedrock.

The other potential location is located upgradient (southeast) of the Airstrip Landfill and is considered more suitable for a NHWLF (see photos in Appendix C.12). This area is relatively flat and has stable ground conditions with good drainage. The northern portion of the new NHWLF could be tied into an existing bedrock outcrop. Proposed Location 5 is close to the identified Type 2 borrow sources and its use for a NHWLF would result in the downhill haul of demolition waste materials.

7.8 Recommendations

While Proposed Locations 1, 2, 3, 4 and 5 would be acceptable for the construction of a NHWLF, the two most suitable locations would be either Proposed Location 3 (West of the Tier II) or Proposed Location 5 (Southeast of Airstrip Landfill). The chosen location would depend on the priorities and timing of future maintenance work items, since using Proposed Location 1 would affect other proposed action items, and the constructability of a landfill in the proposed location.

8. Assessment of Site Access

8.1 Airstrip Evaluation

The airstrip assessment at BAF-5 was based on visual observations conducted during the 2013 Maintenance Assessment, as no test pits were excavated and no California Bearing Ratio (CBR) testing was performed. The airstrip at BAF-5 is approximately 450 m long and 40 m wide and is presumed to have been constructed from material borrowed from an area adjacent to the Airstrip. The airstrip material appeared to consist of sand and gravel with very little fines, which results in a loose to compact surface. The airstrip drains reasonably well, with the majority of surface runoff collected in drainage ditches on the northwest and southeast sides of the airstrip. These drainage ditches drain down a slope to the southwest and into a large valley.

The airstrip was generally in good condition at the time of the 2013 site visit, but had certain features which may need to be addressed or monitored during the site maintenance work. These features are as follows:

- Rutting of the airstrip near the centre due to road crossing
- Uneven surface where water may pond
- Minor erosion features, such as channels, running across the airstrip

The aircraft used during the 2013 site investigation was a Twin Otter, operated by Kenn Borek. The Kenn Borek pilots considered the airstrip to be in fair to good condition. Pilots noted that the airstrip could use an upgrade in the centre section where rutting has taken place, which would require grading and compaction in this area. In general, most of the airstrip could use grading. During the 2013 Maintenance Assessment, laborers were instructed to pick large rocks off the airstrip to improve the smoothness of landing and takeoff. The airstrip should be inspected by aircraft crew familiar with gravel airstrips prior to use, in particular if aircraft larger than a Twin Otter are to use the airstrip. The airstrip may need to be upgraded and regularly maintained during maintenance works.

8.2 Existing Road Network

The site is connected through a number of gravel roads connecting the Station, the Airstrip, the Freshwater Lake, and the Beach Landing area. A visual inspection was conducted to evaluate the general condition of gravel roads and to assess the maintenance/upgrading required for movement of construction equipment, haul trucks, and other passenger vehicles likely to occur during the maintenance activities. Key areas were photographed during inspection, and photos of the road have been indexed and are included in C.13 of Appendix C.

Most of the roads at BAF-5 are elevated and are constructed with locally available granular material. In general, the condition of the roads ranged between very poor and good. Roads within the upper site area tended to be in better condition than the road connecting the Freshwater Lake and Beach Area. The worst road sections occurred in the vicinity of the Freshwater Lake.

The roads were assessed based on four factors that may negatively impact the serviceability of the road and are as follows:

- ***Road Width*** – The width of the road may restrict movement of vehicular or track equipment on-site depending on the size of the equipment. Narrow sections of road may need to be widened to facilitate movement of construction equipment. The roads were categorized based on the size of vehicular or tracked equipment that could safely travel along a section of road, i.e. ranging from impassable with a pick-up truck to passable with heavy construction equipment. The minimum width along narrow road sections was also recorded.

- ***Rough Road Surface and Exposed Bedrock*** – Areas with exposed bedrock or rough surfaces (cobbles, boulders) were recorded.
- ***Major Erosion Features*** – Major erosion features were noted, including: erosion gullies, erosion channels, washouts, seepage and sinkholes.
- ***Steep and High Side Slopes*** - Steep and high side slopes may restrict the ability to widen narrow road sections. In this regard, steep and high side slopes were only noted in narrow road sections where side slopes were steeper then 3H:1V and greater than 3 m in height.

Key features of the road condition assessment are included on the site figures in Appendix A. The gravel roads at the BAF-5 site have been divided in four sections (Sections 1 to 4): Upper Site to Airstrip, Airstrip to Freshwater Lake, Freshwater Lake to Beach, and Radio Hill Access Road. These road sections are described in the following subsections and summarized in Table 9.

8.2.1 Road Section 1: Upper Site to Airstrip

Road Section 1 includes the access road network in the vicinity of the Upper Site and the road that connects the Upper Site with the Airstrip. In general, the roads in this area were in good to fair condition, requiring minor repair or upgrade for use during future maintenance activities. Minor erosion features and localized areas of poor drainage were present, but could easily be addressed during future maintenance activities. The area adjacent to the Tier II Facility was not adequate for two-way traffic and may require widening during maintenance activities. The portion of road within 100 m of the airstrip was in very poor condition, with major erosion, drainage channels, and slope failure. Fill and compaction efforts would be required in this area.

8.2.2 Road Section 2: Airstrip to Freshwater Lake

Road Section 2 includes the portion of the road network that connects the Airstrip to the Freshwater Lake. This section was in good to very poor condition, and a portion of this road is considered to be impassable for construction equipment. Minor erosion features and localized areas of poor drainage were present in the section of the road between the Airstrip and Radio Hill Access. Deep erosion channels (approximately 15 to 20 cm deep) were present in the section between the Radio Hill Access and Freshwater Lake. There was a washout near the bottom of the hill where the ditch has silted up. Approximately 30 to 50 cm of fill would be required to repair this 30 m section of road, as well as the drainage ditch. There were multiple washouts at a low spot near the Freshwater Lake where water crossed the road, so a culvert may be required in this location. The most significant feature in this section of road was a washout at the base of the hill near the Freshwater Lake, where there were originally two culverts, both of which have collapsed and segmented. During the field investigation, this washout was passable by ATV but not by the Kubota excavator. Repair of this area will require the installation of two new culverts without destroying the dam that is currently preventing flow from the Freshwater Lake across the road.

8.2.3 Road Section 3: Freshwater Lake to Beach

Road Section 3 includes the portion of the road network that connects the Freshwater Lake to the Beach Area. This section was generally in fair condition, but several erosion gullies and washouts have developed that require repair. These erosion features can be repaired during construction, and it is recommended that improvement of the drainage ditches also be completed in this section of the road to protect it by redirecting surface runoff. Portions of the road may need to be widened to accommodate two-way traffic.

8.2.4 Road Section 4: Radio Hill Access Road

Road Section 4 is the access road to Radio Hill. This section of road was in good to fair condition. There was a large drainage channel present in the centre of the road, approximately 70 m upgradient of the access point of the Radio Hill Access Road from the Airstrip to Freshwater Lake road section. The road was on a relatively steep slope and enhanced safety precautions will be required during construction around the tight bends and narrow sections.

Table 9. Summary of Roadway Assessment

Road Section	Condition	Passable (Minimum Width)	Steep and High Side Slopes	Erosion Features	Rough Surface and Exposed Bedrock	Photo # (Appendix C.14)
1 – Upper Site to Airstrip	Good to Very Poor	Area near Tier II may require widening to accommodate two-way traffic.	The section of road within 100 m of the airstrip in experiencing slope failure. Fill and compaction required.	Minor erosion features and localized areas of poor drainage are present, which require repair. The section of road within 100 m of the airstrip has major erosion and drainage channels that require attention.	Exposed bedrock near centre of road in few locations.	Photo 4 to 11
2 – Airstrip to Freshwater Lake	Good to Very Poor	Currently not passable due to large washout near Freshwater Lake.	N/A	Several erosional features present and require repair: Major washouts and drainage issues make potions of the road impassable. Culverts may be required in some locations.	N/A	Photo 12 to 20
3 – Freshwater Lake to Beach	Fair	Portions road may need to be widened if two-way traffic is required during construction.	N/A	Several erosion features have developed that require repair including several erosion gullies and washouts. Adding drainage ditches would protect the road by redirecting surface runoff from the road.	N/A	Photo 21 to 24
4 – Radio Hill Access	Good to Fair	Tight bends and narrow sections will require precautions during construction.	Road is on relatively steep slope.	N/A	N/A	Photo 25 and 26

8.3 Beach Landing Area

The Beach Landing Area is on the shore of Brewer Bay where barges historically accessed the site. The area is in good condition, with little upgrading required to be used again. Photographs of the beach landing area are provided in C.13 of Appendix C.

9. Environmental Data Quality Assurance and Quality Control (QA/QC) Procedures

9.1 QA/QC Procedures and Evaluation

In order to confirm that the sampling and analytical data collected for BAF-5 was interpretable, defensible and comparable, a Quality Assurance and Quality Control (QA/QC) program was implemented for the project. QA/QC measures were taken in both the collection and analysis of the environmental sampling program. The following subsections outline the QA/QC program completed during the maintenance assessment.

9.2 Summary of AECOM QA/QC Program and Results

Quality Control (QC) measures used in the collection, preservation, shipment, and analysis of samples included the following:

- Sampling techniques were performed in accordance with standard written AECOM protocols
- Field notes were recorded during the investigation
- All samples were kept cool prior to , and during, shipment to the laboratory
- Samples were assigned unique sample control numbers and transported under chain of custody procedures
- The analytical laboratory has proficiency certification issued by the Canadian Analytical Laboratories Association (CALA) for the specific analyses conducted

Quality Assurance (QA) measures established for the investigation included collection of duplicate field samples at a rate of approximately 10%. A blind duplicate sample consists of a second aliquot of an individual sample that is submitted to the analytical laboratory under a separate label such that the analytical laboratory has no prior knowledge that it is a duplicate. Seven duplicate samples from various locations across the site were submitted to the laboratory for analysis.

The relative percent difference (RPD) between duplicate results was used to assess overall sampling precision. The RPD is a measure of the variability between two duplicate analyses and is calculated by the following equation:

$$RPD = 100 \times ((2 \times (x_1 - x_2))/(x_1 + x_2))$$

Where x_1 is the primary result and x_2 is the blind duplicate result.

Table B.10 in Appendix B compares sample analysis between the original samples and their duplicates. Acceptable RPD values vary on the analytical parameters, the sample matrix and the concentrations of analytes in the sample. For metals in soils acceptable RPD values are 35% and for organics in soils (PHCs and PCBs), the acceptable RPD values are 50%. Only when concentrations are at least 10 times the method detection limit are RPD calculations considered valid.

9.2.1 Field Duplicate Samples

During this program, one water sample and 68 soil samples were collected, of these soil samples, six were duplicates, which were completed to provide an indication of the overall sampling and analytical precision. Duplicates were obtained from locations around the site (goal was every tenth sample) and from a variety of soil depths. Since only one water sample was collected, no duplicate was obtained.

The blind field duplicates were analyzed for various parameters based on their location and expected contaminant(s) present. RPDs were calculated for all parameters analyzed in each sample. For the sets of duplicate samples submitted, the RPD values were below 35% for metals and 50% for PHCs and PCBs, so no potential issues with sampling procedures were identified.

9.2.2 Laboratory QA/QC

Maxxam Analytics (Maxxam) was the analytical laboratory for the 2013 analytical program. Maxxam ran calibration check samples, matrix spike samples, surrogate spike analysis, laboratory duplicates, and standard reference material analysis to determine analytical accuracy. The QA report for the investigation was within acceptable limits for all parameters. The QA program completed by Maxxam included duplicates, Method Blank, Method Blank Spikes and Matrix Spikes.

Laboratory duplicates are two aliquots taken from the same sample container, and processed through the entire analytical procedure separately. Measured results are used to compare the analytical precision of the entire analytical process including the sample preparation, digestion/extraction, and instrument measurement. Matrix spike duplicates are used to determine method precision. These samples involve taking two aliquots from a client sample and preparing two matrix spikes from the two aliquots.

Matrix Spikes and Method Blank Spikes measure both the accuracy of the analytical method and the effect a particular sample matrix has on the accuracy of measurement. A Matrix Spike is prepared by adding a known amount of the target analyte(s) to a volumetric aliquot of the client sample. The recovery of the Matrix Spike is then calculated. The percentage recovery of the matrix spike will indicate the accuracy of the analytical method. It will also provide a measure of the suitability of the method used for the samples undergoing analysis. The Method Blank Spike is there to act as a check on the equipment and the analyst technique used to prepare the Matrix Spike.

For some samples submitted for PCB analysis, the detection limit was increased, due to background interference (as per personal communication with Maxxam). The laboratory reportedly had issues with background interference for several of the soil submitted for PCBs analysis from this site. This is evidenced by the 20 samples with PCB analyses where the laboratory method detection limits had to be raised.

Two other issues of note were that eight of the PHC samples were extracted past the seven day hold time, due to poor weather conditions resulting in difficulties shipping samples to the laboratory within the required timeframe. The samples were extracted 10 days after they were sampled, but had been maintained under ideal conditions (kept cool) for their journey to the laboratory. None of the volatile PHC results were close to the guideline value (F1 results were below or near detection limit and the guideline is 15,000 mg/kg), so it is highly unlikely that the delay affected the integrity of the investigation results. Since volatile contamination has a higher potential to attenuate (decades since spills occurred), the primary interest of PHC sampling for this project were the heavier, less attenuable PHC fractions (F2-F4), which have a hold time within the submission timeline. Secondly, a matrix spike was unsuccessfully recovered within the control limits for three metals parameters for one batch. The laboratory acknowledged the spike recovery issue, and stated that the overall quality of the analysis still falls within a range of acceptability.

10. Conclusions and Recommendations

The conclusions included in this report are based on the information and data collected during the Maintenance Assessment at the BAF-5, Resolution Island site. The following is a summary of the conclusions.

10.1 Residual Soil Contamination

AECOM obtained topographic information for the Furniture Dump source areas, migration pathways, and barrier locations, which will be combined with ASU's delineation of residual PCB contaminated soil, and their implementation plan will be used to develop a remediation design for the Furniture Dump, its drainage pathway, and the new PCB barrier.

AECOM identified localized residual contaminated soil at the North Slope Dump and at the Airstrip Landfill. Two isolated Tier II copper exceedances were identified in surface soils at the North Slope Dump. Additional investigation is recommended to delineate the Tier II copper contamination and estimate a contaminated soil volume. Tier II cadmium and cobalt was identified at the Airstrip Landfill. Additional investigation is recommended to delineate the Tier II cadmium and cobalt contamination and estimate a contaminated soil volume. Approximately 44 m^3 of Tier I and 2.5 m^3 of Tier II PCB contaminated soil was also identified at the Airstrip Landfill.

10.2 Existing Dumps and Landfills

Additional work will be required at several of the dumps and landfills at BAF-5. A summary table of issues is outlined below:

Table 10. Existing Dumps and Landfills Assessment Summary

Location	Issues	Maintenance Recommendations
Camp Landfill	Further monitoring required to confirm containment, surficial debris present, sinkholes and cap integrity issues, drainage issues.	Generally structurally integral, but has some minor issues. Action Rating: Low to Moderate Recommended Maintenance: • Remove surface debris • Regrade
PCL Dump	Exposed debris present, insufficient cover, drainage issues.	Generally in good condition. Action Rating: Low Recommended Maintenance: • Remove surface debris • Regrade
North Slope Dump	Isolated metals exceedances noted in surface soil, debris is exposed at the toe, cap deficiencies.	Generally in good condition. Action Rating: Moderate Recommended Maintenance: • Remove surface debris • Regrade
SRR Construction Landfill	No environmental assessment completed, poor containment due to cover materials.	Additional investigation is required to assess the potential for contaminant migration from the buried debris material. Future evidence of contaminant migration would affect the recommended remedial action.
Maintenance Dump	Exposed debris, cap deficiencies, drainage issues.	Generally in good condition. Action Rating: Low Recommended Maintenance: • Remove surface debris • Regrade
Airstrip Landfill	Metals and PCB contaminated soil at surface, cap deficiencies, erosion, exposed debris.	Geotechnically unstable and has contaminated soil at surface. Action Rating: Moderate Recommended Maintenance: • Remove surface debris • Regrade • Armour north slope
Beach Landfill	Exposed debris, some erosion (but self-armouring), some minor sinkholes due to inadequate debris compaction.	Generally in good condition. Action Rating: Low Recommended Maintenance: • Remove surface debris • Regrade

10.3 Demolition and Hazardous Waste

Based on the estimated volumes derived from the demolition inventory, the anticipated breakdown of hazardous versus non-hazardous debris at the BAF-5 site is as follows:

- The total volume of non-hazardous waste is estimated to be 1,292 m^3 (crushed)
- The total volume of hazardous waste is estimated to be 117 m^3 (crushed)

Building material samples were obtained to determine hazardous building materials in addition to those previously identified, prior to demolition. Four locations with asbestos-amended materials were noted (drywall joint in Building S9, pipe wrap at Building S16, floor tile in Building N10 and floor tile in the Radio Hall Building), and one sample with lead-amended paint (at Building S10). One concrete sample was submitted for PCB content, but it was below the allowable guideline value.

10.4 Borrow Areas

Several additional borrow areas were investigated and several potential sources of additional Type 1 and Type 2 Granular Fills were identified. The Type 1 Granular Fill in the borrow areas consists mainly of “gravel and cobbles”. The Type 2 Granular Fill in the borrow areas consists of variable proportions of sand and gravel and is classified as “sand and gravel”. The fines content of Type 2 Fill is variable, but should generally be within the gradation limits. A summary of granular material that can be obtained from each potential borrow area is presented in the following table.

Table 11. Summary of Granular Material Quantities

Borrow Area	Location	Type(1)	Estimated Quantity(2) (m^3)	Evaluation of Source
Upper Airstrip Borrow Area 1	South Side of East End of Airstrip	Type 1	Quantity of material not estimated during Maintenance Assessment.	Potential source. However, not a substantial volume of material is expected.
Upper Airstrip Borrow Area 2	South Side of West End of Airstrip	Type 1, 2, 3, 6	Old borrow area depleted. Potential expansion not investigated during Maintenance Assessment.	Potential source if existing borrow area is expanded. Potential expansion is accessible through depleted borrow area.
Upper Airstrip Borrow Area 3	North of Airstrip	Type 1, 2, 3, 6	5,000	Likely insufficient yield following removal of oversize material and construction of access.
Lower Airstrip Borrow Area 1	West of Airstrip	Type 1, 2, 3, 6	3,000	Potential source. Access to the area would be difficult.
Lower Airstrip Borrow Area 2	Southwest of Airstrip		Quantity of material not estimated during Maintenance Assessment	Not considered suitable for further development.
Lower Airstrip Borrow Area 3	West of Airstrip	Type 1, 2, 3, 6	21,000	Potential source and likely a key borrow area for future construction activities. Construction of access may be difficult and require a significant volume of material.
Freshwater Lake Borrow Area 1	Southeast portion of Freshwater Lake, including stockpile	Type 1, 2, 3, 6	13,000	Potential Source, Difficult to access remaining material in borrow area.
Freshwater Lake Borrow Area 2	North of Freshwater Lake	Type 1, 2, 3, 6	9,000	Likely insufficient yield due to the volume of granular material required to construct access.
Access Road Borrow Area 1	North of Beach Landfill	Type 1, 2, 3, 6	Quantity of material not estimated during Maintenance Assessment	Likely insufficient yield due to saturation of material.
Access Road Borrow Area 2	Beach Area		Not investigated during Maintenance Assessment	Likely insufficient yield based on visual assessment. Borrow area appears mostly depleted and saturated.
Freshwater Lake Borrow Area 3	East of South End of Freshwater Lake	Type 2, 3, 6	3,000	Potential source.
Lower Airstrip Borrow Area 4	Near Junction of Main Road and Radio Hill Access Road	Type 1, 2, 3, 6	22,000	Potential source and likely a key borrow area for future construction activities. Surface water management is required.
Lower Airstrip Borrow Area 5	Southwest of Airstrip	Type 1, 2, 3, 6	13,000	Potential source.
Upper Beach Borrow Area	Near Former Road to S1/S4 Beach Area	Type 1, 2, 3, 6	9,000	Potential source.
Upper Airstrip Borrow Area 1	South Side of East End of Airstrip	Type 1	Quantity of material not estimated during Maintenance Assessment.	Potential source. However, not a substantial volume of material is expected.
Upper Airstrip Borrow Area 2	South Side of West End of Airstrip	Type 1, 2, 3, 6	Old borrow area depleted. Potential expansion not investigated during Maintenance Assessment.	Potential source if existing borrow area is expanded. Potential expansion is accessible through depleted borrow area.
			Total	**98,000 m^3**

Notes:

(1) *Processing/screening may be required to obtain required granular material type.*

(2) *Estimated borrow volumes are bulk volumes including all material types and do not consider wasting of poor quality or otherwise unsuitable material.*

10.5 Potential Landfill Sites

Five potential locations for a NHWLF site were identified during the 2013 Maintenance Assessment. While Proposed Locations 1, 2, 3, 4 and 5 would be acceptable for the construction of a NHWLF, the two most suitable locations would be either Proposed Location 3 (West of the Tier II) or Proposed Location 5 (Southeast of Airstrip Landfill). The chosen location would depend on the priorities and timing of future maintenance work items, since using Proposed Location 1 would affect other proposed action items, and the constructability of a landfill in the proposed location.

10.6 Site Access

The airstrip, road, and barge landing locations were assessed during the site investigation. A small amount of maintenance work (boulder removal from the airstrip) was completed during the 2013 Maintenance Assessment, which should have improved the smoothness of the airstrip. Otherwise, the airstrip was deemed to be in sufficient condition for use by a Twin Otter or similarly sized aircraft, but should be inspected by aircraft crew familiar with gravel airstrips prior to use if a larger aircraft is considered to land on this airstrip. The airstrip may need to be upgraded and regularly maintained during future maintenance programs to maintain functionality. The existing road network sections were assessed to range from very poor to good and will require some upgrading by the Maintenance Contractor to facilitate access during maintenance construction activities.

10.7 Remaining Gaps

Not all of the 2013 Maintenance Assessment action items could be investigated due to poor weather conditions and limited time on site. Action items not covered in the 2013 assessment include: identifying and assessing additional borrow areas, quantifying surface debris, quantifying and characterizing site culverts, surveying the Beach Landfill, additional delineation of contaminated soil identified at the landfills and fuel storage area, as well as additional assessment of the PCB barriers.

It is expected that the remaining information gaps can be overcome through the use of good engineering judgement and existing historical data. Table 12 summarizes the actions that will be taken during development of the remediation design and specifications to account for remaining information gaps.

Table 12. 2013 Data Gaps

Action Item	Mitigation Strategy
Identification and assessment of additional borrow areas	Nine of the fourteen borrow areas assessed during the 2013 field program were identified as potential sources with sufficient yield and acceptable material properties. Additional locations were identified as potential borrow areas but were inaccessible during the maintenance assessment due to either poor access or limited time on site. Should a need for additional borrow be identified, these borrow areas can be investigated during maintenance construction activities.
Quantification of surface debris	There is little surface debris remaining on the site due to previous remediation programs and in general, most surface debris is within the footprints of the existing landfills. Surface debris volumes will be estimated using site photographs and field observations obtained during the 2013 maintenance assessment in combination with data from past monitoring events.
Quantification of site culverts	The number of existing culverts currently on site was not specifically assessed during the 2013 field program. The number of culverts remaining on site can be estimated using site photographs and field observations obtained in 2013, combined with data from past monitoring events.
Topographic survey of Beach Landfill	Topographical information for the Beach Landfill can be estimated using a combination of on site observations, existing topographical information and satellite images. This information can be used to approximate the quantities required for use in the remediation design and specifications.
Additional investigation of contaminated soil	Soil samples were collected at the North Slope Dump and Airstrip Landfill during the maintenance assessment. Analysis of the sample results identified areas of incomplete delineation of contaminated soil plumes. Additional investigation is also recommended in the vicinity of the AANDC fuel tanks, where depth samples have not yet been collected. This gap can be mitigated by using sound engineering judgment to estimate the extent of contamination in the areas. Estimates can be refined through implementation of a test pitting program during maintenance construction activities.
Additional assessment of the PCB barriers	Information regarding the construction details of the PCB barriers at the Furniture Dump, S1/S4 Valley and S1/S4 Beach will be obtained from Queen's University. This information combined with field observations and site photographs collected during the 2013 maintenance assessment can be used to develop remediation procedures for the barriers.

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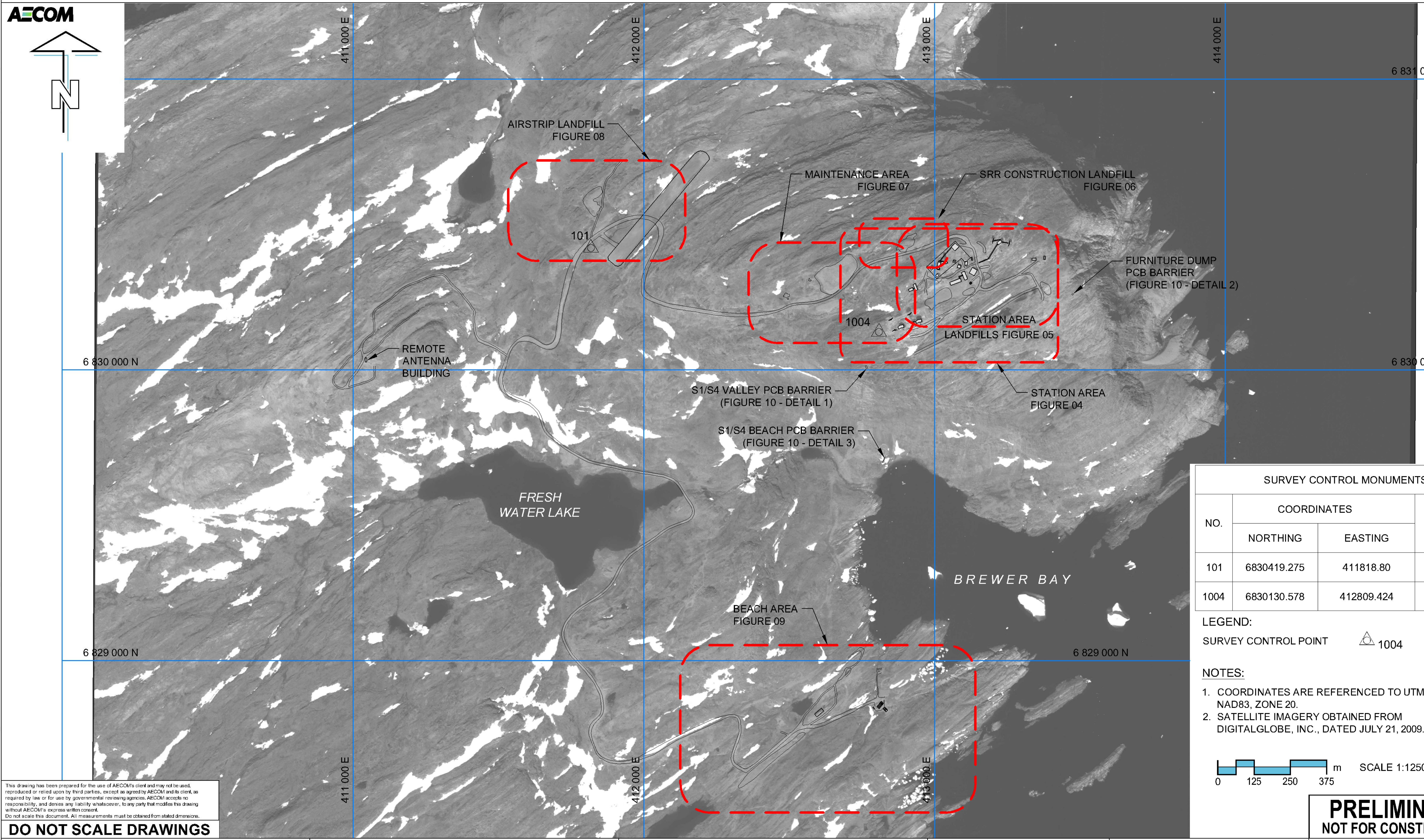
Appendix A

Figures



SURVEY CONTROL MONUMENTS

NO.	COORDINATES		ELEVATION
	NORTHING	EASTING	
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1004	6830130.578	412809.424	350.43

LEGEND:

SURVEY CONTROL POINT △ 1004

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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DO NOT SCALE DRAWINGS

PRELIMINARY
NOT FOR CONSTRUCTION

Client/client
PUBLIC WORKS
GOVERNMENT SERVICES
CANADA

Project title/Titre du projet
Resolution Island
Maintenance Assessment

Drawing title/Titre du dessin
Overall Site Plan

Approved by/Approuve par: R. Schmidtke
Designed by/Concept par: R. Morley
Drawn by/Dessine par: G. Vukasinovic-Draganic
PWGSC Project Manager/Administrateur de Projets TPSGC: G. Cotta
PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC:
Date/Date: January 10, 2014
Project No./No. du projet: 60304883
Sheet/Feuille: B-F01 OF 10
Revision/Revision: B

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Plotted on: January 8, 2014
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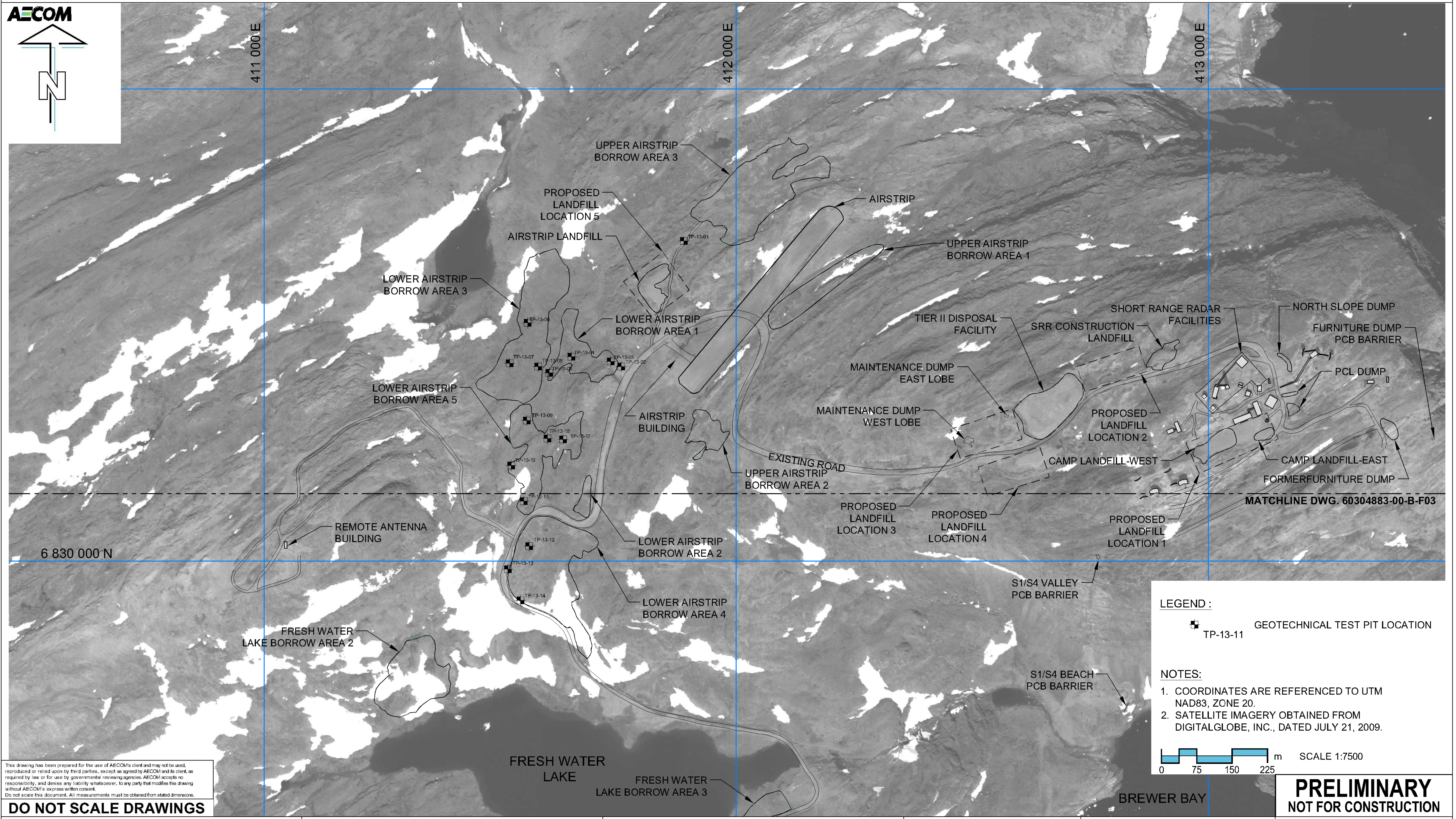
Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES / SERVICES IMMOBILIERS
Western Region / Région de l'ouest

AECOM



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▚ TP-13-11	GEOTECHNICAL TEST PIT LOCATION

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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PRELIMINARY
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Client/client **PUBLIC WORKS GOVERNMENT SERVICES CANADA**	Project title/Titre du projet **Resolution Island Maintenance Assessment**	Drawing title/Titre du dessin **North Site Plan**	Approved by/Approuve par **R. Schmidtke**	PWGSC Project Manager/Administrateur de Projets TPSGC **G. Cotta**	Project No./No. du projet **60304883**	
			Designed by/Concept par **R. Morley**	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC	Sheet/Feuille **B-F02** **OF 10**	Revision/Revision **B**
			Drawn by/Dessine par **G. Vukasinovic-Draganic**	Date/Date **January 10, 2014**		

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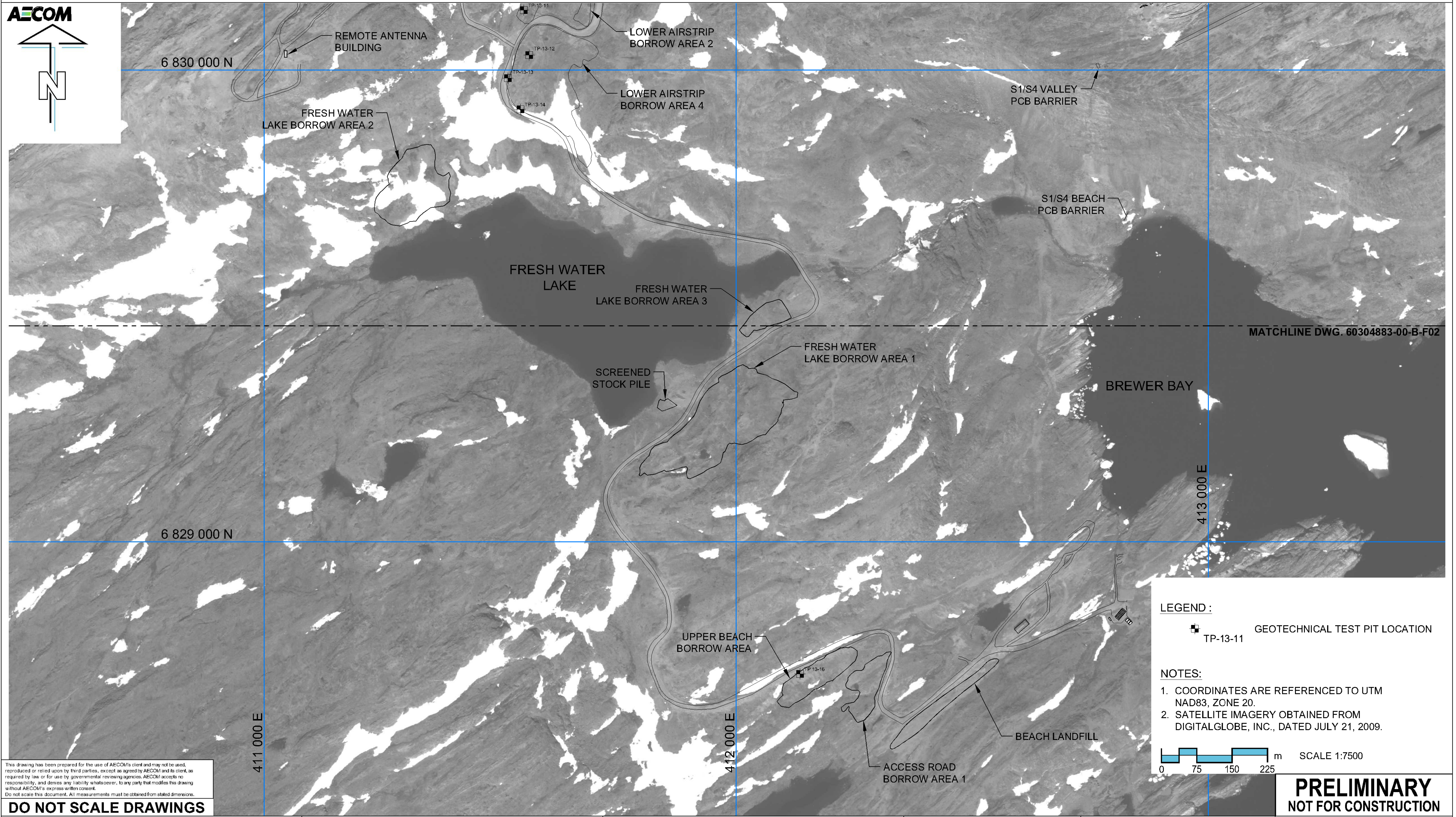

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TP-13-11 GEOTECHNICAL TEST PIT LOCATION

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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Client/client **PUBLIC WORKS GOVERNMENT SERVICES CANADA**	Project title/Titre du projet **Resolution Island Maintenance Assessment**	Drawing title/Titre du dessin **South Site Plan**	Approved by/Approuve par **R. Schmidtke**	PWGSC Project Manager/Administrateur de Projets TPSGC **G. Cotta**	Project No./No. du projet **60304883**
			Designed by/Concept par **R. Morley**	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC	Sheet/Feuille **B-F03** OF 10
			Drawn by/Dessine par **G. Vukasinovic-Draganic**	Date/Date **January 10, 2014**	Revision/Revision **B**

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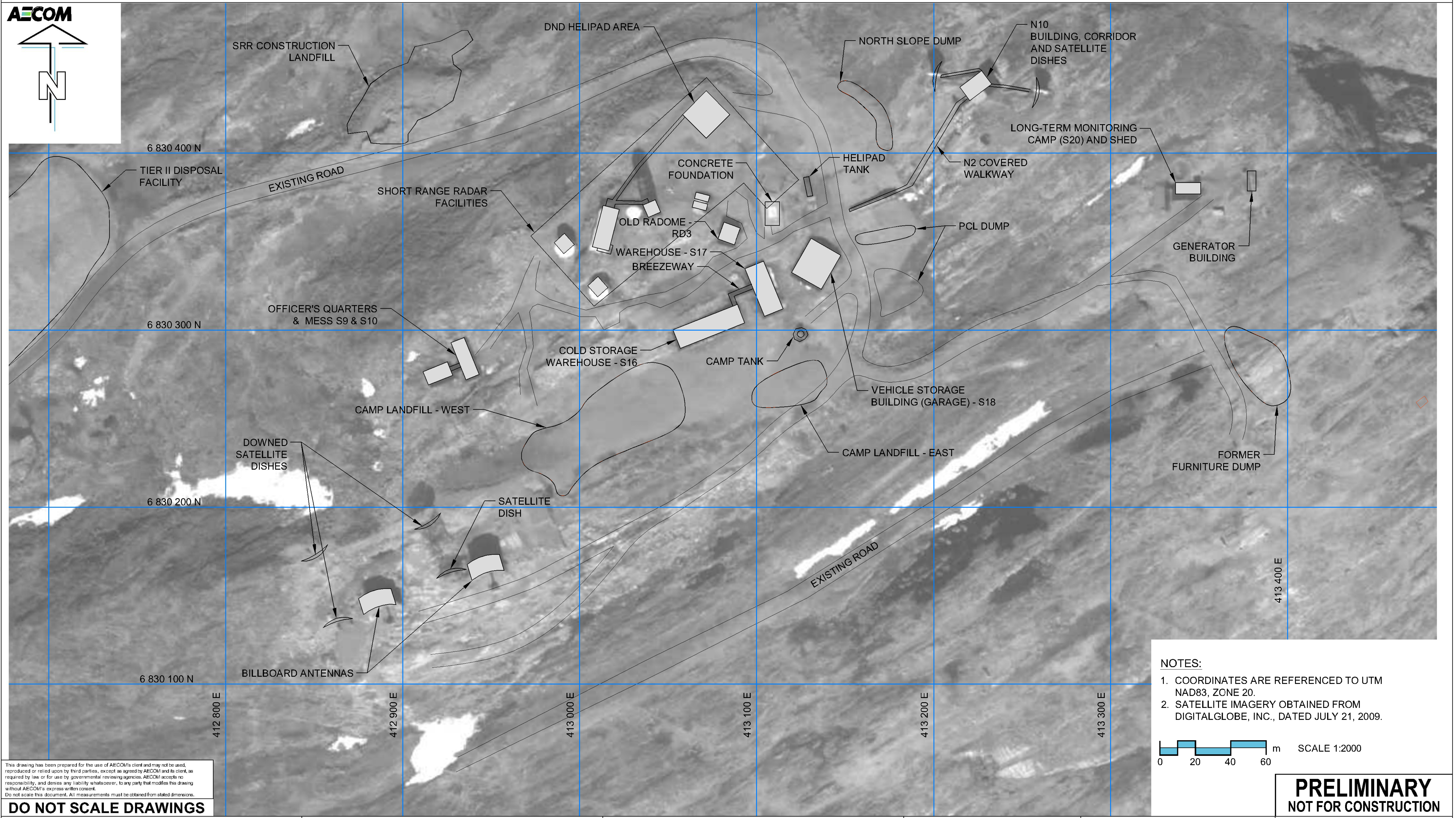

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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Resolution Island
Maintenance Assessment

Drawing title/Titre du dessin
Station Area

Approved by/Approuve par
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Designed by/Concept par
R. Morley

Drawn by/Dessine par
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PWGSC Project Manager/Administrateur de Projets TPSGC
G. Cotta

PWGSC, Architectural and Engineering Resources Manager/
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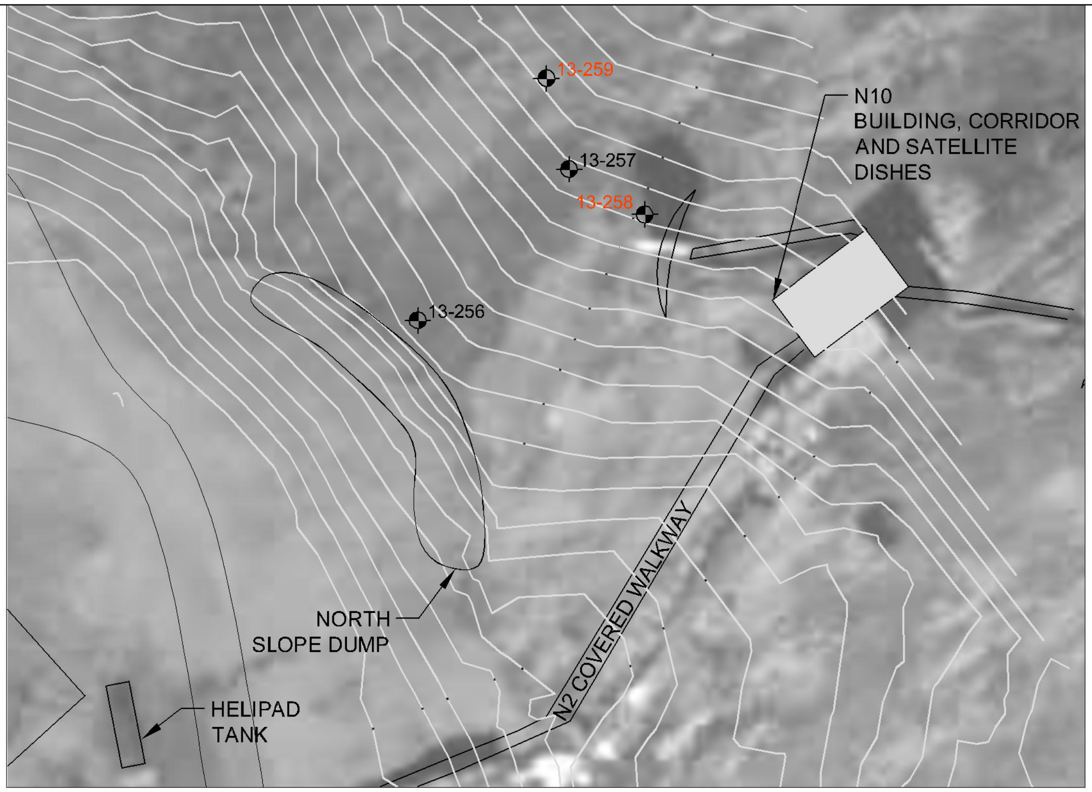

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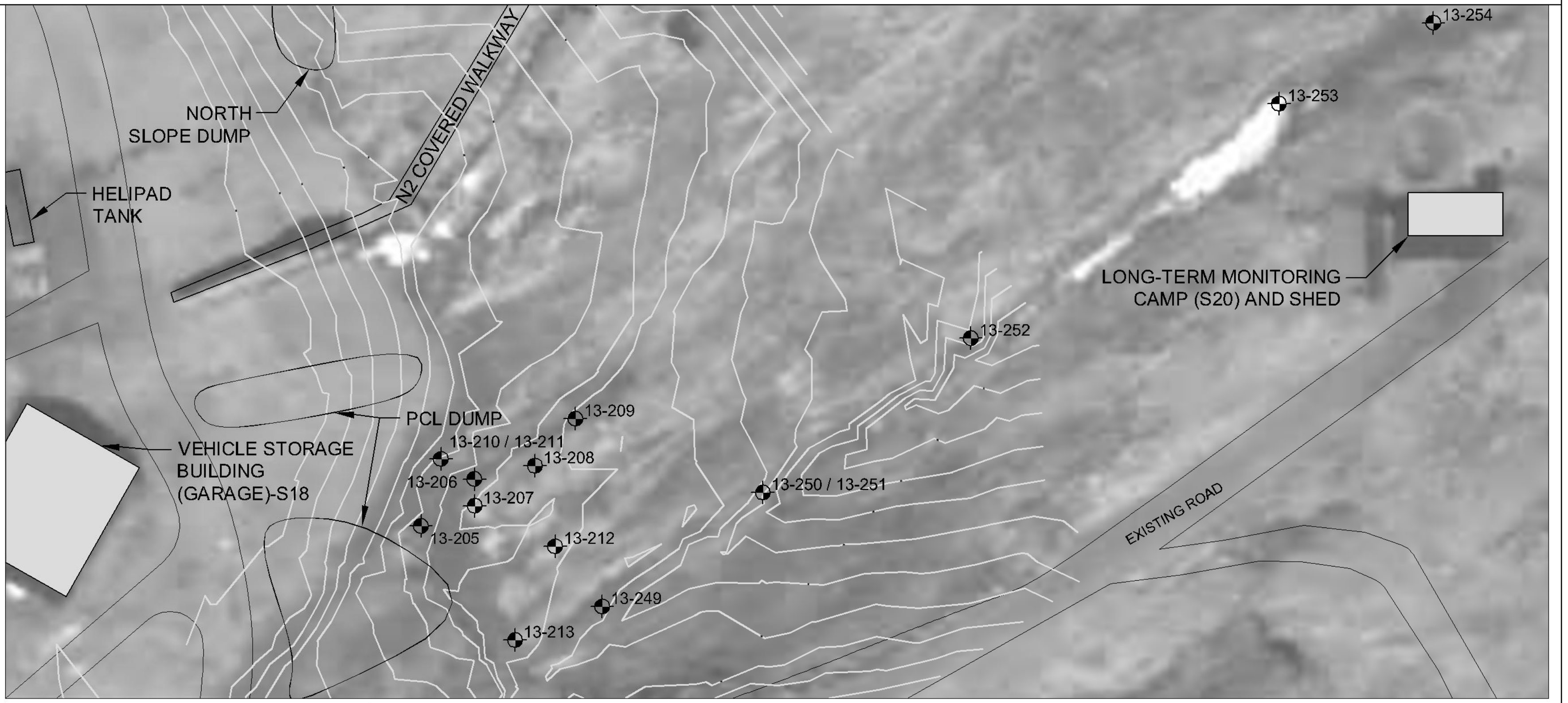

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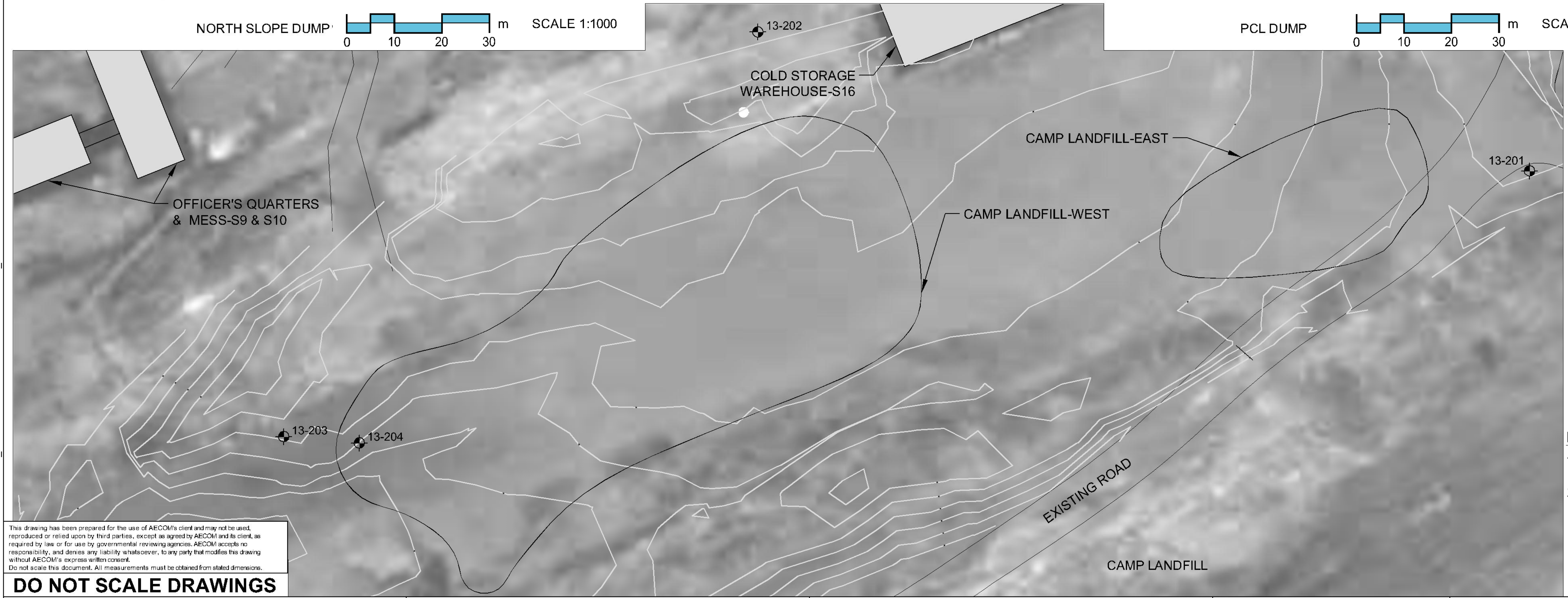

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13-XXX	SAMPLE NUMBER - EXCEEDS CRITERIA

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PUBLIC WORKS
GOVERNMENT SERVICES
CANADA

Project title/Titre du projet
Resolution Island
Maintenance Assessment

Drawing title/Titre du dessin
Station Area Landfills

Approved by/Approuve par
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Designed by/Concept par
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G. Cotta

PWGSC, Architectural and Engineering Resources Manager/
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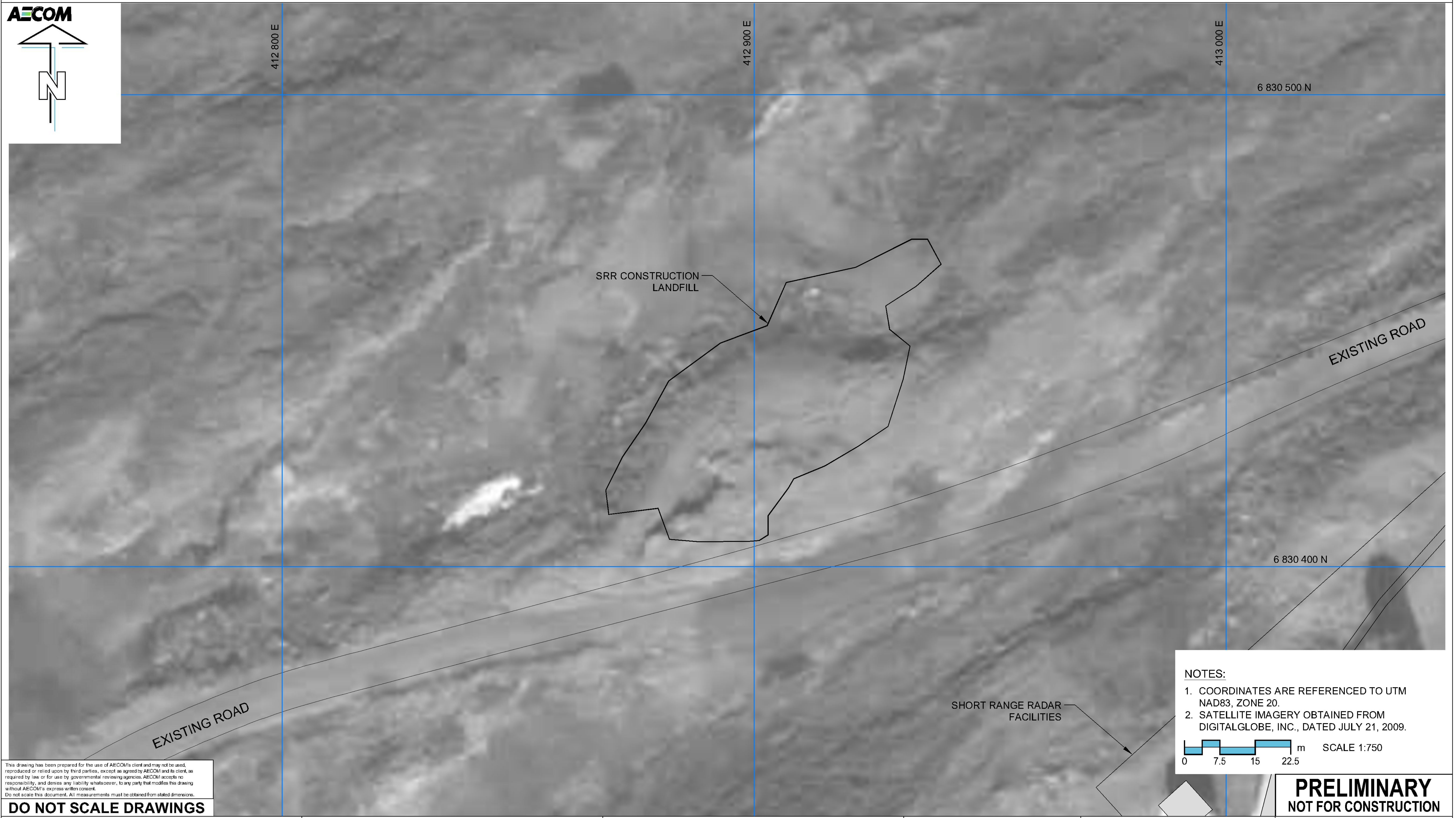

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1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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Client/client **PUBLIC WORKS GOVERNMENT SERVICES CANADA**	Project title/Titre du projet **Resolution Island Maintenance Assessment**	Drawing title/Titre du dessin **SRR Construction Landfill**	Approved by/Approuve par **R. Schmidtke**	PWGSC Project Manager/Administrateur de Projets TPSGC **G. Cotta**	Project No./No. du projet **60304883**
			Designed by/Concept par **R. Morley**	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC	Sheet/Feuille **B-F06** OF 10
			Drawn by/Dessine par **G. Vukasinovic-Draganic**	Date/Date **January 10, 2014**	Revision/Revision **B**

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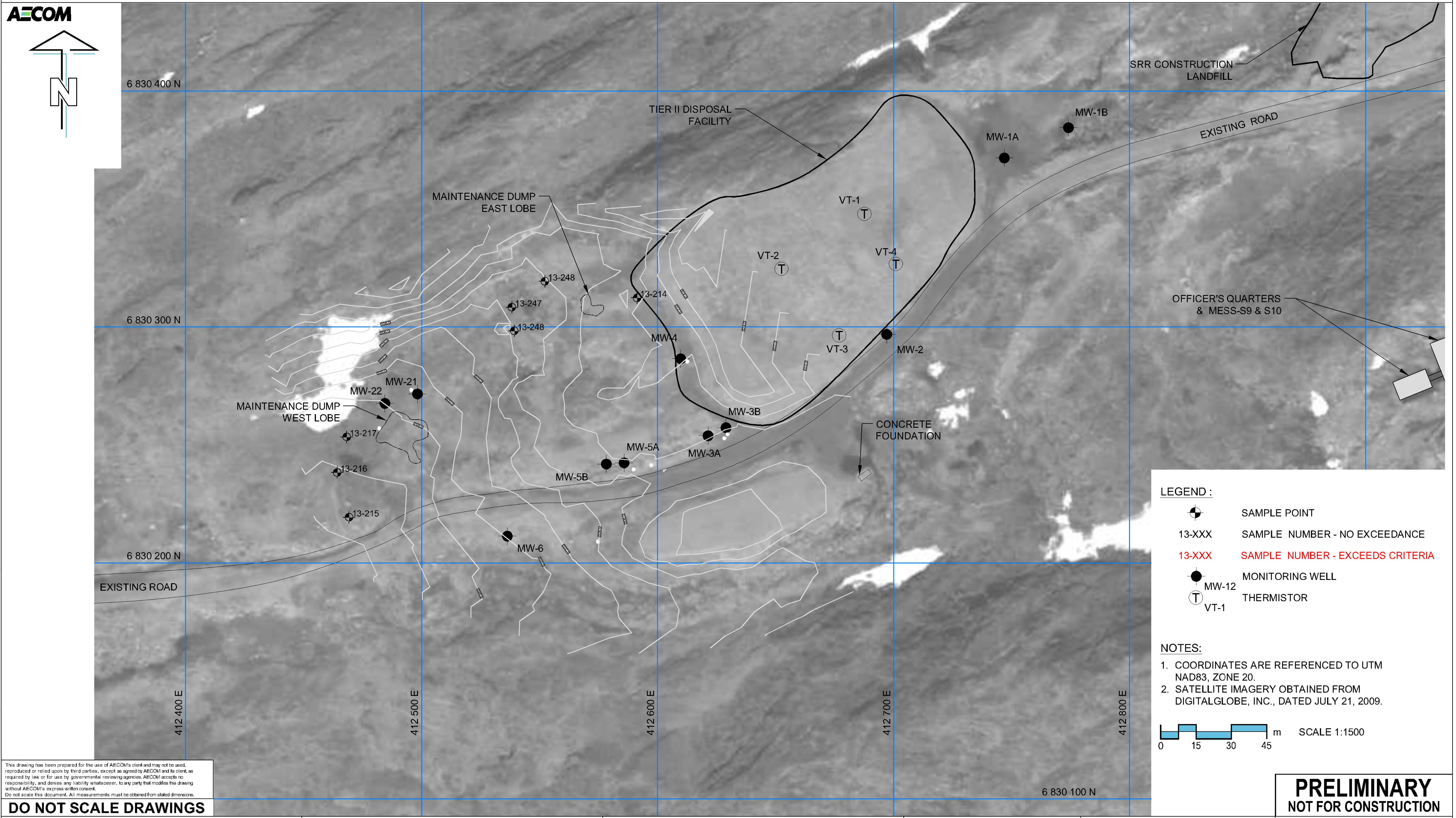
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES / SERVICES IMMOBILIERS
Western Region / Région de l'ouest



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13-XXX	SAMPLE NUMBER - EXCEEDS CRITERIA
● MW-12	MONITORING WELL
Ⓣ VT-1	THERMISTOR

NOTES:

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0 15 30 45 m SCALE 1:1500

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PUBLIC WORKS GOVERNMENT SERVICES CANADA

Project title/Titre du projet
Resolution Island Maintenance Assessment

Drawing title/Titre du dessin
Maintenance Area

Approved by/Approuve par
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PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC

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60304883

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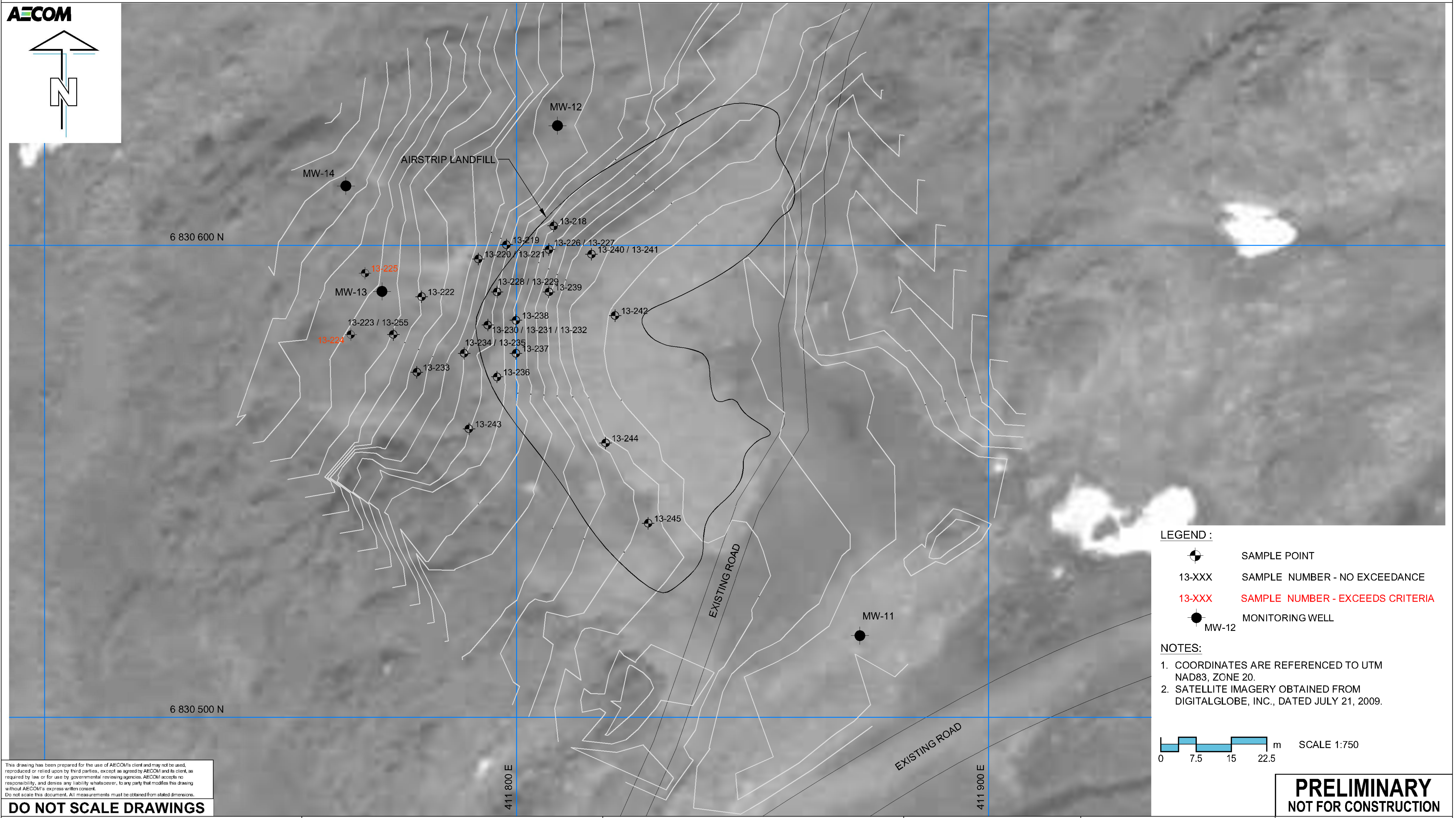

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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Project title/Titre du projet
Resolution Island Maintenance Assessment

Drawing title/Titre du dessin
Airstrip Landfill

Approved by/Approuve par
R. Schmidtke

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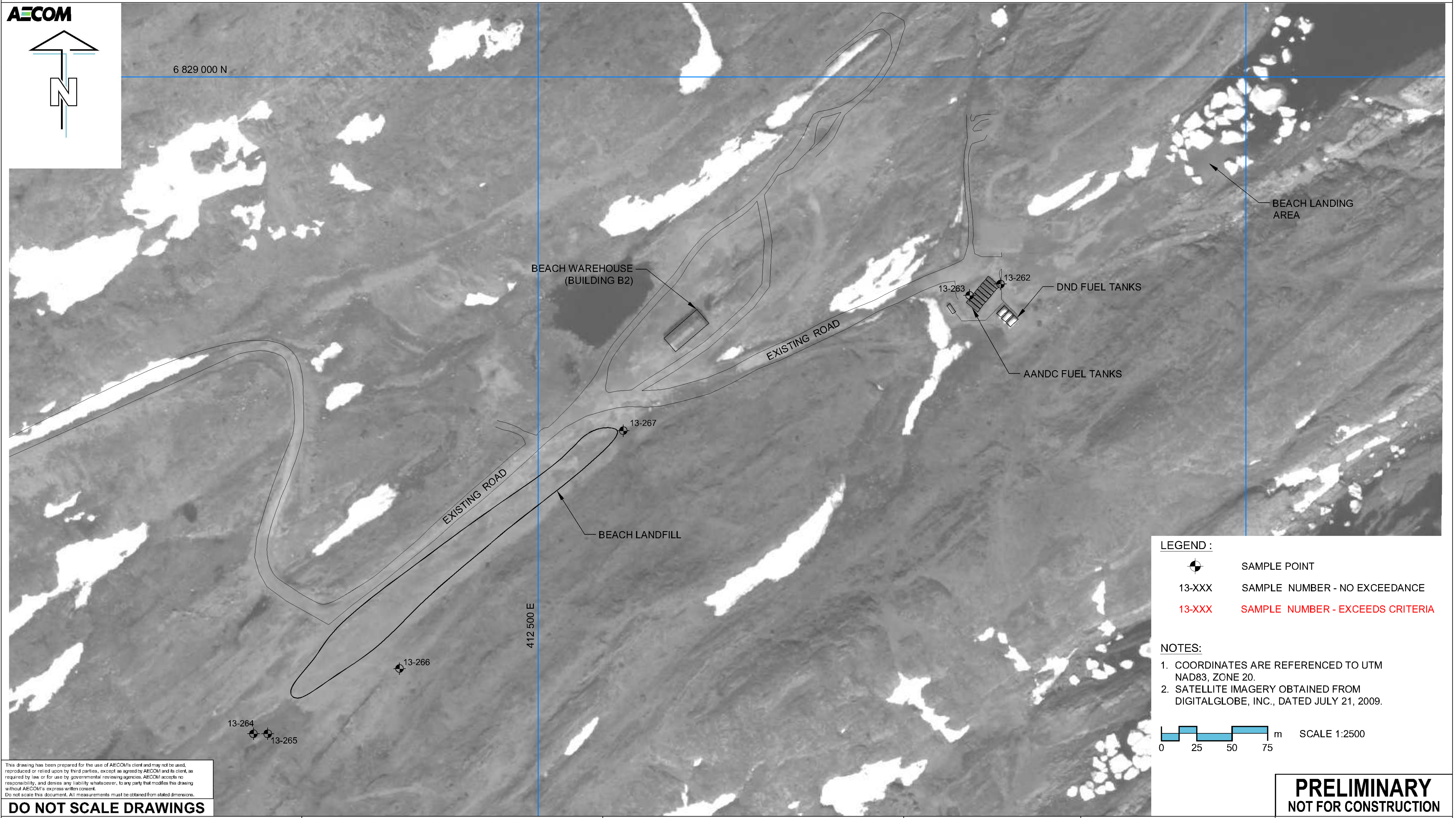

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NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
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0 25 50 75 m SCALE 1:2500

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Client/client **PUBLIC WORKS GOVERNMENT SERVICES CANADA**	Project title/Titre du projet **Resolution Island Maintenance Assessment**	Drawing title/Titre du dessin **Beach Area**	Approved by/Approuve par **R. Schmidtke**	PWGSC Project Manager/Administrateur de Projets TPSGC	Project No./No. du projet **60304883**
			Designed by/Concept par **R.Morley**	PWGSC, Architectural and Engineering Resources Manager/ Ressources Architectural et de Directeur d'Ingénierie, TPSGC **G. Cotta**	Sheet/Feuille **B-F09** OF 10
			Drawn by/Dessine par **G. Vukasinovic-Draganic**	Date/Date **January 10, 2014**	Revision/Revision **B**

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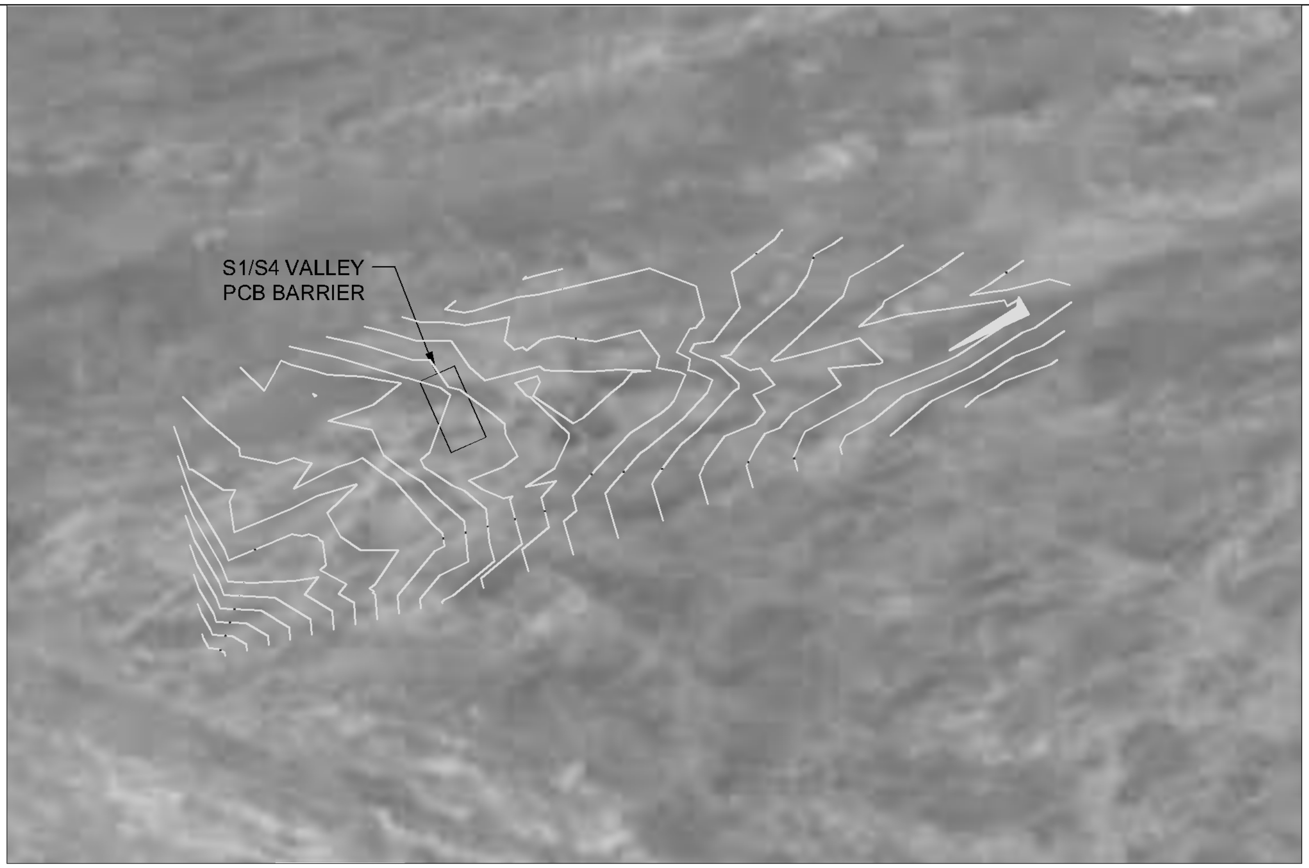
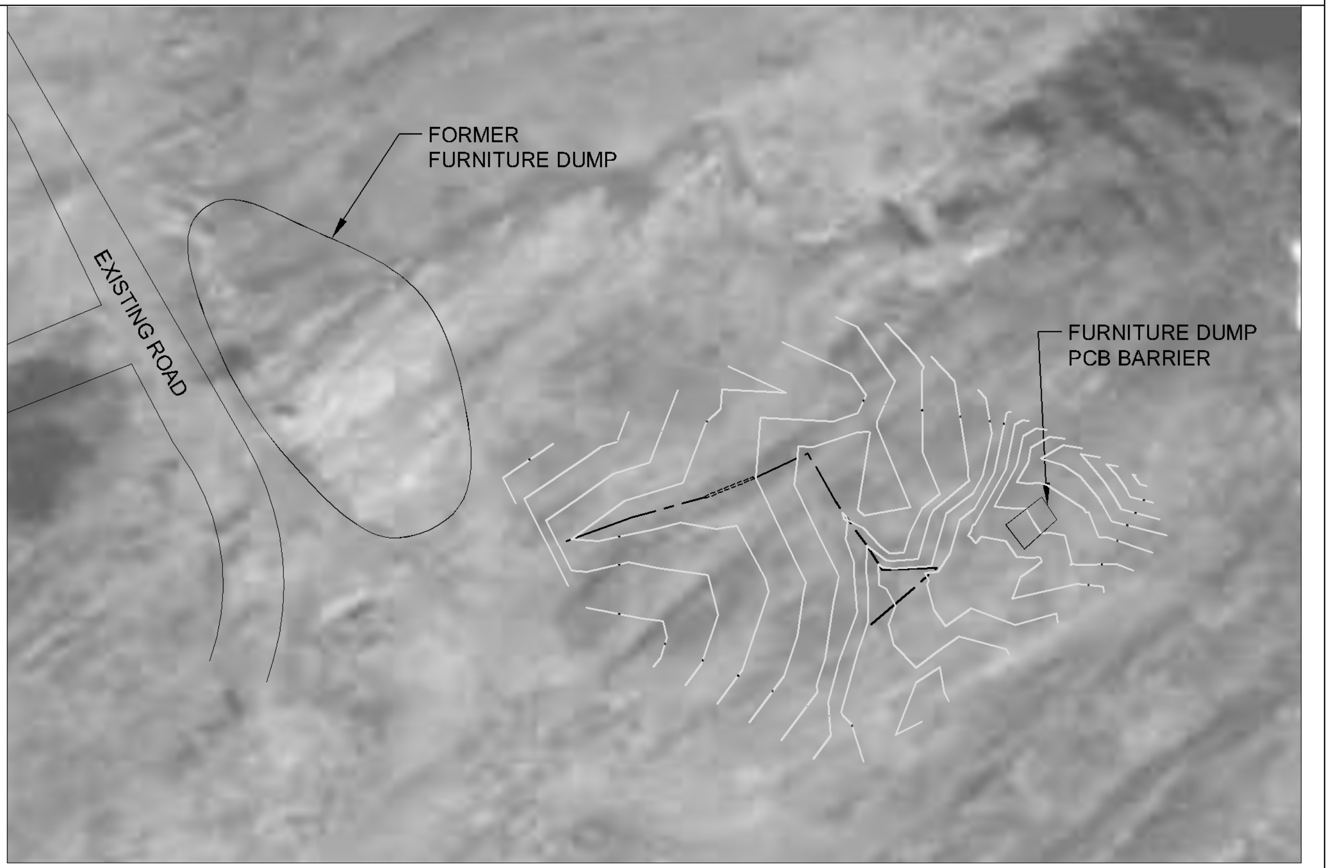
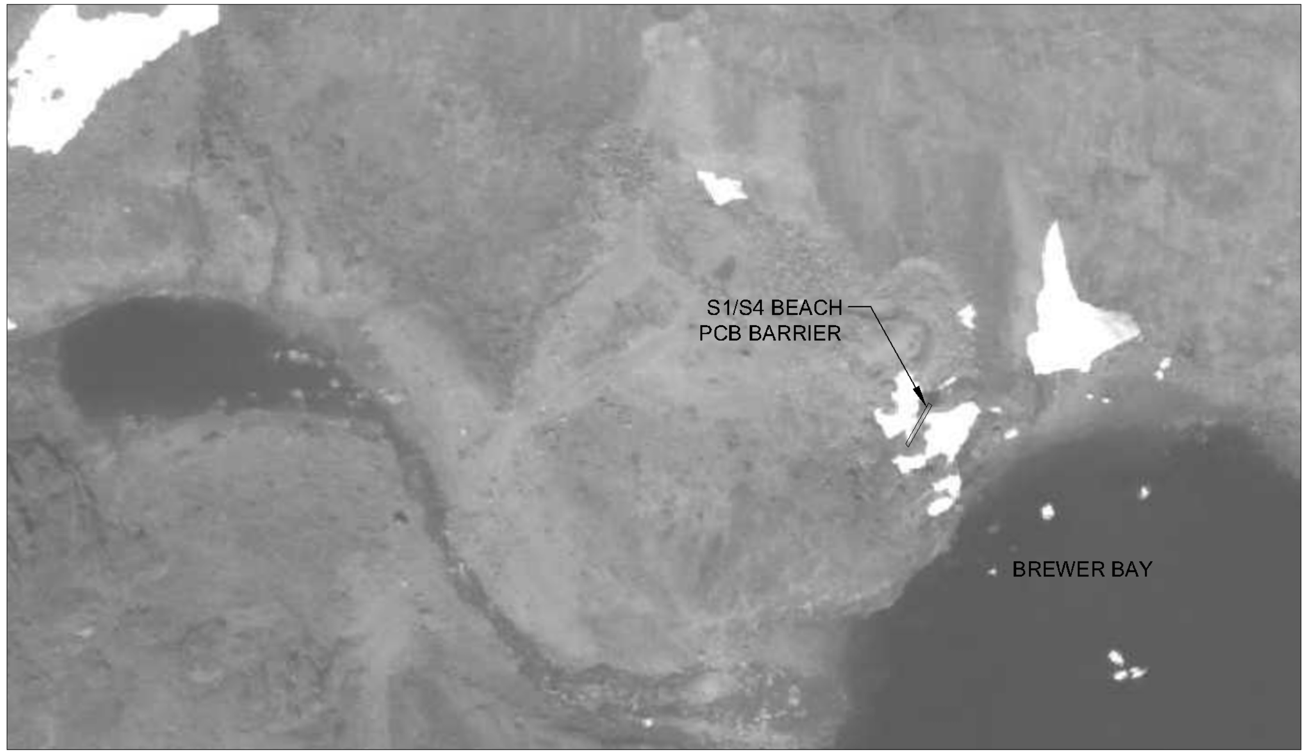


DETAIL 1 - S1/S4 VALLEY PCB BARRIER 0 10 20 30 m SCALE 1:1000



DETAIL 2 - FURNITURE DUMP PCB BARRIER 0 10 20 30 m SCALE 1:1000



DETAIL 3 - S1/S4 BEACH PCB BARRIER 0 25 50 75 m SCALE 1:2500

NOTES:

1. COORDINATES ARE REFERENCED TO UTM NAD83, ZONE 20.
2. SATELLITE IMAGERY OBTAINED FROM DIGITALGLOBE, INC., DATED JULY 21, 2009.

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Project title/Titre du projet
Resolution Island Maintenance Assessment

Drawing title/Titre du dessin
PCB Barriers

Approved by/Approuve par
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Appendix B

Data Tables

Table B.1
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Camp Landfill Analytical Data

Sample #	Location	Field Duplicate	Depth (cm)	Date Collected	Metals (DCLU Suite) Soil									PCB Aroclor Soil			
					As	Cd	Cr	Co	Cu	Pb	Hg	Ni	Zn	Aroclor 1242	Aroclor 1254	Aroclor 1260	Total PCBs
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA																	**50**
Tier II/PHC Near Shore Criteria					**30**	**5**	**250**	**50**	**100**	**500**	**2**	**100**	**500**				**5**
Tier I/PHC Far Shore Criteria										**200**							**1**
13-200	Downgradient - East	-	0-10	19-Aug-13	1.20	0.12	26	10	60	4.7	<0.050	52	45	<0.10	<0.10	0.39	0.39
13-201	Downgradient - Southeast	-	0-10	19-Aug-13	<1.0	0.11	19	6	39	6.5	<0.050	35	38	<0.10	<0.10	0.75	0.75
13-202	Upgradient - North	-	0-10	19-Aug-13	<1.0	0.18	18	10	34	13.0	<0.050	48	48	<0.10	<0.10	0.18	0.18
13-203	Downgradient - Northwest	-	0-10	19-Aug-13	1.10	1.50	37	18	87	5.1	<0.050	89	200	<0.010	<0.010	0.04	0.04
13-204	Downgradient - Southwest	-	0-10	19-Aug-13	<1.0	0.82	37	21	85	3.1	<0.050	92	120	<0.010	<0.010	0.03	0.03

Table B.2
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
PCL Dump Drainage Analytical Data

Sample #	**Location**	**Field Duplicate**	**Depth (cm)**	**Date Collected**	**PCB Aroclor Soil**				**CCME PHC Soil**					
					Aroclor 1242	**Aroclor 1254**	**Aroclor 1260**	**Total PCBs**	**F1**	**F2**	**F3**	**F4**	**Type B**	**Type A**
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA								**50**						
Tier II/PHC Near Shore Criteria								**5**						
Tier I/PHC Far Shore Criteria								**1**	**15,000**	**8,000**	**18,000**	**25,000**		
13-205	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.020	<0.020	0.12	0.12	<12	1,000	1,200	210	2,212	1,410
13-206	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.010	<0.010	0.07	0.07	62	1,800	950	120	2,812	1,070
13-207	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.050	<0.050	0.19	0.19	<12	1,400	2,600	410	4,012	3,010
13-208	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.010	<0.010	0.11	0.11	<12	860	1,200	190	2,072	1,390
13-209	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.020	<0.020	0.14	0.14	<12	1,000	820	110	1,832	930
13-210	Unexcavated PCL Dump Drainage	13-211	0-10	19-Aug-13	<0.010	<0.010	0.07	0.07	<12	12	100	<50	124	150
13-211	Unexcavated PCL Dump Drainage	13-210	0-10	19-Aug-13	<0.010	<0.010	0.05	0.05	<12	<10	140	57	162	197
13-212	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.010	<0.010	0.06	0.06	<12	140	370	87	522	457
13-213	Unexcavated PCL Dump Drainage	-	0-10	19-Aug-13	<0.010	<0.010	0.06	0.06	<12	14	380	110	406	490
13-249	Excavated PCL Dump Drainage	-	0-10	21-Aug-13	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	-
13-250	Excavated PCL Dump Drainage	13-251	0-10	21-Aug-13	<0.10	<0.10	0.10	0.10	-	-	-	-	-	-
13-251	Excavated PCL Dump Drainage	13-250	0-10	21-Aug-13	<0.10	<0.10	<0.10	<0.10	-	-	-	-	-	-
13-252	Excavated PCL Dump Drainage	-	0-10	21-Aug-13	<0.010	<0.010	0.07	0.07	-	-	-	-	-	-
13-253	Excavated PCL Dump Drainage	-	0-10	21-Aug-13	<0.010	<0.010	0.10	0.10	-	-	-	-	-	-
13-254	Excavated PCL Dump Drainage	-	0-10	21-Aug-13	<0.020	<0.020	0.10	0.10	-	-	-	-	-	-

Table B.3
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
North Slope Dump Drainage Analytical Data

Sample #	Depth	Location	Field Duplicate	Depth (cm)	Date Collected	Metals (DCLU Suite) Soil									PCB Aroclor Soil				CCME PHC Soil					
						As	Cd	Cr	Co	Cu	Pb	Hg	Ni	Zn	Aroclor 1242	Aroclor 1254	Aroclor 1260	Total PCBs	F1	F2	F3	F4	Type B	Type A
Units						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA																		**50**						
Tier II/PHC Near Shore Criteria						**30**	**5**	**250**	**50**	**100**	**500**	**2**	**100**	**500**				**5**						
Tier I/PHC Far Shore Criteria											**200**							**1**	**15,000**	**8,000**	**18,000**	**25,000**		
13-256	Surface	West	-	0-10	22-Aug-13	1.0	0.2	36	16	78	6.5	<0.050	81	76	<0.010	0.02	0.04	0.06	<12	47	360	120	419	480
13-257	Surface	Centre	-	0-10	22-Aug-13	<1.0	0.2	21	7.1	59	9.0	<0.050	39	70	<0.010	0.04	0.04	0.08	<12	29	460	190	501	650
13-258	Surface	North	-	0-10	22-Aug-13	2.3	0.28	33	11	**130**	82	0.09	63	240	<0.10	0.31	0.25	0.56	<12	3,200	6,400	2,000	9,612	15,300
13-259	Surface	South	-	0-10	22-Aug-13	8.1	0.54	33	16	**120**	43	0.06	63	310	<0.10	0.23	0.11	0.33	<12	45	3,000	1,700	3,057	10,200
13-260	Surface	East	13-261	0-10	22-Aug-13	<1.0	0.10	21	5.6	60	26	<0.050	33	55	<0.050	0.15	0.06	0.21	<12	350	1,200	410	1,562	3,200
13-261	Surface	East	13-260	0-10	22-Aug-13	<1.0	<0.10	22	5.4	53	25	<0.050	34	54	<0.050	0.12	0.07	0.19	<12	340	1,100	360	1,452	3,900

Bold Exceeds guideline

Table B.4
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Maintenance Dump Analytical Data

Sample #	Location	Field Duplicate	Depth (cm)	Date Collected	Metals (DCLU Suite) Soil									PCB Aroclor Soil			
					As	Cd	Cr	Co	Cu	Pb	Hg	Ni	Zn	Aroclor 1242	Aroclor 1254	Aroclor 1260	Total PCBs
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA																	**50**
Tier II/PHC Near Shore Criteria					**30**	**5**	**250**	**50**	**100**	**500**	**2**	**100**	**500**				**5**
Tier I/PHC Far Shore Criteria										**200**							**1**
13-214	Upgradient - East	-	0-10	20-Aug-13	1.10	0.11	35	14	69	14	<0.050	73	67	<0.050	<0.050	0.12	0.12
13-215	Downgradient Debris - South	-	0-10	20-Aug-13	1.30	<0.10	27	13	65	9.10	<0.050	68	79	<0.010	<0.010	0.02	0.02
13-216	Downgradient Debris - West	-	0-10	20-Aug-13	1.10	0.22	31	20	68	11	<0.050	74	210	<0.010	<0.010	<0.010	<0.010
13-217	Downgradient Debris - North	-	0-10	20-Aug-13	1.10	0.11	33	11	80	13	<0.050	67	93	<0.010	<0.010	<0.010	<0.010
13-246	Downgradient Dump - South	-	0-10	21-Aug-13	<1.0	0.13	28	14	73	7	<0.050	85	98	<0.010	<0.010	0.02	0.02
13-247	Downgradient Dump - West	-	0-10	21-Aug-13	1.30	<0.10	25	8.8	55	2.4	<0.050	61	55	<0.010	<0.010	0.06	0.06
13-248	Downgradient Dump - North	-	0-10	21-Aug-13	<1.0	<0.10	22	7.2	47	3.5	<0.050	48	49	<0.010	<0.010	0.02	0.02

Table B.5
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Airstrip Landfill Analytical Data

					Metals (DCLU Suite) Soil									**PCB Aroclor Soil**			
Sample #	**Location**	**Field Duplicate**	**Depth (cm)**	**Date Collected**	**As**	**Cd**	**Cr**	**Co**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**Aroclor 1242**	**Aroclor 1254**	**Aroclor 1260**	**Total PCBs**
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA																	**50**
Tier II/PHC Near Shore Criteria					**30**	**5**	**250**	**50**	**100**	**500**	**2**	**100**	**500**				**5**
Tier I/PHC Far Shore Criteria										**200**							**1**
13-218	North of Airstrip Landfill	-	0-10	20-Aug-13	1.1	0.28	39	19	96	14	<0.050	94	100	<0.010	<0.010	0.01	0.01
13-219	North of Airstrip Landfill	-	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<1.0	<1.0	<1.0 (1)	<1.0
13-220	North of Airstrip Landfill	13-221	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	0.05	0.05
13-221	North of Airstrip Landfill	13-220	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.10	<0.10	<0.10	<0.10
13-222	North of Airstrip Landfill	-	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-223	North of Airstrip Landfill	-	0-10	20-Aug-13	<1.0	0.33	35	15	78	12	<0.050	82	110	<0.10	<0.10	<0.10	<0.10
13-224	North of Airstrip Landfill	-	0-10	20-Aug-13	1.4	0.71	43	26	95	21	0.07	**130**	240	<0.10	<0.10	<0.10	<0.10
13-225	North of Airstrip Landfill	-	0-10	20-Aug-13	3.1	**5.6**	86	**65**	**270**	84	0.11	**260**	**610**	<0.010	<0.010	0.14	0.14
13-226	North End of Airstrip Landfill	-	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-227	North End of Airstrip Landfill	-	30-40	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-228	North End of Airstrip Landfill	-	0-10	20-Aug-13	<1.0	0.15	28	15	60	5.5	<0.050	76	62	<0.010	<0.010	0.01	0.01
13-229	North End of Airstrip Landfill	-	30-40	20-Aug-13	<1.0	<0.10	26	12	46	2.3	<0.050	58	42	<0.010	<0.010	<0.010	<0.010
13-230	North End of Airstrip Landfill	13-231	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-231	North End of Airstrip Landfill	13-230	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-232	North End of Airstrip Landfill	-	30-40	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-233	North End of Airstrip Landfill	-	0-10	20-Aug-13	<1.0	0.18	34	17	73	3.6	<0.050	86	65	<0.010	<0.010	<0.010	<0.010
13-234	North End of Airstrip Landfill	-	0-10	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-235	North End of Airstrip Landfill	-	30-40	20-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-236	North End of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<1.0	6.20	<1.0	**6.2**
13-237	North End of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-238	North End of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-239	North End of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-240	North End of Airstrip Landfill	13-241	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-241	North End of Airstrip Landfill	13-240	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-242	Centre of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-243	West of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-244	Centre of Airstrip Landfill	-	0-10	21-Aug-13	<1.0	0.15	33	17	73	2.5	<0.050	84	60	<0.010	<0.010	<0.010	<0.010
13-245	South Centre of Airstrip Landfill	-	0-10	21-Aug-13	-	-	-	-	-	-	-	-	-	<0.010	<0.010	<0.010	<0.010
13-255	North of Airstrip Landfill	-	30-40	21-Aug-13	1	0.22	33	14	82	8	<0.050	92	110	<0.010	<0.010	0.01	0.01

Bold	Exceeds guideline

Table B.6
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Beach Landfill Analytical Data

Sample #	**Location**	**Field Duplicate**	**Depth (cm)**	**Date Collected**	**Metals (DCLU Suite) Soil**									**PCB Aroclor Soil**			
					As	**Cd**	**Cr**	**Co**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**Aroclor 1242**	**Aroclor 1254**	**Aroclor 1260**	**Total PCBs**
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
CEPA																	**50**
Tier II/PHC Near Shore Criteria					**30**	**5**	**250**	**50**	**100**	**500**	**2**	**100**	**500**				**5**
Tier I/PHC Far Shore Criteria										**200**							**1**
13-264	Downgradient West - North	-	0-10	22-Aug-13	<1.0	<0.10	19	3.7	29	1.7	<0.050	18	16	<0.010	<0.010	<0.010	<0.010
13-265	Downgradient West - South	-	0-10	22-Aug-13	<1.0	<0.10	18	8	36	8.4	<0.050	39	29	<0.010	<0.010	0.03	0.03
13-266	Upgradient - South	-	0-10	22-Aug-13	1.00	<0.10	25	8.3	49	3.4	<0.050	42	30	<0.010	<0.010	<0.010	<0.010
13-267	Downgradient East	-	0-10	22-Aug-13	<1.0	<0.10	16	6	31	3.7	<0.050	35	24	<0.010	0.02	0.05	0.07

Table B.7
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Beach Fuel System Analytical Data

Sample #	Location	Field Duplicate	Depth (cm)	Date Collected	CCME PHC Soil					
					F1	F2	F3	F4	Type B	Type A
Units					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Site-Specific Guidelines					**15,000**	**8,000**	**18,000**	**25,000**		
13-262	ESG Sample 29704	-	0-10	22-Aug-13	280	5,300	150	<50	5,730	200
13-263	ESG Sample 29702	-	0-10	22-Aug-13	<12	40	58	<50	110	108

Table B.8
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Water Sample Analytical Data

Sample #	Location	Date Collected		Metals (DCLU Suite) Water									PCB										PHC					
			pH	Total Arsenic	Dissolved Cadmium	Dissolved Chromium	Disolved Cobalt	Dissolved Copper	Dissolved Lead	Dissolved Nickel	Total Zinc	Total Mercury	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Total PCBs	Benzene	Toluene	Ethylbenzene	Xylenes	F1	Oil and Grease
Units				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/kg	mg/kg	mg/L	mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/kg	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L
Site-Specific Guidelines			**6-9**	**0.10**	**0.01**	**0.10**	**0.05**	**0.20**	**0.05**	**0.20**	**0.10**	**0.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**370**	**2**	**90**	**-**	**-**	**5**
Camp Tank Discharge	Camp	21-Aug-13	6.99	<0.00020	0.00014	<0.0010	0.00039	0.00210	0.00028	0.00580	<0.0030	<0.0020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0	<0.40	<0.40	<0.40	<0.80	<100	<2.0

Table B.9
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
Building Material Assessment

Sample #	Location	Material Type	Date Collected	Pb	Aroclor 1242	Aroclor 1254	Aroclor 1260	Total PCBs	% Asbestos	Form of Asbestos/ Comment
Units				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		
CEPA								**50**		
Transportation of Dangerous Goods for Leachable Lead				**5**						
S9-001A	Building S9 Room #1	Drywall joint compound	19-Aug-13	-	-	-	-	-	0.5-10	chrysotile
S9-002A	Building S9 Room #7	Brown sheet vinyl	19-Aug-13	-	-	-	-	-	ND	
S9-003A	Building S9 Room #5	Grey vinyl tile	19-Aug-13	-	-	-	-	-	ND	
S9-004A	Building S9 Room #6	12"x12" ceiling tile	19-Aug-13	-	-	-	-	-	ND	(70-90% glass fibres)
S-0001A	Building S16 Room #13 floor	Brown sheet vinyl	19-Aug-13	-	-	-	-	-	ND	(10-30% glass fibres)
S-0002A	Building S16 Room #12 overhead pipe insulation	Black pipe wrap	19-Aug-13	-	-	-	-	-	20-40	
S-0003A	Building S16 Room #9 flooring	Grey/brown sheet vinyl	19-Aug-13	-	-	-	-	-	ND	(10-30% glass fibres)
S-0004A	Building S16 Room #10 flooring	Brown sheet vinyl	19-Aug-13	-	-	-	-	-	ND	(10-30% glass fibres)
S-0005A	Building S16 Room #4 flooring	Brown sheet vinyl	19-Aug-13	-	-	-	-	-	ND	(10-30% glass fibres)
SN10-001A	Building N10 insultated duct	Parging cement	19-Aug-13	-	-	-	-	-	0.5-20	chrysotile
SN10-002A	Builidng N10 floor	Grey 9"x9" vinyl tile	19-Aug-13	-	-	-	-	-	ND	
SN10-003A	Building N10 floor	Dark grey sheet vinyl flooring	19-Aug-13	-	-	-	-	-	ND	
SN10-004A	Building N10 (North) floor	Brown 9"x9" vinyl tile	19-Aug-13	-	-	-	-	-	ND	
S-RH001A	Radio Hill interior stairs	Beige/brown 9"x9" vinyl tile	19-Aug-13	-	-	-	-	-	0.5-10	chrysotile
S-RH002A	Radio Hill mod-bit roofing bitumen	Black bitumen (roofing)	19-Aug-13	-	-	-	-	-	ND	
PCB-PC1	PCB Storage garage slab north end	Non-stained concrete slab	19-Aug-13	-	<0.010	<0.010	0.074	0.074		
S10 (Metal)	Building S10 northeast room, east wall	Blue painted metal (interior)	19-Aug-13	**5.5**	-	-	-	-		
S16 (Metal)	Builidng S16 Metal walls Room #11 north wall	Blue painted metal (interior)	19-Aug-13	<0.10	-	-	-	-		
S16 (Wood)	Building S16 Plywood walls Room #11 south wall	Blue painted wood (interior)	19-Aug-13	<0.10	-	-	-	-		
S18 (Metal)	Building S18 east wall	Beige/yellow paint (interior)	19-Aug-13	0.53	-	-	-	-		

Bold	Exceeds guideline
ND	Not detectable

Table B.10
Public Works and Government Services Canada
Resolution Island
Maintenance Assessment Report
QA/QC

Parameter		**Metals (DLCU Suite) Soil**									**PCB Aroclor Soil**				**PHC Soil**					
		As	**Cd**	**Cr**	**Co**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**	**Aroclor 1242**	**Aroclor 1254**	**Aroclor 1260**	**Total PCBs**	**F1**	**F2**	**F3**	**F4**	**Type B**	**Type A**
Method Detection Limit											0.010	0.010	0.010	0.010	12	10	10	10		
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/g	ug/g	ug/g	ug/g	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample	**Area**																			
13-210	PCL Dump Drainage										<0.010	<0.010	0.066	0.066	<12	12	100	<50	124	150
13-211	PCL Dump Drainage										<0.010	<0.010	0.048	0.048	<12	<10	140	57	162	197
RPD											n/a	n/a	31.6	31.6	n/a	n/a	33.3	13.1	26.6	27.1
13-220	Airstrip Landfill										<0.010	<0.010	0.054	0.054						
13-221	Airstrip Landfill										<0.10*	<0.10*	<0.10*	<0.10*						
RPD											n/a	n/a	n/a	n/a						
13-230	Airstrip Landfill										<0.010	<0.010	<0.010	<0.010						
13-231	Airstrip Landfill										<0.010	<0.010	<0.010	<0.010						
RPD											n/a	n/a	n/a	n/a						
13-240	Airstrip Landfill										<0.010	<0.010	<0.010	<0.010						
13-241	Airstrip Landfill										<0.010	<0.010	<0.010	<0.010						
RPD											n/a	n/a	n/a	n/a						
13-250	PCL Dump Drainage										<0.10	<0.10	0.10	0.10						
13-251	PCL Dump Drainage										<0.10	<0.10	<0.10	<0.10						
RPD											n/a	n/a	n/a	n/a						
13-260	North Slope Dump	<1.0	0	21	6	60	26	<0.050	33	55	<0.050	0.150	0.057	0.210	<12	350	1200	410	1562	3200
13-261	North Slope Dump	<1.0	<0.10	22	5	53	25	<0.050	34	54	<0.050	0.120	0.070	0.190	<12	340	1100	360	1452	3900
RPD		n/a	n/a	4.7	3.6	12.4	3.9	n/a	3.0	1.8	n/a	22.2	20.5	10.0	n/a	2.9	8.7	13.0	7.3	19.7

Notes:

Acceptable RPD values vary based on the analytical parameters, the sample matrix, and the concentrations of analytes in the samples.

Acceptable RPD values below 35% for metals and 50% for PHCs and PCBs.

BOLD	indicates the RDP exceeded the recommended alert criteria (only when the concentrations are at least ten times the method detection limit are RPD calculations considered valid.)
BOLD	indicates that concentrations are <10 times the detection limit, therefore the calculated RDP value is not strictly valid.
*	Duplicate sample results were run in a different batch and had more background interference, so the detection limit was raised.

RPD = 100 x ((2 x (x_1 – x_2))/(x_1 + x_2))

Where x_1 is the primary result and x_2 is the blind duplicate result.

Appendix C

Site Photographs

- C.1 General Site Photographs
- C.2 PCB Barriers
- C.3 Camp Landfill
- C.4 PCL Dump and Drainage
- C.5 North Slope Dump and Drainage
- C.6 SRR Construction Landfill
- C.7 Maintenance Dump
- C.8 Airstrip Landfill
- C.9 Beach Landfill
- C.10 Beach Fuel Tanks
- C.11 Demolition & Hazardous Waste Audit
- C.12 Borrow Assessment
- C.13 Proposed Landfill Locations
- C.14 Site Access

C.1 General Site Photographs

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
General Site Photographs	Resolution Island, NU	60304883

Photo No.	Date:
1	14/08/2013

Photo File Name:

DSC_1389

Description:

Aerial photograph of station area, looking west.

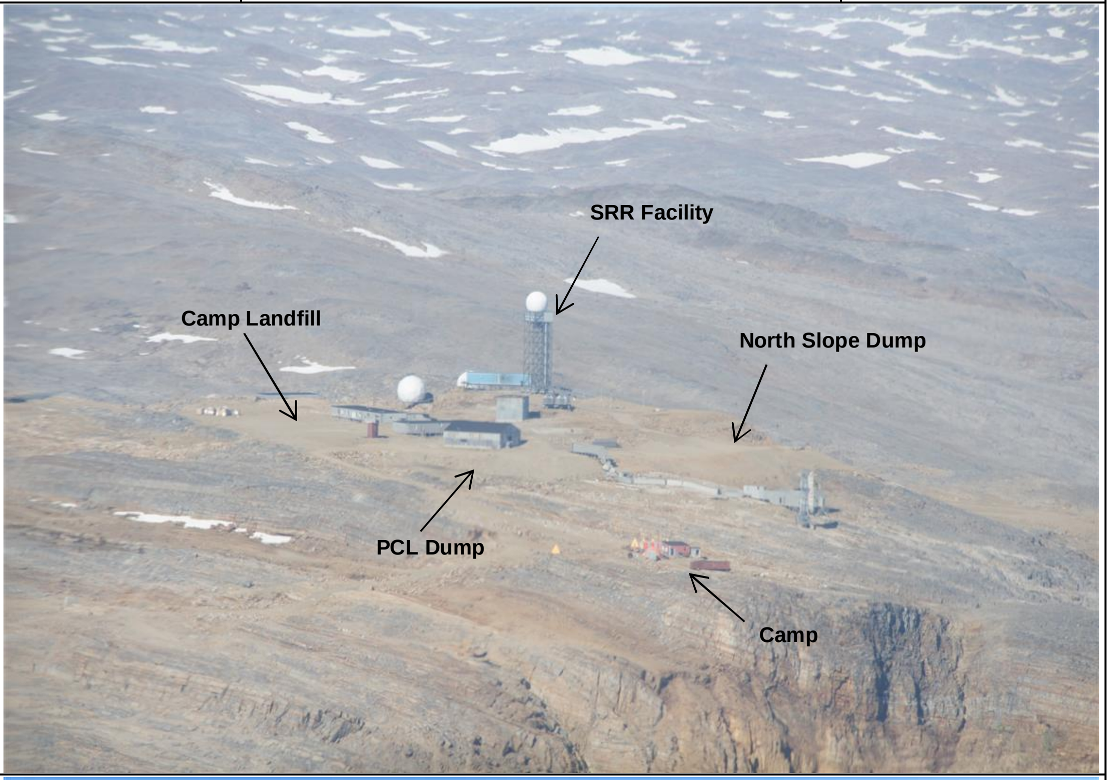


Photo No.	Date:
2	19/08/2013

Photo File Name:

DSC03176

Description:

Station area, looking east from survey control monument.

PHOTOGRAPHIC RECORD

Site Name: General Site Photographs	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
3	17/08/2013

Photo File Name:

DSC03061

Description:

Looking east at the Maintenance Assessment Camp. Camp was set up adjacent to the existing monitoring camp (Building S20).

Photo No.	**Date:**
4	19/08/2013

Photo File Name:

DSC03174

Description:

Looking north at the Maintenance Area from the survey control monument at the station area.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
General Site Photographs	Resolution Island, NU	60304883

Photo No.	Date:
5	14/08/2013

Photo File Name:

DSC_1379

Description:

Aerial photograph of Radio Hill.

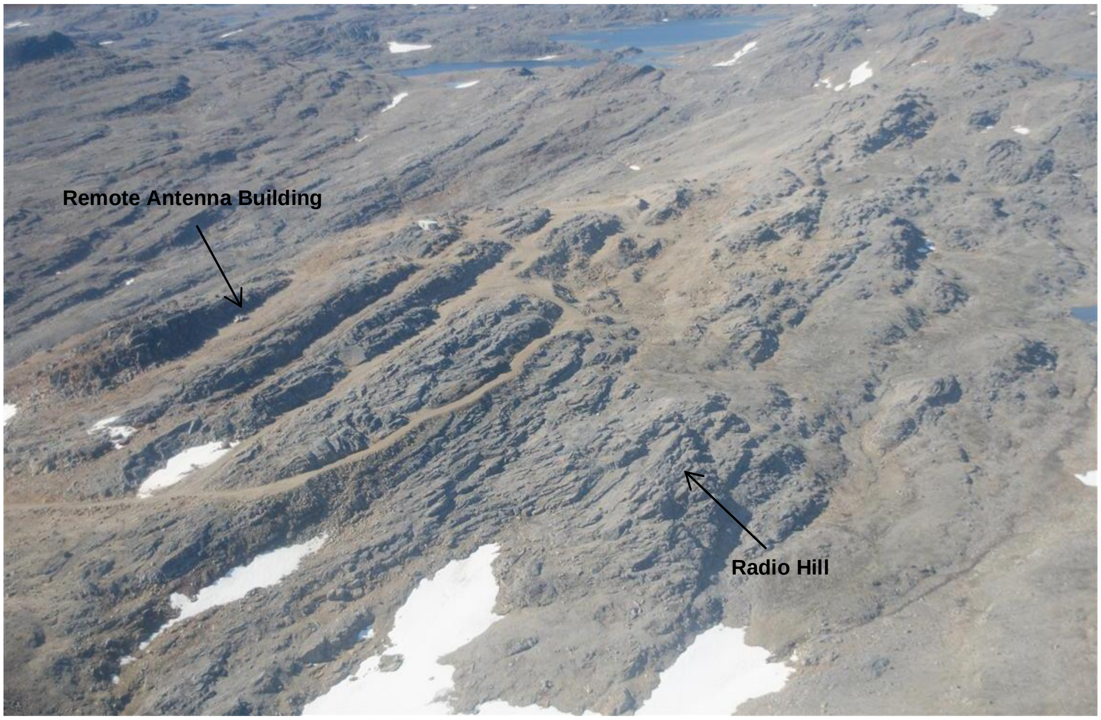


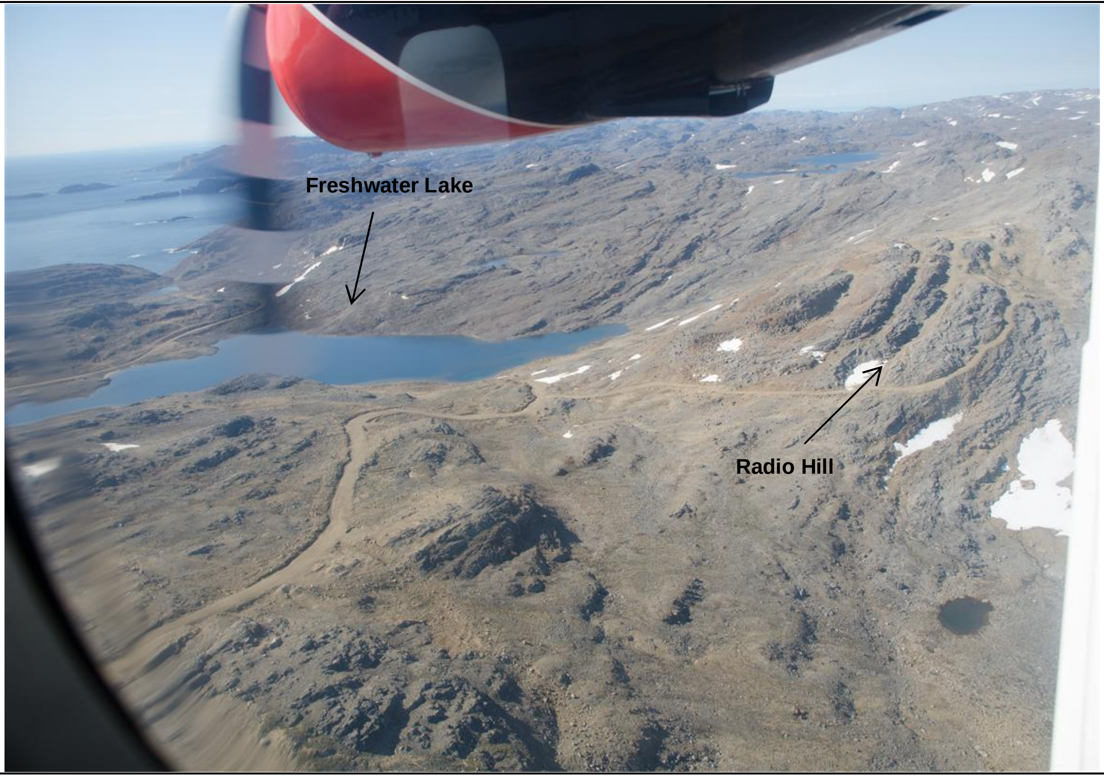
Photo No.	Date:
6	14/08/2014

Photo File Name:

DSC_1380

Description:

Aerial photograph of the Freshwater Lake Area, looking south west.



PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
General Site Photographs	Resolution Island, NU	60304883

Photo No.	Date:
7	14/08/2013

Photo File Name:

DSC_1381

Description:

Aerial photograph of the Freshwater Lake Area, looking south.

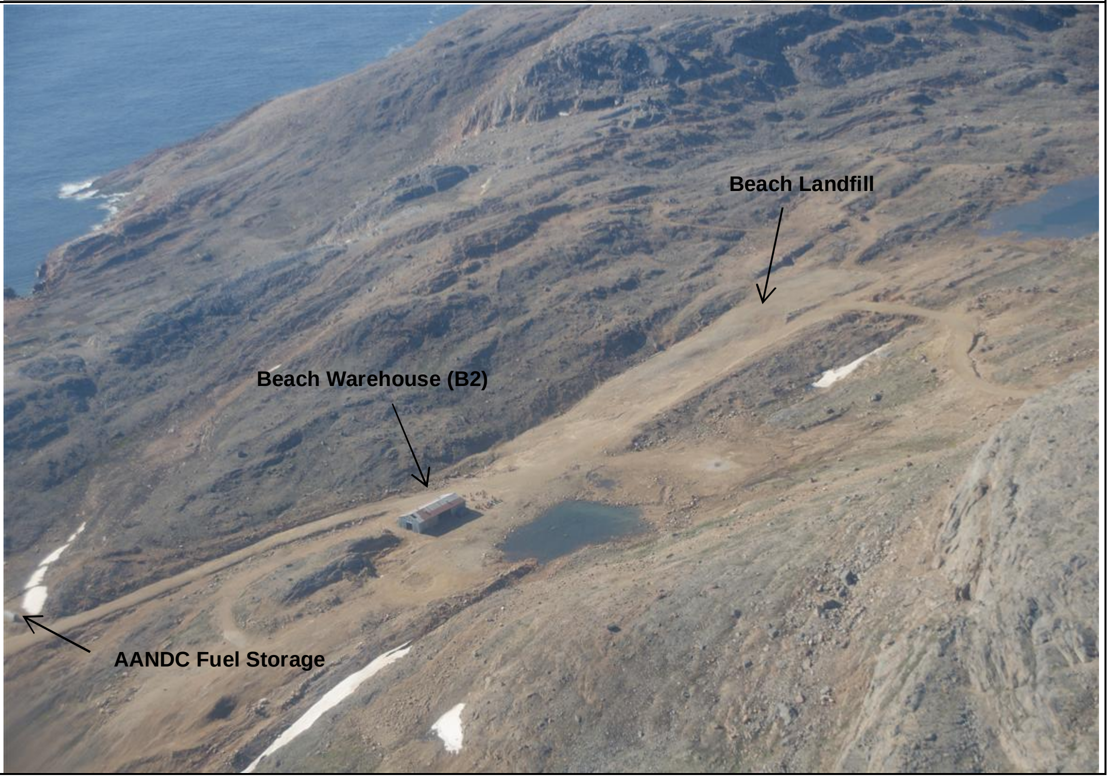
Photo No.	Date:
8	14/08/2013

Photo File Name:

DSC_1383

Description:

Aerial photograph of the Beach Area, looking south.



C.2 PCB Barriers

PHOTOGRAPHIC RECORD

Site Name: PCB Barriers	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 1

Date: 20/08/2013

Photo File Name:

DSC_1537

Description:

Furniture Dump PCB Barrier – Looking northeast at permeable reactive barrier located at cliff edge.

Photo No. 2

Date: 20/08/2013

Photo File Name:

DSC_1542

Description:

Furniture Dump PCB Barrier – Looking northeast at sediment trap upgradient of permeable reactive barrier

PHOTOGRAPHIC RECORD

Site Name: PCB Barriers	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 3	**Date:** 20/08/2013

Photo File Name:

DSC03271

Description:

Furniture Dump PCB Barrier – Looking southeast at sediment trap and permeable reactive barrier

Photo No. 4	**Date:** 20/08/2013

Photo File Name:

DSC_1568

Description:

S1/S4 Valley PCB Barrier – Looking north at drainage channel upgradient of sediment trap and permeable reactive barrier

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
PCB Barriers	Resolution Island, NU	60304883

Photo No.	Date:
5	20/08/2013

Photo File Name:

DSC_1574

Description:

S1/S4 Valley PCB Barrier – Looking west at sediment trap with permeable reactive barrier at outlet

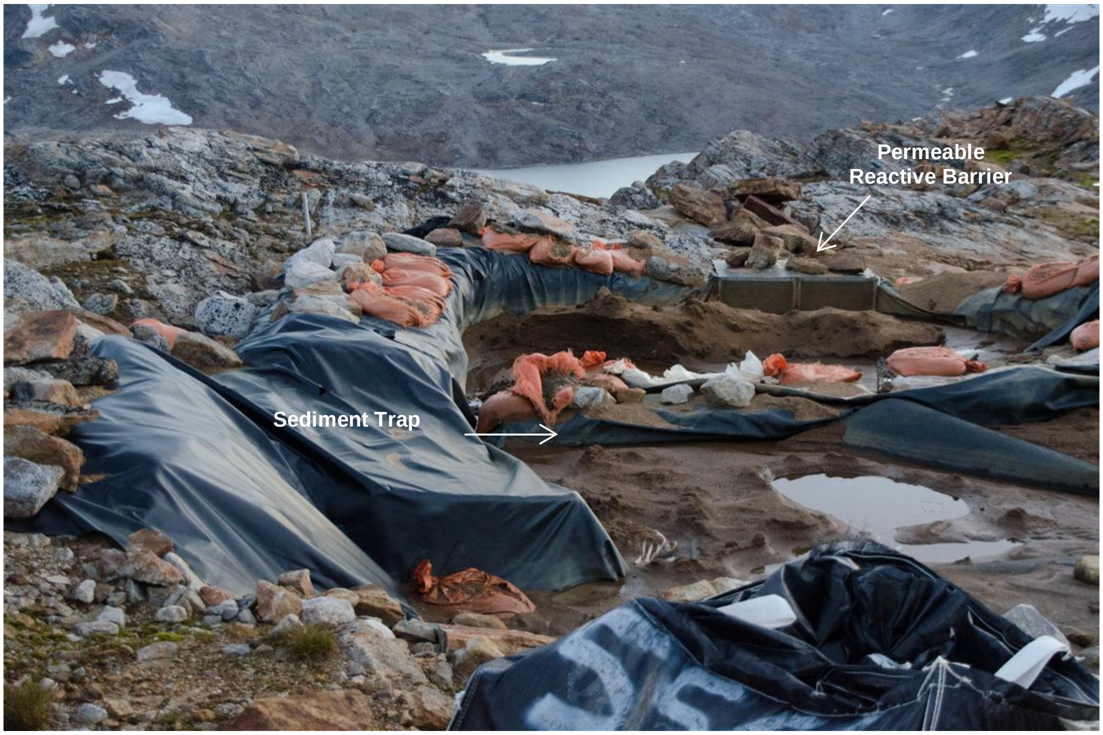


Photo No.	Date:
6	20/08/2013

Photo File Name:

DSC_1576

Description:

S1/S4 Valley PCB Barrier – Looking northwest at sediment trap and gabion basket erosion control

PHOTOGRAPHIC RECORD

Site Name: PCB Barriers	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
7	20/08/2013

Photo File Name:

DSC_1571

Description:

S1/S4 Valley PCB Barrier – Looking northwest at sediment trap and gabion basket erosion control

Photo No.	**Date:**
8	20/08/2013

Photo File Name:

DSC_1583

Description:

S1/S4 Valley PCB Barrier – Looking southwest at sediment traps

C.3 Camp Landfill

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Camp Landfill – Geotechnical Assessment	Resolution Island, NU	60304883

Photo No. 1

Date: 17/08/2013

Photo File Name:

DSC_1411

Description:

Looking southwest at the west portion of the Camp Landfill, taken from north of the landfill.

Photo No. 2

Date: 17/08/2013

Photo File Name:

DSC_1446

Description:

Looking west at east toe of slope, taken from beyond the east toe of the landfill. The Camp Tank is visible in photo right.

PHOTOGRAPHIC RECORD

Site Name:
Camp Landfill

Site Location:
Resolution Island, NU

Project No.
60304883

Photo No. 3

Date: 17/08/2013

Photo File Name:

DSC_1447

Description:

Looking southwest at east toe of the landfill, taken from beyond east toe of landfill.

Photo No. 4

Date: 17/08/2013

Photo File Name:

DSC_1448

Description:

Looking north at the eastern portion of the south toe of the landfill, taken from south of the landfill toe.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Camp Landfill	Resolution Island, NU	60304883

Photo No. 5 **Date:** 17/08/2013

Photo File Name:

DSC_1452

Description:

Looking east at the eastern portion of the south toe of the landfill, taken from south of the landfill toe.

Photo No. 6 **Date:** 17/08/2013

Photo File Name:

DSC_1453

Description:

Looking east at the eastern portion of the south toe of the landfill, taken from south of the landfill toe. Zooming in on Photo 5.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Camp Landfill	Resolution Island, NU	60304883

Photo No.	Date:
7	17/08/2013

Photo File Name:

DSC_1454

Description:

Looking west along the south toe of the landfill, taken from south of the landfill toe. Wood crates containing metallic items, likely associated with SRR facility upgrades, are being stored on the surface of the Camp Landfill.

Photo No.	Date:
8	17/08/2013

Photo File Name:

DSC_1457

Description:

Looking northwest towards west portion of the Camp Landfill, taken from south of the landfill toe.

PHOTOGRAPHIC RECORD

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 9	**Date:** 17/08/2013

Photo File Name:

DSC_1458

Description:

Looking northwest towards the west portion of the Camp Landfill, taken from south of the landfill toe.

Photo No. 10	**Date:** 17/08/2013

Photo File Name:

DSC_1460

Description:

Looking south towards drainage between rock and concrete foundation near billboard antenna, taken near the south toe of the west portion of the landfill.

PHOTOGRAPHIC RECORD

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 11	**Date:** 17/08/2013

Photo File Name:

DSC_1461

Description:

Looking northeast at west portion of landfill with sinkhole area in foreground, taken near the southwest landfill toe

Photo No. 12	**Date:** 17/08/2013

Photo File Name:

DSC_1469

Description:

Looking east along bedrock area north of landfill, taken near the northwest landfill toe.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Camp Landfill	Resolution Island, NU	60304883

Photo No. 13 **Date:** 17/08/2013

Photo File Name:

DSC_1471

Description:

Looking southeast across landfill with sinkhole in foreground, taken near the northwest landfill toe.

Photo No. 14 **Date:** 17/08/2013

Photo File Name:

DSC_1474

Description:

Looking southwest across landfill where drainage channel forms, taken from north side of landfill surface.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Camp Landfill	Resolution Island, NU	60304883

Photo No.	Date:
15	17/08/2013

Photo File Name:

DSC_1475

Description:

Looking northwest towards surface north of landfill area, taken from north side of landfill surface.

Photo No.	Date:
16	17/08/2013

Photo File Name:

DSC_1476

Description:

Looking north towards surface north of landfill area, taken from north side of landfill surface.

PHOTOGRAPHIC RECORD

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
17	17/08/2013

Photo File Name:

DSC_1477

Description:

Looking east towards surface north of landfill area, taken from north side of landfill surface.

Photo No.	**Date:**
18	17/08/2013

Photo File Name:

DSC03071

Description:

Looking east across the Camp Landfill, taken west of the landfill.

PHOTOGRAPHIC RECORD

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
19	17/08/2013

Photo File Name:

DSC03079

Description:

Looking north at south toe of east portion of the Camp Landfill.

Photo No.	**Date:**
20	17/08/2013

Photo File Name:

DSC03087

Description:

Looking northeast across east portion of Camp Landfill cap. Sinkhole visible in foreground.

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
21	17/08/2013

Photo File Name:

DSC_1462

Description:

Looking northeast at west landfill lobe with sinkhole area in foreground, taken near the southwest landfill toe.

Photo No.	**Date:**
22	17/08/2013

Photo File Name:

DSC_1463

Description:

Looking north at west landfill toe with area of staining and poor drainage, taken near the southwest landfill toe.

PHOTOGRAPHIC RECORD

Site Name: Camp Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 23	**Date:** 19/08/2013

Photo File Name:

DSC03178

Description:

Looking east at west landfill toe with area of staining and poor drainage.

Photo No.	**Date:**

Photo File Name:

Description:

C.4 PCL Dump and Drainage

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
PCL Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
1	17/08/2013

Photo File Name:

DSC_1414

Description:

Looking north at lower lobe of PCL Dump

Photo No.	Date:
2	17/08/2013

Photo File Name:

DSC_1415

Description:

Looking northwest at PCL Dump, taken from the main drainage path

PHOTOGRAPHIC RECORD

Site Name:	**Site Location:**	**Project No.**
PCL Dump and Drainage	Resolution Island, NU	60304883

Photo No. 3

Date: 17/08/2013

Photo File Name:

DSC_1417

Description:

Looking west at south section of the PCL Dump (lower lobe), taken from the main drainage path

Photo No. 4

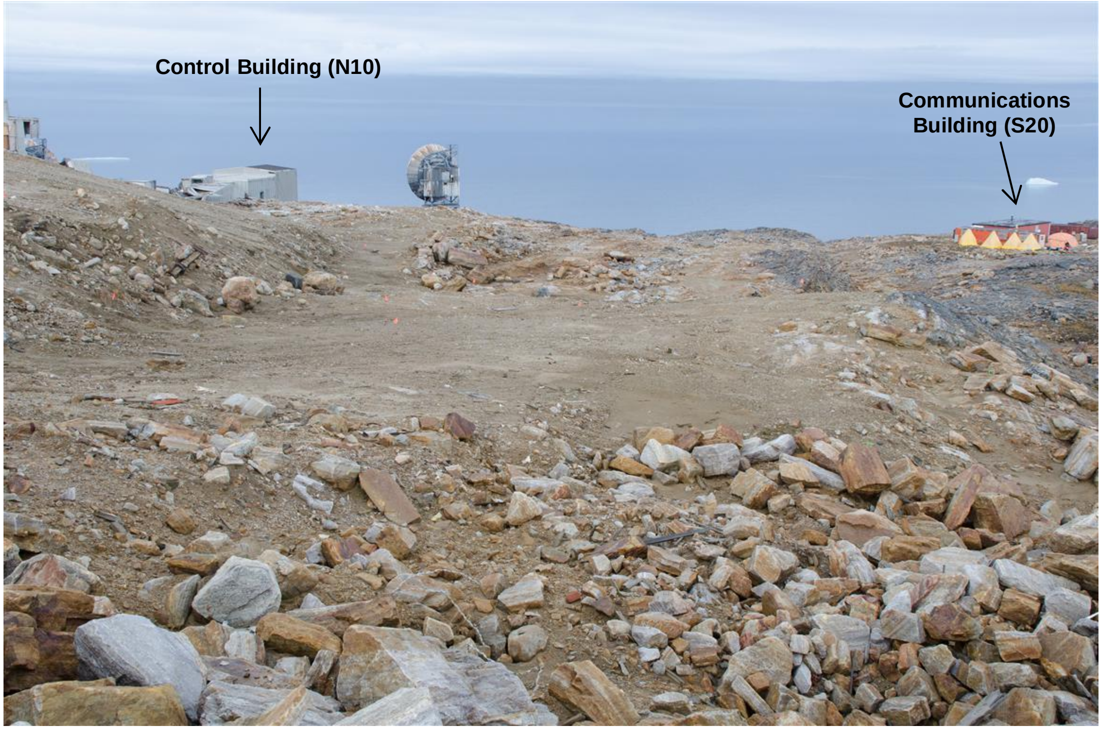
Date: 17/08/2013

Photo File Name:

DSC_1419

Description:

Looking northeast at south section (lower lobe) of PCL Dump, taken from south of dump after anomaly flagging



PHOTOGRAPHIC RECORD

Site Name: PCL Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
5	17/08/2013

Photo File Name:

DSC_1421

Description:

Looking north at sloped section of PCL Dump, taken from south section (lower lobe) after anomaly flagging

Photo No.	**Date:**
6	17/08/2013

Photo File Name:

DSC_1423

Description:

Looking down at eroded section of PCL Dump, taken from upslope

PHOTOGRAPHIC RECORD

Site Name:
PCL Dump and Drainage

Site Location:
Resolution Island, NU

Project No.
60304883

Photo No. 7

Date: 17/08/2013

Photo File Name:

DSC_1424

Description:

Looking northeast at erosion channels, taken from upslope

Photo No. 8

Date: 17/08/2013

Photo File Name:

DSC_1428

Description:

Looking northwest at erosion channels on sloped section of PCL Dump, taken from downslope

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
PCL Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
9	17/08/2013

Photo File Name:

DSC_1431

Description:

Sinkhole at lower section of PCL Dump

Photo No.	Date:
10	17/08/2013

Photo File Name:

DSC_1432

Description:

Looking south at exposed debris on lower section of PCL Dump

PHOTOGRAPHIC RECORD

Site Name: PCL Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
11	17/08/2013

Photo File Name:

DSC_1438

Description:

Looking north where soil meets bedrock, taken on lower section of PCL Dump

Photo No.	**Date:**
12	17/08/2013

Photo File Name:

DSC_1443

Description:

Looking northwest at exposed slope and debris, taken below slope of north section

Site Name:	Site Location:	Project No.
PCL Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
13	17/08/2013

Photo File Name:

DSC_1440

Description:

Looking east at downstream drainage, taken on lower section

Photo No.	Date:
14	17/08/2013

Photo File Name:

DSC_1441

Description:

Looking south at exposed debris, taken below slope of north section

PHOTOGRAPHIC RECORD

Site Name: PCL Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 15 **Date:** 17/08/2013

Photo File Name:

DSC_1442

Description:

Looking north along exposed slope, taken below slope of north section

Photo No. 16 **Date:** 17/08/2013

Photo File Name:

DSC_1445

Description:

Looking southwest at access road, exposed slope and debris associated with the PCL Dump. Photo taken below slope of the north section

PHOTOGRAPHIC RECORD

Site Name: PCL Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
17	17/08/2013

Photo File Name:

DSC03354

Description:

Soil sample collected from main drainage channel. Low volume of soil present in channel is indicative of previous excavation activities.

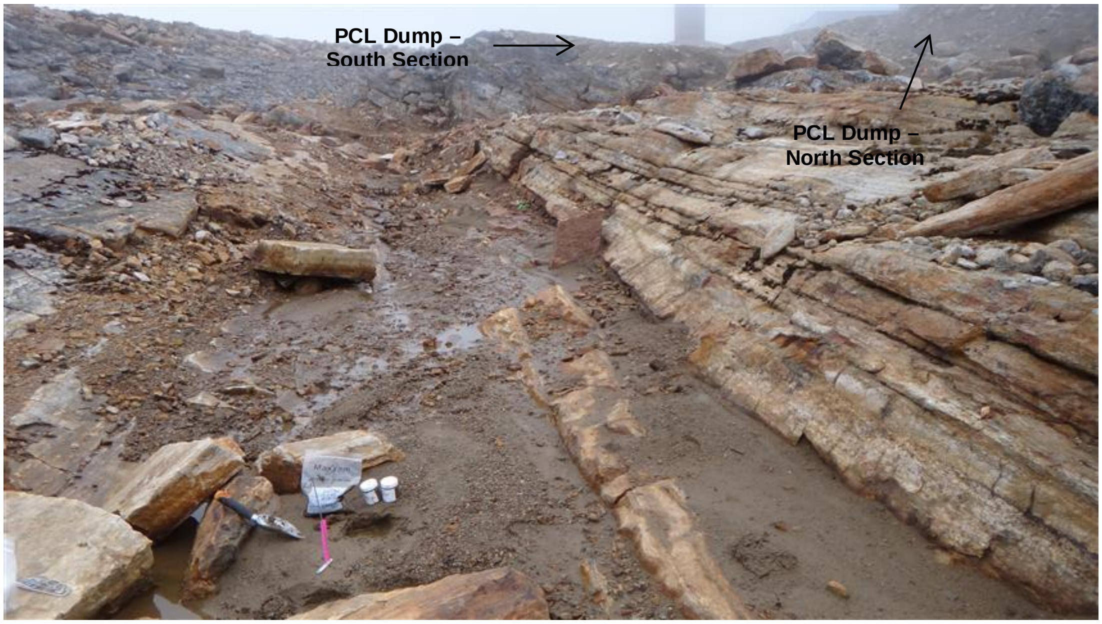


Photo No.	**Date:**
18	19/08/2013

Photo File Name:

DSC03192

Description:

Looking west along drainage channel

C.5 North Slope Dump and Drainage

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
1	17/08/2013

Photo File Name:

DSC03129

Description:

Looking west at toe of south-most portion of North Slope Dump

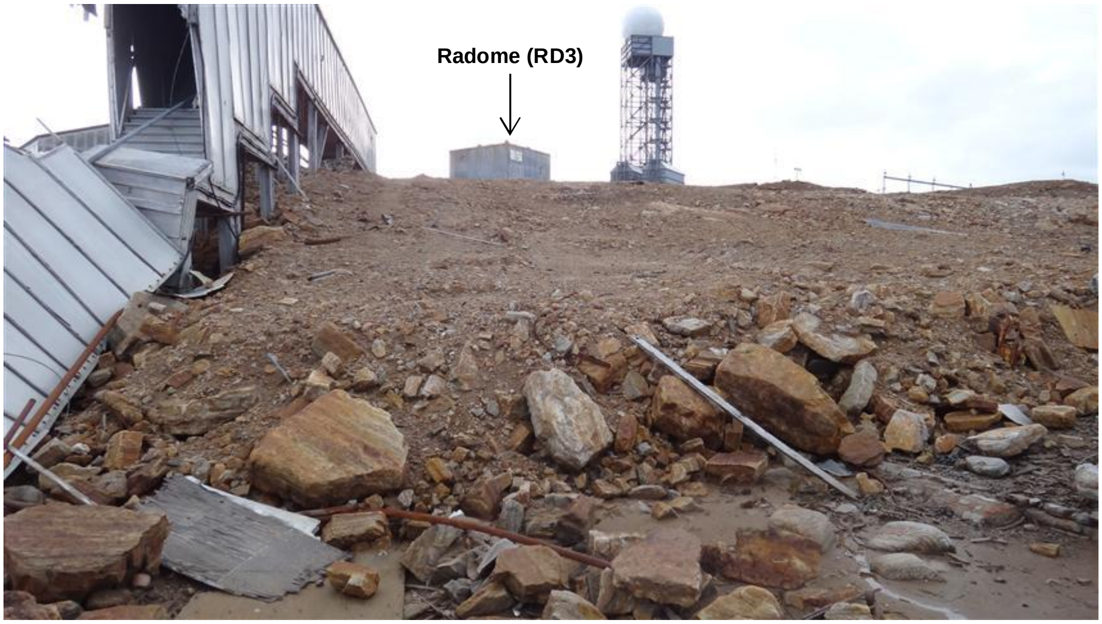


Photo No.	Date:
2	17/08/2013

Photo File Name:

DSC03131

Description:

Looking west at toe of southern portion of North Slope Dump

PHOTOGRAPHIC RECORD

Site Name: North Slope Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 3	**Date:** 17/08/2013

Photo File Name:

DSC03107

Description:

Looking south along toe of southern portion of North Slope Dump. Taken from the same location as Photo No. 3

Photo No. 4	**Date:** 17/08/2013

Photo File Name:

DSC03139

Description:

Looking south along toe of North Slope Dump. Miscellaneous metal debris visible

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
5	17/08/2013

Photo File Name:

DSC03109

Description:

Looking west at toe of central portion of North Slope Dump

Photo No.	Date:
6	17/08/2013

Photo File Name:

DSC03141

Description:

Looking southwest at toe of central portion of North Slope Dump. Miscellaneous metal and wood debris is visible in foreground

PHOTOGRAPHIC RECORD

Site Name: North Slope Dump and Drainage	Site Location: Resolution Island, NU	Project No. 60304883

Photo No. 7

Date: 17/08/2013

Photo File Name:

DSC03111

Description:

Looking northwest at toe of northern section of North Slope Dump

Photo No. 8

Date:

Photo File Name:

DSC03114

Description:

Looking southwest at northern section of North Slope Dump

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
9	17/08/2013

Photo File Name:

DSC03145

Description:

Looking northwest at northern section of North Slope Dump

Photo No.	Date:
10	17/08/2013

Photo File Name:

DSC03146

Description:

Looking northwest along northern portion of North Slope Dump

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
11	17/08/2013

Photo File Name:

DSC03115

Description:

Looking west along toe of north-most potion of North Slope Dump. POL stain visible adjacent to edge of fill

Photo No.	Date:
12	17/08/2013

Photo File Name:

DSC03157

Description:

Looking south along top of slope , taken from central section of North Slope Dump

PHOTOGRAPHIC RECORD

Site Name:
North Slope Dump and Drainage

Site Location:
Resolution Island, NU

Project No.
60304883

Photo No. 13

Date: 22/08/2013

Photo File Name:

DSC_1717

Description:

Looking north along crest of south section of dump at partially buried metal cable (near WP#64)

Photo No. 14

Date: 22/08/2013

Photo File Name:

DSC_1722

Description:

Sinkhole in south section of North Slope Dump (WP#068)

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
15	22/08/2013

Photo File Name:

DSC_1730

Description:

Erosion channels in central section of North Slope Dump (WP#074)

Photo No.	Date:
16	22/08/2013

Photo File Name:

DSC_1735

Description:

Evidence of erosion in central section of North Slope Dump (WP#076)

PHOTOGRAPHIC RECORD

Site Name: North Slope Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
17	22/08/2013

Photo File Name:

DSC_1736

Description:

Evidence of erosion, settlement and subsequent slope failure in central section of North Slope Dump (WP#078)

Photo No.	**Date:**
18	22/08/2013

Photo File Name:

DSC_1737

Description:

Evidence of erosion, settlement and subsequent slope failure in central section of North Slope Dump (WP#078)

PHOTOGRAPHIC RECORD

Site Name: North Slope Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
19	22/08/2013

Photo File Name:

DSC_1744

Description:

Multiple erosion channels in central section of North Slope Dump (betweenWP#079 andWP#080)

Photo No.	**Date:**
20	22/08/2013

Photo File Name:

DSC_1747

Description:

Large sinkhole near boulder on surface of central section of North Slope Dump (WP#084)

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
21	22/08/2013

Photo File Name:

DSC_1776

Description:

Sinkhole in north section of North Slope Dump (WP#116)

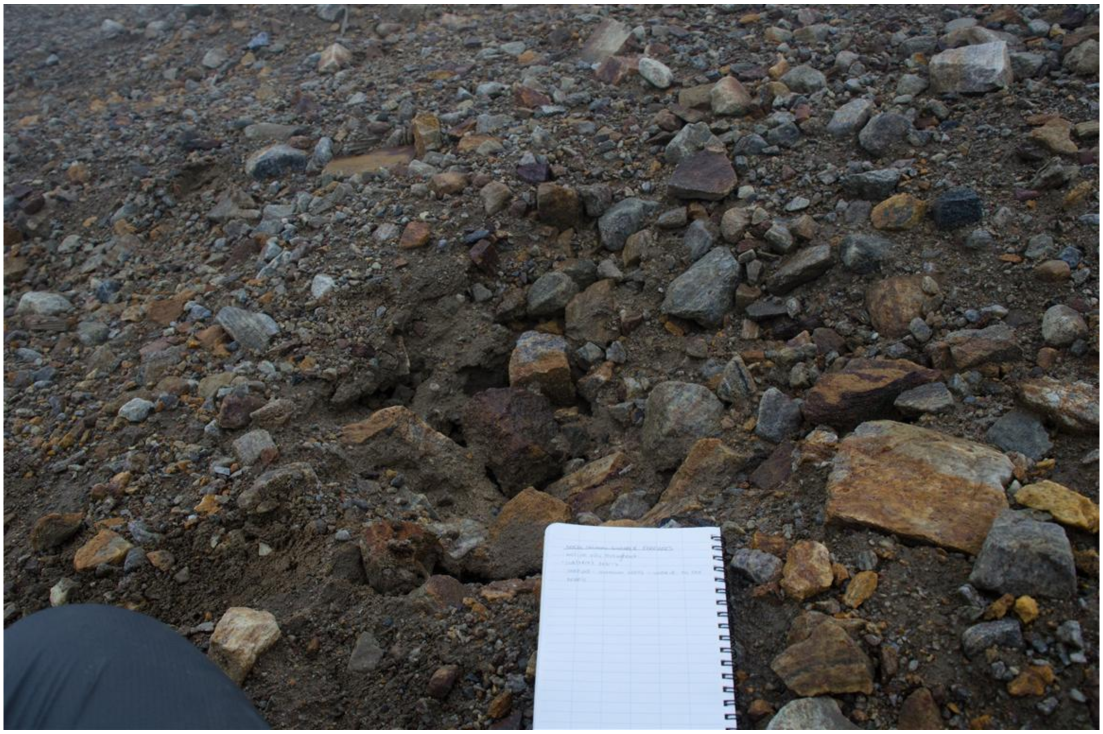


Photo No.	Date:
22	22/08/2013

Photo File Name:

DSC_1777

Description:

Sinkhole in north section of North Slope Dump (WP#118)

Site Name: North Slope Dump and Drainage	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 23 **Date:** 22/08/2013

Photo File Name:

DSC_1778

Description:

Large settlement area in north section of North Slope Dump (WP#119 toWP#120)

Photo No. 24 **Date:** 22/08/2013

Photo File Name:

DSC_1780

Description:

Large sinkhole in north section of North Slope Dump (WP#12)

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
North Slope Dump and Drainage	Resolution Island, NU	60304883

Photo No.	Date:
25	17/08/2013

Photo File Name:

DSC03128

Description:

Area of small pieces of wood debris located downslope of central portion of North Slope Dump

Photo No.	Date:
26	22/08/2013

Photo File Name:

DSC03385

Description:

Looking southwest at one of the environmental sample locations at the North Slope Dump, near the dish adjacent to the Control Building (N10)

PHOTOGRAPHIC RECORD

Site Name:
North Slope Dump and Drainage

Site Location:
Resolution Island, NU

Project No.
60304883

Photo No. 27

Date: 22/08/2013

Photo File Name:

DSC03390

Description:

Looking west at one of the environmental sample locations at the North Slope Dump, collected from a significant sediment deposit downgradient of the dump

Photo No.

Date:

Photo File Name:

Description:

C.6 SRR Construction Landfill

PHOTOGRAPHIC RECORD

Site Name: SRR Construction Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
1	22/08/2013

Photo File Name:

DSC03391

Description:

Looking south at the SRR Construction Landfill.

Photo No.	**Date:**
2	22/08/2013

Photo File Name:

DSC03393

Description:

Looking south at the "ramp" portion of the SRR Construction Landfill. The lathe near photo centre indicates the DND reserve boundary as per the available legal survey.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
SRR Construction Landfill	Resolution Island, NU	60304883

Photo No.	Date:
3	22/08/2013

Photo File Name:

DSC03394

Description:

Looking southwest at SRR Construction Landfill. Staining visible on photo right.

Photo No.	Date:
4	22/08/2013

Photo File Name:

DSC03401

Description:

Looking southeast at ramp portion of SRR Construction Landfill. Note staining throughout the disturbed area.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
SRR Construction Landfill	Resolution Island, NU	60304883

Photo No. 5 **Date:** 22/08/2013

Photo File Name:

DSC03398

Description:

Looking south at eastern portion of landfill.

Photo No. 6 **Date:** 22/08/2013

Photo File Name:

DSC03399

Description:

Looking southwest at western portion of landfill.

PHOTOGRAPHIC RECORD

Site Name: SRR Construction Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
7	22/08/2013

Photo File Name:

DSC03490

Description:

Looking south at erosional feature on “ramp” portion of the SRR Construction Landfill.

Photo No.	**Date:**
8	22/08/2013

Photo File Name:

DSC03492

Description:

Looking southwest at the granular cover of the SRR Construction Landfill. Cover consists primarily of large cobbles/boulders with some finer granular materials placed on the top and upper portion of the slope.

PHOTOGRAPHIC RECORD

Site Name: SRR Construction Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 9	**Date:** 22/08/2013	
Photo File Name: DSC03496		
Description: Example of partially buried wood debris in the landfill cover.		
Photo No. 10	**Date:** 22/08/2013	
Photo File Name: DSC03500		
Description: Example of partially buried metal debris in the landfill cover.		

PHOTOGRAPHIC RECORD

Site Name: SRR Construction Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
11	22/08/2013

Photo File Name:

DSC03506

Description:

Sinkhole on landfill surface indicates presence of large void spaces due to uncompacted debris

Photo No.	**Date:**
12	22/08/2013

Photo File Name:

DSC03510

Description:

Looking east at surficial debris on landfill slope.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
SRR Construction Landfill	Resolution Island, NU	60304883

Photo No.	Date:
13	22/08/2013

Photo File Name:

DSC03513

Description:

Typical cover material on landfill slope.

Photo No.	Date:
14	22/08/2013

Photo File Name:

DSC03521

Description:

Example of void spaces within the SRR Construction Landfill. Large pieces of metal debris are evident throughout.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
SRR Construction Landfill	Resolution Island, NU	60304883

Photo No.	Date:
15	22/08/2013

Photo File Name:

DSC03525

Description:

Looking south at tank at base of landfill slope.

Photo No.	Date:
16	22/08/2013

Photo File Name:

DSC03526

Description:

Looking east at partially buried pipe near base of landfill slope.

C.7 Maintenance Dump

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Maintenance Dump	Resolution Island, NU	60304883

Photo No.	Date:
1	20/08/2013

Photo File Name:

DSC03199

Description:

Looking southeast at East Lobe of Maintenance Dump.

Photo No.	Date:
2	20/08/2013

Photo File Name:

DSC03201

Description:

Looking south west at Maintenance Dump area.

PHOTOGRAPHIC RECORD

Site Name: Maintenance Dump	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
3	20/08/2013

Photo File Name:

DSC_1670

Description:

Looking south at East Lobe of Maintenance Landfill, taken from north bedrock ridge.

Photo No.	**Date:**
4	20/08/2013

Photo File Name:

DSC_1672

Description:

Looking west at Maintenance Dump area, taken from on north bedrock ridge.

PHOTOGRAPHIC RECORD

Site Name: Maintenance Dump	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
5	20/08/2013

Photo File Name:

DSC_1674

Description:

Looking northeast at primary anomaly at the East Lobe of the Maintenance Dump (MD-Upper).

Photo No.	**Date:**
6	20/08/2013

Photo File Name:

DSC_1676

Description:

Looking east at East Lobe of Maintenance Dump.

PHOTOGRAPHIC RECORD

Site Name: Maintenance Dump	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
7	20/08/2013

Photo File Name:

DSC_1691

Description:

Looking southeast below East Lobe of Maintenance Dump.

Photo No.	**Date:**
8	20/08/2013

Photo File Name:

DSC_1692

Description:

Looking east at East Lobe of Maintenance Dump.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Maintenance Dump	Resolution Island, NU	60304883

Photo No.	Date:
9	20/08/2013

Photo File Name:

DSC_1693

Description:

Looking west at West Lobe of Maintenance Dump, taken from bedrock east of West Lobe.

Photo No.	Date:
10	20/08/2013

Photo File Name:

DSC_1695

Description:

Looking north at West Lobe of Maintenance Dump.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Maintenance Dump	Resolution Island, NU	60304883

Photo No. 11
Date: 20/08/2013

Photo File Name:

DSC_1698

Description:

Exposed debris and non-compacted slope of West Lobe.

Photo No. 12
Date: 20/08/2013

Photo File Name:

DSC_1699

Description:

Exposed debris at the West Lobe.

PHOTOGRAPHIC RECORD

Site Name: Maintenance Dump	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 13	**Date:** 20/08/2013	
Photo File Name: DSC_1700		
Description: Looking west at the south extent of the West Lobe taken from immediately east of West Lobe of Maintenance Dump. Photo 20 to 22 are panning from west to north.		
Photo No. 14	**Date:** 20/08/2013	
Photo File Name: DSC_1701		
Description: Looking northwest at the West Lobe taken from immediately east of West Lobe of Maintenance Dump. Photo 20 to 22 are panning from west to north.		

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Maintenance Dump	Resolution Island, NU	60304883

Photo No.	Date:
15	20/08/2013

Photo File Name:

DSC_1702

Description:

Looking north at the north extent of the West Lobe taken from immediately east of West Lobe of Maintenance Dump.

Photo 20 to 22 are panning from west to north.

Photo No.	Date:
16	20/08/2013

Photo File Name:

DSC_1705

Description:

Looking north at exposed debris associated with West Lobe of Maintenance Dump, taken from south of West Lobe.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Maintenance Dump	Resolution Island, NU	60304883

Photo No.	Date:
17	20/08/2013

Photo File Name:

DSC_1706

Description:

Looking east at West Lobe, taken from northwest corner of anomaly in heavily vegetated area.

Photo No.	Date:
18	20/08/2013

Photo File Name:

DSC_1709

Description:

Looking east at the West Lobe from near MW-22.

C.8 Airstrip Dump

PHOTOGRAPHIC RECORD

Site Name: Airstrip Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 1

Date: 23/08/2013

Photo File Name:

DSC_1848

Description:

Looking west at south lobe of landfill identified in 2012 after geophysical anomaly flagging.

Photo No. 2

Date: 23/08/2013

Photo File Name:

DSC_1850

Description:

Exposed debris on the surface of the south lobe of the Airstrip Landfill.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Airstrip Landfill	Resolution Island, NU	60304883

Photo No.	Date:
3	23/08/2013

Photo File Name:

DSC_1860

Description:

Looking southeast at southwest edge of the west side of the Airstrip Landfill. Photos 3 to 6 are taken as a panoramic from the southeast to the north.

Photo No.	Date:
4	23/08/2013

Photo File Name:

DSC_1861

Description:

Looking east at southern portion of the west side of the Airstrip Landfill cap.

PHOTOGRAPHIC RECORD

Site Name: Airstrip Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 5	**Date:** 23/08/2013	
Photo File Name: DSC_1862		
Description: Looking northeast at west side of the Airstrip Landfill.		
Photo No. 6	**Date:** 23/08/2013	
Photo File Name: DSC_1863		
Description: Looking north at the west side of the Airstrip Landfill.		

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Airstrip Landfill	Resolution Island, NU	60304883

Photo No. 7	**Date:** 23/08/2013
Photo File Name: DSC_1873	
Description: Looking west at northwest portion of the Airstrip Landfill. Photos 7 to 10 are taken as a panoramic from the west to the east.	

Photo No. 8	**Date:** 23/08/2013
Photo File Name: DSC_1874	
Description: Looking south at the north side of the Airstrip Landfill.	

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Airstrip Landfill	Resolution Island, NU	60304883

Photo No.	Date:
9	23/08/2013

Photo File Name:

DSC_1875

Description:

Looking southwest at the northwest portion of the Airstrip Landfill. Note area of lush vegetation.

Photo No.	Date:
10	23/08/2013

Photo File Name:

DSC_1876

Description:

Looking west at the northwest portion of the Airstrip Landfill.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Airstrip Landfill	Resolution Island, NU	60304883

Photo No. 11 **Date:** 23/08/2013

Photo File Name:

DSC_1883

Description:

Looking west at north portion of the Airstrip Landfill. Photos 11 to 15 are taken as a panoramic from the west to the east.

Photo No. 12 **Date:** 23/08/2013

Photo File Name:

DSC_1884

Description:

Looking west at steep north toe of Airstrip Landfill.

PHOTOGRAPHIC RECORD

Site Name: Airstrip Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
13	23/08/2013

Photo File Name:

DSC_1885

Description:

Looking southwest at the eastern portion of the Airstrip Landfill.

Photo No.	**Date:**
14	23/08/2013

Photo File Name:

DSC_1886

Description:

Looking south at the east-most portion of the Airstrip landfill. Access Road visible on photo left.

C.9 Beach Landfill

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Beach Landfill	Resolution Island, NU	60304883

Photo No.	Date:
1	22/08/2013

Photo File Name:

DSC_1383

Description:

Aerial photo of the Beach Landfill

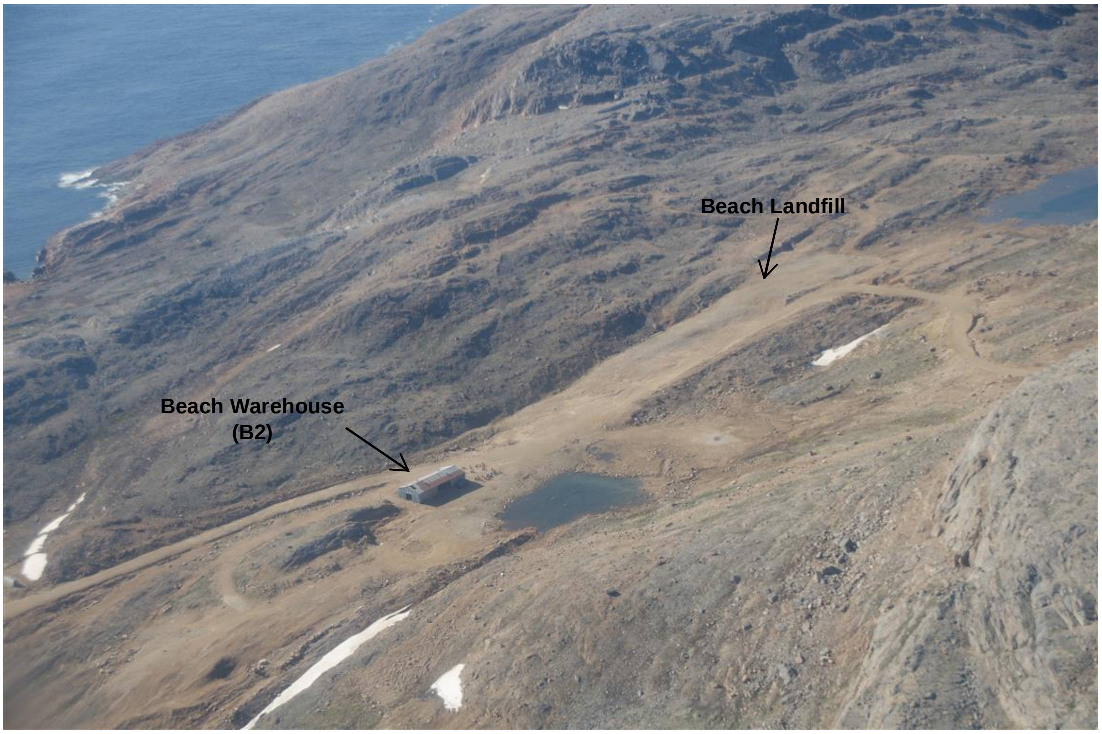


Photo No.	Date:
2	22/08/2013

Photo File Name:

DSC_1384

Description:

Aerial photo of the Beach Landfill

PHOTOGRAPHIC RECORD

AECOM

Site Name:	Site Location:	Project No.
Beach Landfill	Resolution Island, NU	60304883

Photo No.	Date:
3	22/08/2013

Photo File Name:

DSC03453

Description:

Looking east at west toe of the Beach Landfil

Photo No.	Date:
4	22/08/2013

Photo File Name:

DSC03460

Description:

Looking east at several sinkholes on the eastern portion of the landfill cap

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Beach Landfill	Resolution Island, NU	60304883

Photo No.	Date:
5	22/08/2013

Photo File Name:

DSC03462

Description:

Partially exposed drum at the eastern toe of the landfill

Photo No.	Date:
6	22/08/2013

Photo File Name:

DSC03463

Description:

Looking east at the drainage channel downgradient of the east toe of the landfill

PHOTOGRAPHIC RECORD

Site Name: Beach Landfill	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 7	**Date:** 22/08/2013	
Photo File Name: DSC03465		
Description: Looking west at the drainage channel downgradient of the east toe of the landfill		

Photo No. 8	**Date:** 22/08/2013	
Photo File Name: DSC03466		
Description: Looking west at the re-vegetation on the eastern portion of landfill cap		

C.10 Beach Fuel Tanks

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Beach Fuel Tanks	Resolution Island, NU	60304883

Photo No.	Date:
1	22/08/2013

Photo File Name:

DSC03405

Description:

Looking south at the beach fuel tanks. The DND fuel storage facility is visible in photo left. The AANDC fuel storage facility is visible in photo right.

Photo No.	Date:
2	22/08/2013

Photo File Name:

DSC03407

Description:

Looking along north side of AANDC fuel storage facility.

PHOTOGRAPHIC RECORD

Site Name: Beach Fuel Tanks	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
3	22/08/2013

Photo File Name:

DSC03426

Description:

Sample 13-262 collected at same location as ESG sample tag #29704 located near valve on southeast corner of tank #1 (east-most tank).

Photo No.	**Date:**
4	22/08/2013

Photo File Name:

DSC03410

Description:

Looking at south side of AANDC fuel storage facility.

PHOTOGRAPHIC RECORD

Site Name: Beach Fuel Tanks	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
5	22/08/2013

Photo File Name:

DSC03413

Description:

Looking at north side of AANDC fuel storage facility.

Photo No.	**Date:**
6	22/08/2013

Photo File Name:

DSC03420

Description:

Looking east along south side of fuel tanks.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Beach Fuel Tanks	Resolution Island, NU	60304883

Photo No.	Date:
7	22/08/2013

Photo File Name:

DSC03422

Description:

Looking east along north side of fuel tanks.

Photo No.	Date:
8	22/08/2013

Photo File Name:

DSC03426

Description:

Sample 13-263 collected at same location as ESG sample tag #29702 in between tank #7 and tank #8 (west-most tank)

C.11 Demolition & Hazardous Waste Audit

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	Date:
1	19/08/2013

Photo File Name:

P1040371

Description:

Looking northeast at billboard antennas and circular dishes at the Station Area.

Photo No.	Date:
2	19/08/2013

Photo File Name:

P1040374

Description:

Typical concrete footing of the billboard antennas.

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
3	19/08/2013

Photo File Name:

P1040376

Description:

Looking at the west side of one of the billboard antennas at the station area.

Photo No.	**Date:**
4	19/08/2013

Photo File Name:

P1040382

Description:

Looking south at circular dishes west of east billboard antenna.

PHOTOGRAPHIC RECORD

AECOM

Site Name:	**Site Location:**	**Project No.**
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	**Date:**
5	19/08/2013

Photo File Name:

P1040385

Description:

Looking southwest at circular dish west of east billboard antenna.

Photo No.	**Date:**
6	19/08/2013

Photo File Name:

P1040387

Description:

Downed circular dish located west of west billboard antenna.

PHOTOGRAPHIC RECORD

Site Name:	**Site Location:**	**Project No.**
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	**Date:**
7	19/08/2013

Photo File Name:

P1040390

Description:

Downed circular dish located west of west billboard antenna.

Photo No.	**Date:**
8	19/08/2013

Photo File Name:

P1040505

Description:

Looking north at the Monitoring Camp Shed (adjacent to S20).

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
9	19/08/2013

Photo File Name:

P1040506

Description:

Looking inside the Monitoring Camp Shed (adjacent to S20).

Photo No.	**Date:**
10	19/08/2013

Photo File Name:

P1040498

Description:

Concrete foundation located north of Radome Building (RD3).

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
11	19/08/2013

Photo File Name:

P1040499

Description:

Concrete foundation located north of Radome Building (RD3).

Photo No.	**Date:**
12	19/08/2013

Photo File Name:

P1040366

Description:

Looking west at building S9 of the Officer’s Quarters and Mess.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No. 13	**Date:** 19/08/2013	
Photo File Name: P1040311		
Description: Interior of building S9.		
Photo No. 14	**Date:** 19/08/2013	
Photo File Name: P1040328		
Description: Interior of building S9.		

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
15	19/08/2013

Photo File Name:

P1040329

Description:

Interior of building S9.

Photo No.	**Date:**
16	19/08/2013

Photo File Name:

P20000

Description:

Looking northwest at building S9 and S10 of the Officer's Quarters and Mess. S10 is in photo left. (Photo taken from QE, 2005).

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 17	**Date:** 19/08/2013
Photo File Name: P1040335	
Description: Interior of building S10.	

Photo No. 18	**Date:** 19/08/2013
Photo File Name: P1040348	
Description: Interior of building S10.	

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	Date:
19	19/08/2013

Photo File Name:

P1040358

Description:

Interior of building S10.

Photo No.	Date:
20	19/08/2013

Photo File Name:

P1040497

Description:

Looking north at the Radome Building (RD3). Short Range Radar Station infrastructure is visible in the background.

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 21	**Date:** 19/08/2013

Photo File Name:

P1040487

Description:

Interior of the Radome Building (RD3).

Photo No. 22	**Date:** 19/08/2013

Photo File Name:

P1040496

Description:

Interior of the Radome Building (RD3).

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	Date:
23	19/08/2013

Photo File Name:

P1040428

Description:

Looking north at the Radio Hill Building

Photo No.	Date:
24	19/08/2013

Photo File Name:

P1040436

Description:

Interior of the Radio Hill Building.

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 25	**Date:** 19/08/2013

Photo File Name:

P1040437

Description:

Interior of the Radio Hill Building.

Photo No. 26	**Date:** 19/08/2013

Photo File Name:

P1040406

Description:

Looking west at the Covered Walkway (N2) connecting the top of slope to the Control Building (N10).

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No.	Date:
27	19/08/2013

Photo File Name:

P1040408

Description:

Looking northeast at Covered Walkway (N2) at the connection to the Control Building (N10).

Photo No.	Date:
28	19/08/2013

Photo File Name:

P1040409

Description:

Interior of Covered Walkway (N2).

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 29 **Date:** 19/08/2013

Photo File Name:

P1040411

Description:

Looking east at Beach Warehouse (B2).

Photo No. 30 **Date:** 19/08/2013

Photo File Name:

P1040412

Description:

Looking north at the interior of the Beach Warehouse (B2).

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
31	19/08/2013

Photo File Name:

P1040418

Description:

Empty drums stored on pallets in the southeast corner of the Beach Warehouse (B2).

Photo No.	**Date:**
32	19/08/2013

Photo File Name:

P1040496

Description:

Pallets stored within the Beach Warehouse (B2).

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
33	19/08/2013

Photo File Name:

P1040500

Description:

Looking north at Monitoring Camp (S20).

Photo No.	**Date:**
34	19/08/2013

Photo File Name:

P1040503

Description:

Fuel tanks located adjacent to east side of Monitoring Camp (S20).

PHOTOGRAPHIC RECORD

Site Name:	**Site Location:**	**Project No.**
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No. 35

Date: 19/08/2013

Photo File Name:

P1040508

Description:

Interior of Monitoring Camp (S20).

Photo No. 36

Date: 19/08/2013

Photo File Name:

P1040516

Description:

Interior of Monitoring Camp (S20).

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**	
37	19/08/2013	
Photo File Name: P1040468		
Description: Building N10.		

Photo No.	**Date:**	
38	19/08/2013	
Photo File Name: P1040469		
Description: Building N10.		

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 39	**Date:** 19/08/2013	
Photo File Name: P1040471		
Description: Building N10.		

Photo No. 40	**Date:** 19/08/2013	
Photo File Name: P1040579		
Description: Looking northwest at fuel tank near Building N10. North Slope Dump visible in background.		

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
41	19/08/2013

Photo File Name:

P1040458

Description:

Interior of Building N10.

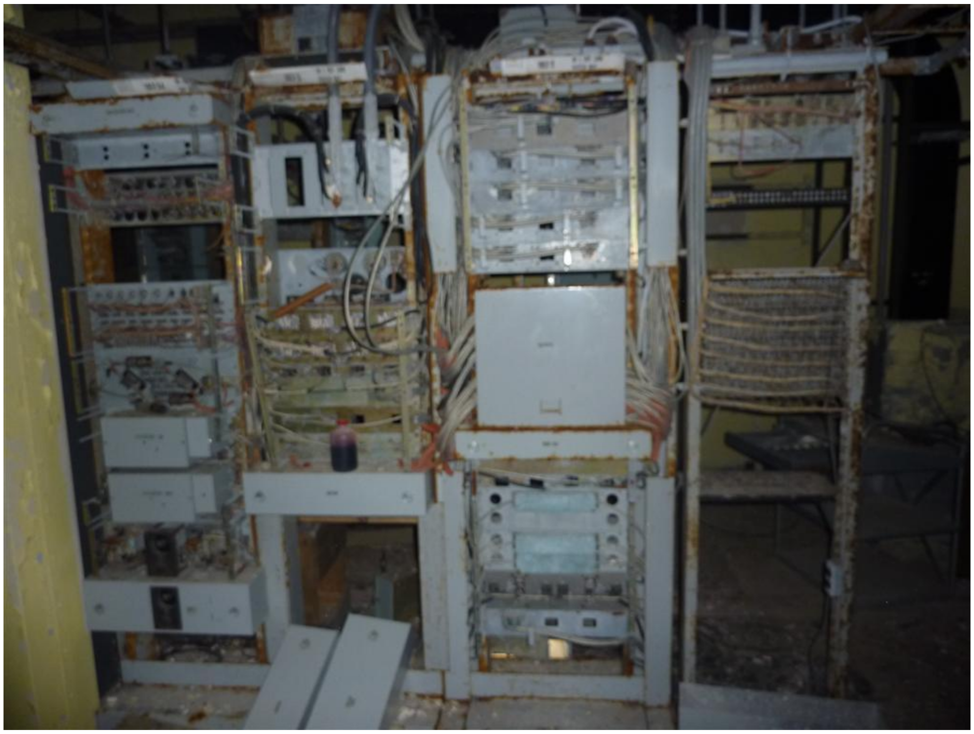
Photo No.	**Date:**
42	19/08/2013

Photo File Name:

P1040459

Description:

Interior of building north of N10.



Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
43	19/08/2013

Photo File Name:

P1040461

Description:

Interior of building north of N10.

Photo No.	**Date:**
44	19/08/2013

Photo File Name:

P1040462

Description:

Interior of building north of N10.

PHOTOGRAPHIC RECORD		
Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
45	19/08/2013

Photo File Name:

P4000

Description:

Looking southwest at the breezeway between S16 and S17 from the Radome Building (Photo taken from QE, 2005).

Photo No.	**Date:**
46	19/08/2013

Photo File Name:

P1040401

Description:

Interior of Garage Building (S18).

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Demolition and Hazardous Waste Audit	Resolution Island, NU	60304883

Photo No. 47	**Date:** 19/08/2013	
Photo File Name: P1040403		
Description: Interior of Garage Building (S18).		
Photo No. 48	**Date:** 19/08/2013	
Photo File Name: P1040398		
Description: Interior of Garage Building (S18).		

PHOTOGRAPHIC RECORD

Site Name: Demolition and Hazardous Waste Audit	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 49 **Date:** 19/08/2013 **Photo File Name:** P1040396 **Description:** Overhead furnace unit in Garage Building (S18).	
Photo No. 50 **Date:** 19/08/2013 **Photo File Name:** P3000 **Description:** Looking north at Garage Building (S18). Radome visible in photo left. (Photo taken from QE, 2005).	

C.12 Borrow Assessment

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
1	28/8/2013

Photo File Name:

DSC_1598

Description:

Lower Airstrip Borrow Area 4 – Testpitting at Lower Airstrip Borrow Area 3.

Photo No.	Date:
2	28/8/2013

Photo File Name:

DSC_1600

Description:

Lower Airstrip Borrow Area 4 – Example of granular material investigated at Lower Airstrip Borrow Area 4 (TP13-13).

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
3	28/8/2013

Photo File Name:

DSC_1605

Description:

Lower Airstrip Borrow Area 4 – Overview of Lower Airstrip Borrow Area 4, looking west. Photo taken from the northeast corner of borrow area, on the road

Photo No.	Date:
4	28/8/2013

Photo File Name:

DSC_1609

Description:

Lower Airstrip Borrow Area 4 – Overview of Lower Airstrip Borrow Area 4, looking south. Photo taken from the northeast corner of borrow area, on the road.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
5	28/8/2013

Photo File Name:

DSC_1610

Description:

Lower Airstrip Borrow Area 4 – Overview of Lower Airstrip Borrow Area 4, looking southwest. Photo taken from the east side of borrow area, on bedrock.

Photo No.	Date:
6	28/8/2013

Photo File Name:

DSC_1614

Description:

Lower Airstrip Borrow Area 4 – Overview of Lower Airstrip Borrow Area 4, looking northwest. Photo taken from east side of borrow area, on bedrock.

PHOTOGRAPHIC RECORD

Site Name: Granular Borrow Assessment	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
7	28/8/2013

Photo File Name:

DSC_1619

Description:

Freshwater Lake Borrow Area 1 – Looking at west section of borrow area, taken from north of the road.

Photo No.	**Date:**
8	28/8/2013

Photo File Name:

DSC_1621

Description:

Freshwater Lake Borrow Area 1 – Looking at west section of borrow area, taken from north of the road.

PHOTOGRAPHIC RECORD

AECOM

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
9	28/8/2013

Photo File Name:

DSC_1628

Description:

Freshwater Lake Borrow Area 1 – Looking east at borrow area, taken from material stockpile on the road.

Photo No.	Date:
10	28/8/2013

Photo File Name:

DSC_1616

Description:

Freshwater Lake Borrow Area 2 – Looking northwest at borrow area from the east side of Freshwater Lake.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
11	28/8/2013

Photo File Name:

DSC_1617

Description:

Freshwater Lake Borrow Area 2 – Looking northwest at borrow area from the east side of Freshwater Lake

Photo No.	Date:
12	28/8/2013

Photo File Name:

DSC_1636

Description:

Access Road Borrow Area 1 (Beach) – Looking southwest at borrow area. Photo taken from Upper Beach Borrow Area.

PHOTOGRAPHIC RECORD

Site Name: Granular Borrow Assessment	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
13	28/8/2013

Photo File Name:

DSC_1639

Description:

Access Road Borrow Area 1 (Beach) – Looking east at borrow area. Photo taken from Upper Beach Borrow Area.

Photo No.	**Date:**
14	28/8/2013

Photo File Name:

DSC_1655

Description:

Access Road Borrow Area 1 (Beach) – Looking north at borrow area. Photo taken from southeast corner of borrow area.

PHOTOGRAPHIC RECORD

AECOM

Site Name: Granular Borrow Assessment	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
15	28/8/2013

Photo File Name:

DSC_1622

Description:

Freshwater Lake Borrow Area 3 – Looking northwest at potential borrow area from south bedrock outcrop.

Photo No.	**Date:**
16	28/8/2013

Photo File Name:

DSC_1624

Description:

Freshwater Lake Borrow Area 3 – Looking northeast at potential borrow area from south bedrock outcrop.

PHOTOGRAPHIC RECORD

Site Name:
Granular Borrow Assessment

Site Location:
Resolution Island, NU

Project No.
60304883

Photo No.
17

Date:
28/8/2013

Photo File Name:

DSC_1490

Description:

Lower Airstrip Borrow Area 3 – Example of material encountered in Lower Airstrip Borrow Area 3

Photo No.
18

Date:
28/8/2013

Photo File Name:

DSC_1491

Description:

Lower Airstrip Borrow Area 3 – Testpitting in Lower Airstrip Borrow Area 3

PHOTOGRAPHIC RECORD

Site Name: Granular Borrow Assessment	Site Location: Resolution Island, NU	Project No. 60304883

Photo No. 19 **Date:** 28/8/2013

Photo File Name:

DSC_1493

Description:

Lower Airstrip Borrow Area 3 – Overview of borrow area, looking southwest. Photo taken from northeast corner of borrow area.

Photo No. 20 **Date:** 28/8/2013

Photo File Name:

DSC_1494

Description:

Lower Airstrip Borrow Area 3 – Overview of borrow area, looking southwest. Photo taken from northeast corner of borrow area.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
21	28/8/2013

Photo File Name:

DSC_1509

Description:

Lower Airstrip Borrow Area 3 – Overview of borrow area, looking north. Photo taken from the east side of the central portion of the borrow area.

Photo No.	Date:
22	28/8/2013

Photo File Name:

DSC_1512

Description:

Lower Airstrip Borrow Area 3 – Overview of borrow area, looking west. Photo taken from the east side of the central area of borrow area.

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
23	28/8/2013

Photo File Name:

DSC_1660

Description:

Lower Airstrip Borrow Area 5 – Looking uphill to the east portion of the borrow area (TP13-17). Photo taken from central area.

Photo No.	Date:
24	28/8/2013

Photo File Name:

DSC_1661

Description:

Lower Airstrip Borrow Area 5 – Looking north at borrow area. Photo taken from central area.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No.	Date:
25	28/8/2013

Photo File Name:

DSC_1662

Description:

Lower Airstrip Borrow Area 5 – Looking northwest at borrow area. Photo taken from central area.

Photo No.	Date:
26	28/8/2013

Photo File Name:

DSC_1664

Description:

Lower Airstrip Borrow Area 5 – Testpitting in borrow area (TP13-18).

PHOTOGRAPHIC RECORD		
Site Name: Granular Borrow Assessment	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
27	28/8/2013

Photo File Name:

DSC_1632

Description:

Upper Beach Borrow Area – Testpitting in Upper Beach Borrow Area. Photo taken looking east.

Photo No.	**Date:**
28	28/8/2013

Photo File Name:

DSC_1633

Description:

Upper Beach Borrow Area – Testpitting in Upper Beach Borrow Area. Photo taken looking north.

PHOTOGRAPHIC RECORD

Site Name:	**Site Location:**	**Project No.**
Granular Borrow Assessment	Resolution Island, NU	60304883

Photo No. 29 **Date:** 28/8/2013

Photo File Name:

DSC_1634

Description:

Upper Beach Borrow Area – Looking east at Upper Beach Borrow Area Photo taken from west side of borrow area.

Photo No. 30 **Date:** 28/8/2013

Photo File Name:

DSC_1635

Description:

Upper Beach Borrow Area – Looking southeast at Upper Beach Borrow Area Photo taken from west side of borrow area.

C.13 Proposed Landfill Locations

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Proposed Landfill Locations	Resolution Island, NU	60304883

Photo No.	Date:
1	17/08/2013

Photo File Name:

DSC03062

Description:

Proposed Landfill Location 1: Looking southwest at west portion of Camp Landfill area. See Appendix C.3 for additional photos.

Photo No.	Date:
2	17/08/2013

Photo File Name:

DSC03063

Description:

Proposed Landfill Location 1: Looking south at East portion of Camp Landfill area. See Appendix C.3 for additional photos.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Proposed Landfill Locations	Resolution Island, NU	60304883

Photo No.	Date:
3	23/08/2013

Photo File Name:

DSC_1818

Description:

Proposed Landfill Location 2: Looking east at south portion of proposed landfill location east of Tier II Disposal Facility.

Photo No.	Date:
4	23/08/2013

Photo File Name:

DSC_1819

Description:

Proposed Landfill Location 2: Looking east at proposed landfill location east of Tier II Disposal Facility.

PHOTOGRAPHIC RECORD

Site Name: Proposed Landfill Locations	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
5	23/08/2013

Photo File Name:

DSC_1820

Description:

Proposed Landfill Location 2: Looking northeast at north portion of proposed landfill location east of Tier II Disposal Facility.

Photo No.	**Date:**
6	23/08/2013

Photo File Name:

DSC_1823

Description:

Proposed Landfill Location 2: Looking west at portion of proposed landfill location that abuts Tier II Disposal Facility.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Proposed Landfill Locations	Resolution Island, NU	60304883

Photo No.	Date:
7	23/08/2013

Photo File Name:

DSC_1824

Description:

Proposed Landfill Location 2: Looking southwest at portion of proposed landfill location that abuts Tier II Disposal Facility.

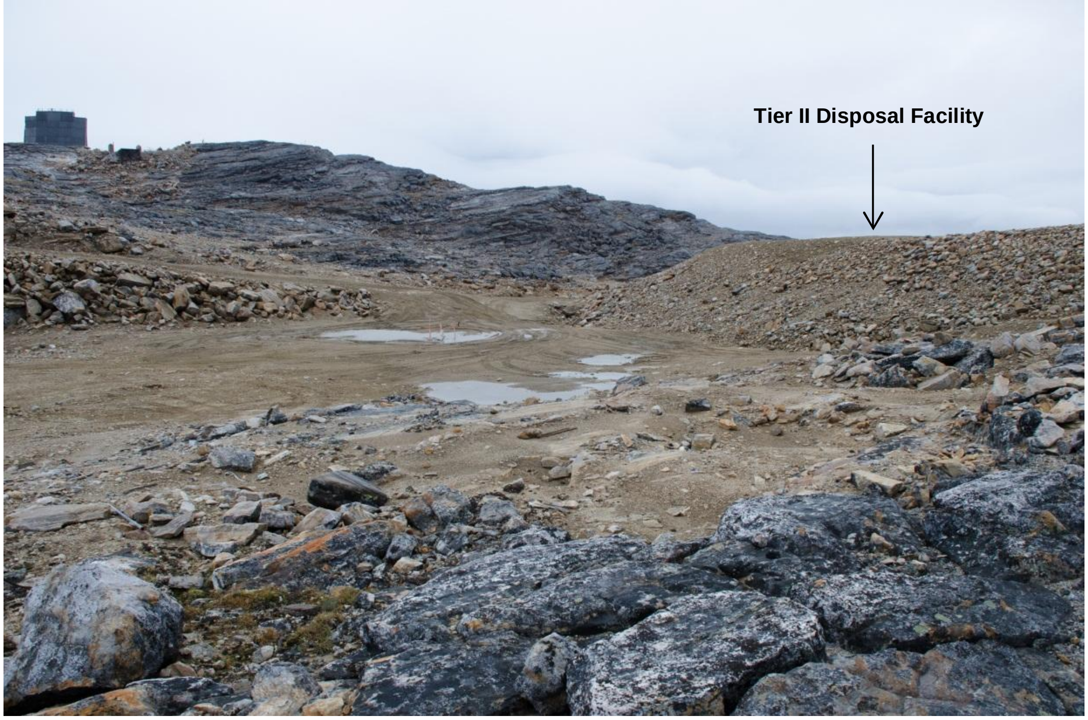


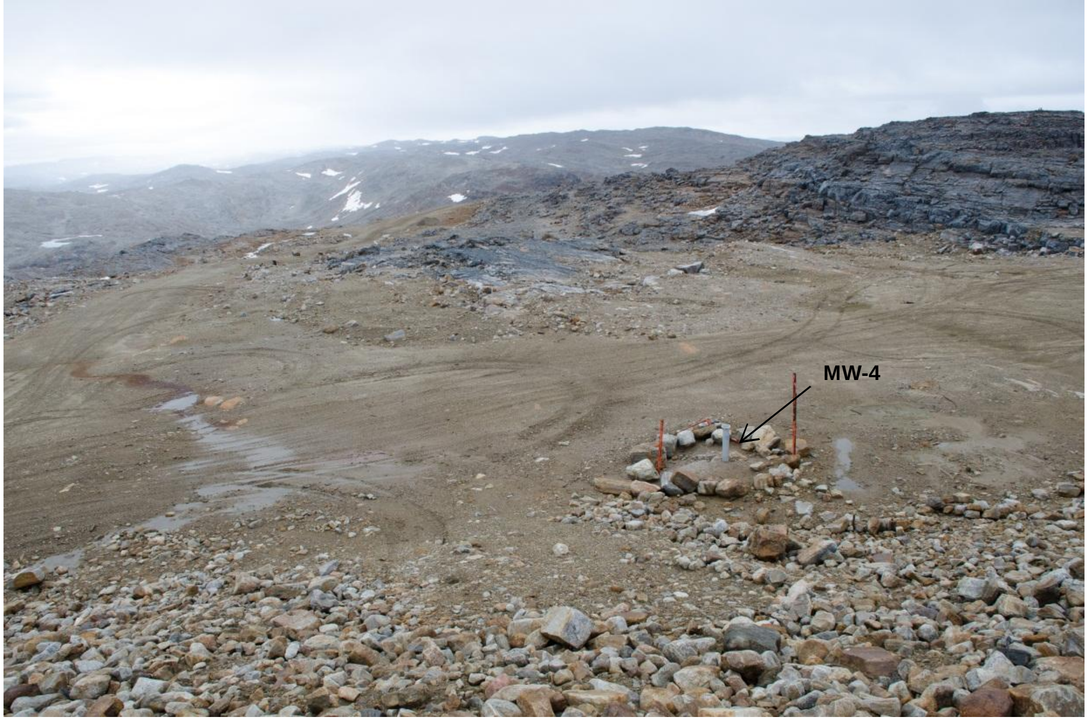
Photo No.	Date:
8	23/08/2013

Photo File Name:

DSC_1842

Description:

Proposed Landfill Location 3: Looking west at proposed landfill location west of Tier II Disposal Facility (taken from the toe of the Tier II Disposal Facility).



PHOTOGRAPHIC RECORD

Site Name: Proposed Landfill Locations	**Site Location:** Resolution Island, NU	**Project No.** 60304883

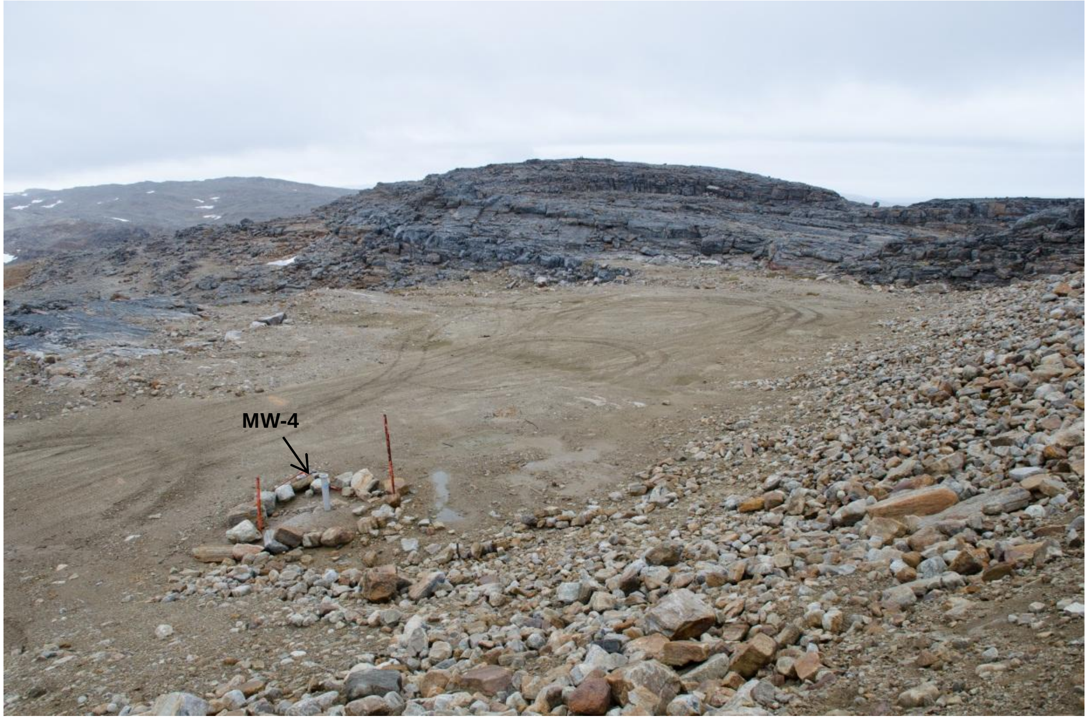
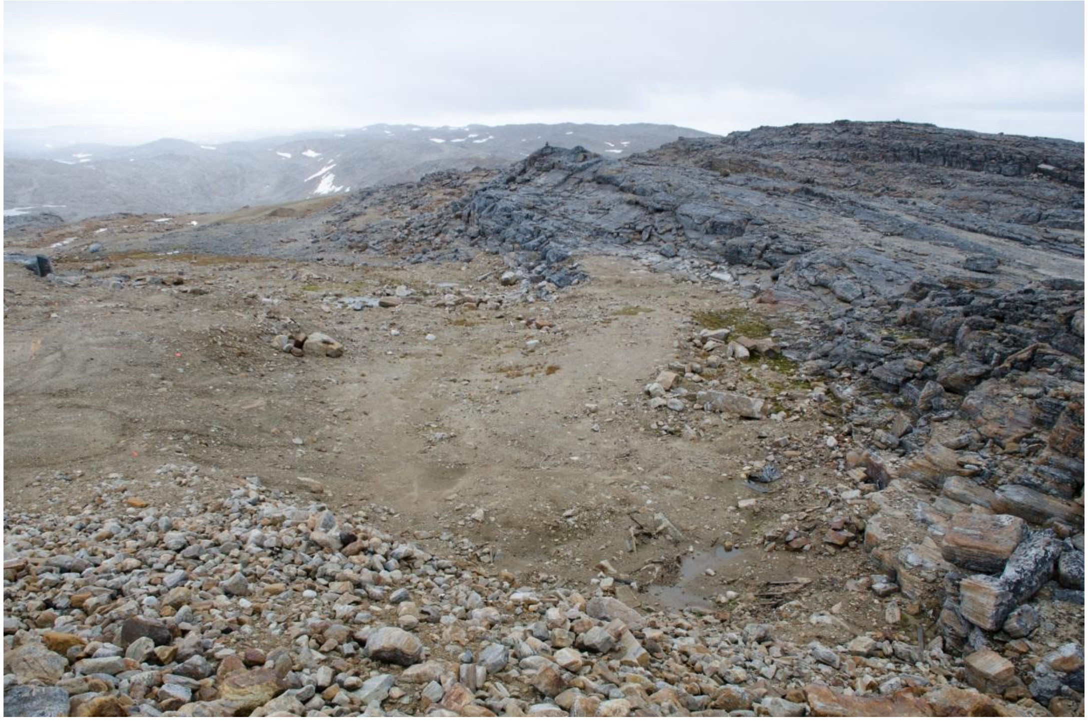
Photo No.	**Date:**	
9	23/08/2013	
Photo File Name: DSC_1843		
Description: Proposed Landfill Location 3: Looking northwest at proposed landfill location west of Tier II Disposal Facility (taken from the toe of the Tier II Disposal Facility).		

Photo No.	**Date:**	
10	23/08/2013	
Photo File Name: DSC_1844		
Description: Proposed Landfill Location 3: Looking northwest at proposed landfill location west of Tier II Disposal Facility (taken from the toe of the Tier II Disposal Facility).		

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Proposed Landfill Locations	Resolution Island, NU	60304883

Photo No.	Date:
11	23/08/2013

Photo File Name:

DSC_1847

Description:

Proposed Landfill Location 3: Looking south at proposed landfill location west of Tier II Disposal Facility.

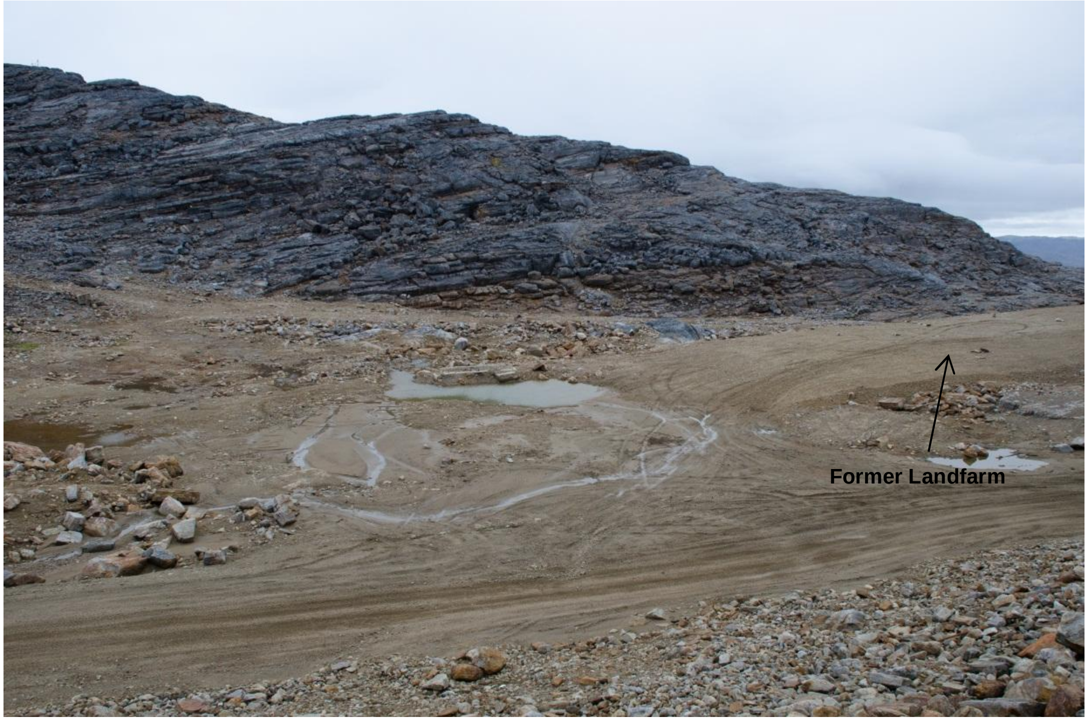
Photo No.	Date:
12	23/08/2013

Photo File Name:

DSC_1838

Description:

Proposed Landfill Location 4: Looking south at east portion of proposed landfill location near former landfarm.



PHOTOGRAPHIC RECORD

Site Name: Proposed Landfill Locations	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 13	**Date:**

Photo File Name:

DSC_1839

Description:

Proposed Landfill Location 4: Looking southwest at proposed landfill location near former landfarm.

Photo No. 14	**Date:** 23/08/2013

Photo File Name:

DSC_1840

Description:

Proposed Landfill Location 4: Looking southwest at proposed landfill location near former landfarm.

PHOTOGRAPHIC RECORD

Site Name: Proposed Landfill Locations	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
15	23/08/2013

Photo File Name:

DSC_1900

Description:

Proposed Landfill Location 5: Looking south at west portion of proposed landfill location south of Airstrip Landfill.

Photo No.	**Date:**
16	23/08/2013

Photo File Name:

DSC_1903

Description:

Proposed Landfill Location 5: Looking west at northern portion of proposed landfill location south of Airstrip Landfill.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Proposed Landfill Locations	Resolution Island, NU	60304883

Photo No.	Date:
17	23/08/2013

Photo File Name:

DSC_1904

Description:

Proposed Landfill Location 5: Looking west at northern portion of proposed landfill location south of Airstrip Landfill.

Photo No.	Date:

Photo File Name:

Description:

C.14 Site Access

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Site Access	Resolution Island, NU	60304883

Photo No.	Date:
1	23/08/2013

Photo File Name:

DSC_1899

Description:

Looking southwest at western portion of airstrip, taken from near Airstrip Landfill.

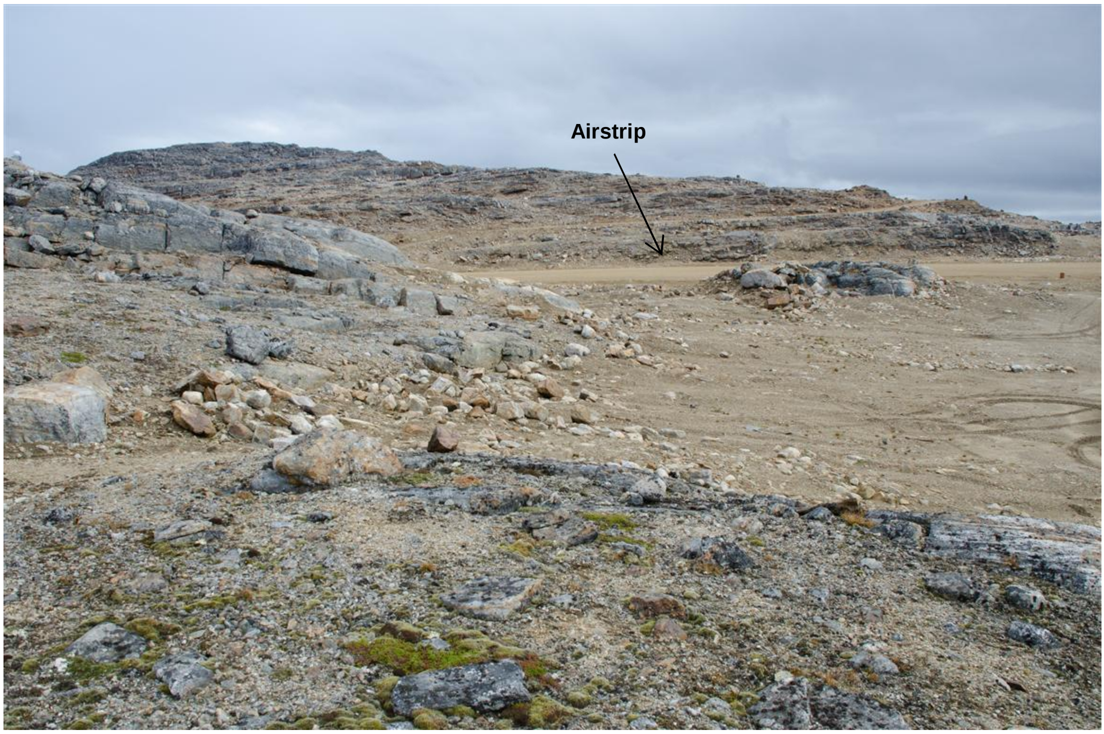
Photo No.	Date:
2	23/08/2013

Photo File Name:

DSC_1900

Description:

Looking south at central portion of airstrip, taken from near Airstrip Landfill.



PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 3	**Date:**

Photo File Name:

DSC_1934

Description:

Looking north at central and eastern portions of the airstrip, taken from the access road connecting the airstrip to the Station Area.

Photo No. 4	**Date:** 23/08/2013

Photo File Name:

DSC_1912

Description:

Road Section 1: Looking northeast at exposed bedrock on road between Station Area and Maintenance Area.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Site Access	Resolution Island, NU	60304883

Photo No.	Date:
5	23/08/2013

Photo File Name:

DSC_1915

Description:

Road Section 1: Example of minor drainage channels on the section of road between the Station Area and Maintenance Area. Photo taken looking east.

Photo No.	Date:
6	23/08/2013

Photo File Name:

DSC_1918

Description:

Road Section 1: Looking northwest at erosion channels on south side of road passing the Maintenance Area. This portion of road can only accommodate one-way traffic. The Tier II Disposal Facility is visible on photo right. The Former Landfarm is visible on photo left.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Site Access	Resolution Island, NU	60304883

Photo No.	Date:
7	23/08/2013

Photo File Name:

DSC_1921

Description:

Road Section 1: Looking northwest at poor drainage near west end of Tier II Disposal Facility. Additional fill or improvement of drainage ditch required.

Photo No.	Date:
8	23/08/2013

Photo File Name:

DSC_1924

Description:

Road Section 1: Looking northwest at minor washout on north side of road at west end of Tier II Disposal Facility.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 9

Date: 23/08/2013

Photo File Name:

DSC_1926

Description:

Road Section 1: Looking northeast at road washout/settlement located along road west of Tier II Disposal Facility. Repair could consist of additional fill or grading.

Photo No. 10

Date: 23/08/2013

Photo File Name:

DSC_1929

Description:

Road Section 1: Looking south at major erosion, drainage channels and slope failure located on the portion of Road Section 1 closest to the Airstrip. Additional fill and compaction required in this area.

PHOTOGRAPHIC RECORD

Site Name:	**Site Location:**	**Project No.**
Site Access	Resolution Island, NU	60304883

Photo No.	**Date:**
11	23/08/2013

Photo File Name:

DSC_1933

Description:

Road Section 1: Looking north at major erosion, drainage channels and slope failure located on the portion of Road Section 1 closest to the Airstrip. Additional fill and compaction required in this area.

Photo No.	**Date:**
12	23/08/2013

Photo File Name:

DSC_1937

Description:

Road Section 2: Looking southwest at example on minor erosion channels/rills in Road Section 2.

PHOTOGRAPHIC RECORD

Site Name: Site Access	Site Location: Resolution Island, NU	Project No. 60304883

Photo No.	Date:
13	23/08/2013

Photo File Name:

DSC_1939

Description:

Road Section 2: Looking southwest at erosion channels/rills in road near the Radio Hill access (to the Remote Antenna Building). Some grading required.

Photo No.	Date:
14	23/08/2013

Photo File Name:

DSC_1946

Description:

Road Section 2: Looking southwest at deep channels (~15 to 20 cm deep) near Freshwater Lake. East ditch is also eroded significantly. This section of road is likely passable with a pickup truck but will require additional fill and grading prior to future maintenance activities.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
15	23/08/2013

Photo File Name:

DSC_1956

Description:

Road Section 2: Looking southwest at location where ditch silted up, resulting in a washout of the road.

Photo No.	**Date:**
16	23/08/2013

Photo File Name:

DSC_1959

Description:

Road Section 2: Looking south at erosion of the ditch on the west side of the road. Approximately 30 to 50 cm of fill is required in this 30 m portion of road.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 17	**Date:** 23/08/2013

Photo File Name:

DSC_1963

Description:

Road Section 2: Looking south at example of typical washout in the road passing Freshwater Lake. Multiple washouts are present in this section of road. In the lowest portions, it appears as though water crosses the road during high flows. A culvert could be considered in some locations.

Photo No. 18	**Date:** 23/08/2013

Photo File Name:

DSC_1969

Description:

Road Section 2: Looking southeast at the largest of the road washouts in the road network. The original two culverts in this location are collapsed and segmented. Construction of two new culverts will likely be required to facilitate future maintenance activities.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
19	23/08/2013

Photo File Name:

DSC_1972

Description:

Road Section 2: Looking south at east portion of the large road washout identified in Photo 18. Freshwater Lake is on photo right.

Photo No.	**Date:**
20	23/08/2013

Photo File Name:

DSC_1973

Description:

Road Section 2: Looking south at west portion of the large road washout identified in Photo 18. Freshwater Lake is on photo right.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No.	**Date:**
21	23/08/2013

Photo File Name:

DSC_1986

Description:

Road Section 3: Looking southeast at minor washout due to culvert collapse. Freshwater Lake is on photo right.

Photo No.	**Date:**
22	23/08/2013

Photo File Name:

DSC_1990

Description:

Road Section 3: Typical condition of Road Section 3 between Freshwater Lake and the beach Area. Minor erosion channels/rills throughout.

PHOTOGRAPHIC RECORD

Site Name:	Site Location:	Project No.
Site Access	Resolution Island, NU	60304883

Photo No.	Date:
23	23/08/2013

Photo File Name:

DSC_1996

Description:

Road Section 3: Larger erosion channels/rills present in this section of road will require additional fill and grading to facilitate future maintenance activities. Photo taken looking east.

Photo No.	Date:
24	23/08/2013

Photo File Name:

DSC_2006

Description:

Looking east along former road to the S1/S4 Beach Area.

PHOTOGRAPHIC RECORD

Site Name: Site Access

Site Location: Resolution Island, NU

Project No. 60304883

Photo No. 25

Date: 23/08/2013

Photo File Name:

DSC_2013

Description:

Road Section 4: Looking north at large drainage channel in the middle of the Radio Hill Access road.

Photo No. 26

Date: 23/08/2013

Photo File Name:

DSC_2018

Description:

Road Section 4: Looking northeast along road. Drainage ditch (photo left) has silted up in the steep section of road, causing multiple drainage channels throughout the road to the top of the hill.

PHOTOGRAPHIC RECORD

Site Name: Site Access	**Site Location:** Resolution Island, NU	**Project No.** 60304883

Photo No. 27	**Date:** 21/08/2013	
Photo File Name: DSC_1645		
Description: Looking south at beach landing area.		
Photo No. 28	**Date:** 21/08/2013	
Photo File Name: DSC_1648		
Description: Looking southeast along entrance to Brewer Bay. The beach landing area shown in Photo 27 is to the right of this photo.		

Appendix D

Geotechnical Laboratory Reports

- D.1 Moisture Content
- D.2 TP13-04
- D.3 TP13-10
- D.4 TP13-12
- D.5 TP13-14
- D.6 TP13-15
- D.7 TP13-17
- D.8 Bedrock

D.1 Moisture Content

WATER CONTENT

AECOM

CLIENT: Public Works and Government Services Canada

PROJECT: Resolution Island Maintenance Assessment

JOB No.: 60304883 task 204.1

DATE : September 13, 2013 TECHNICAN : AH

HOLE No.	TP13-04	TP13-10	TP13-12	TP13-14	TP13-15	TP13-17		
DEPTH	0.2-0.6m	0-1.0m	0.3-0.9m	0.2-1.0m	0.2-0.6m	0.5-1.2m		
SAMPLE No.								
TARE No.				.				
WT. SAMPLE WET + TARE	384.4	454.3	494.0	3092.7	2604.2	441.2		
WT. SAMPLE DRY + TARE	364.5	427.9	445.9	2907.9	2498.8	419.7		
WT. TARE	13.1	13.0	13.4	252.5	253.9	13.2		
WATER CONTENT W%	**5.7%**	**6.4%**	**11.1%**	**7.0%**	**4.7%**	**5.3%**		
HOLE No.								
DEPTH								
SAMPLE No.								
TARE No.								
WT. SAMPLE WET + TARE								
WT. SAMPLE DRY + TARE								
WT. TARE								
WATER CONTENT W%								
HOLE No.								
DEPTH								
SAMPLE No.								
TARE No.								
WT. SAMPLE WET + TARE								
WT. SAMPLE DRY + TARE								
WT. TARE								
WATER CONTENT W%								
HOLE No.								
DEPTH								
SAMPLE No.								
TARE No.								
WT. SAMPLE WET + TARE								
WT. SAMPLE DRY + TARE								
WT. TARE								
WATER CONTENT W%								

FORM : Resolution Island Moistures.xls
DATE: 9/13/2013

D.2 TP13-04

GRAIN SIZE ANALYSIS

AECOM

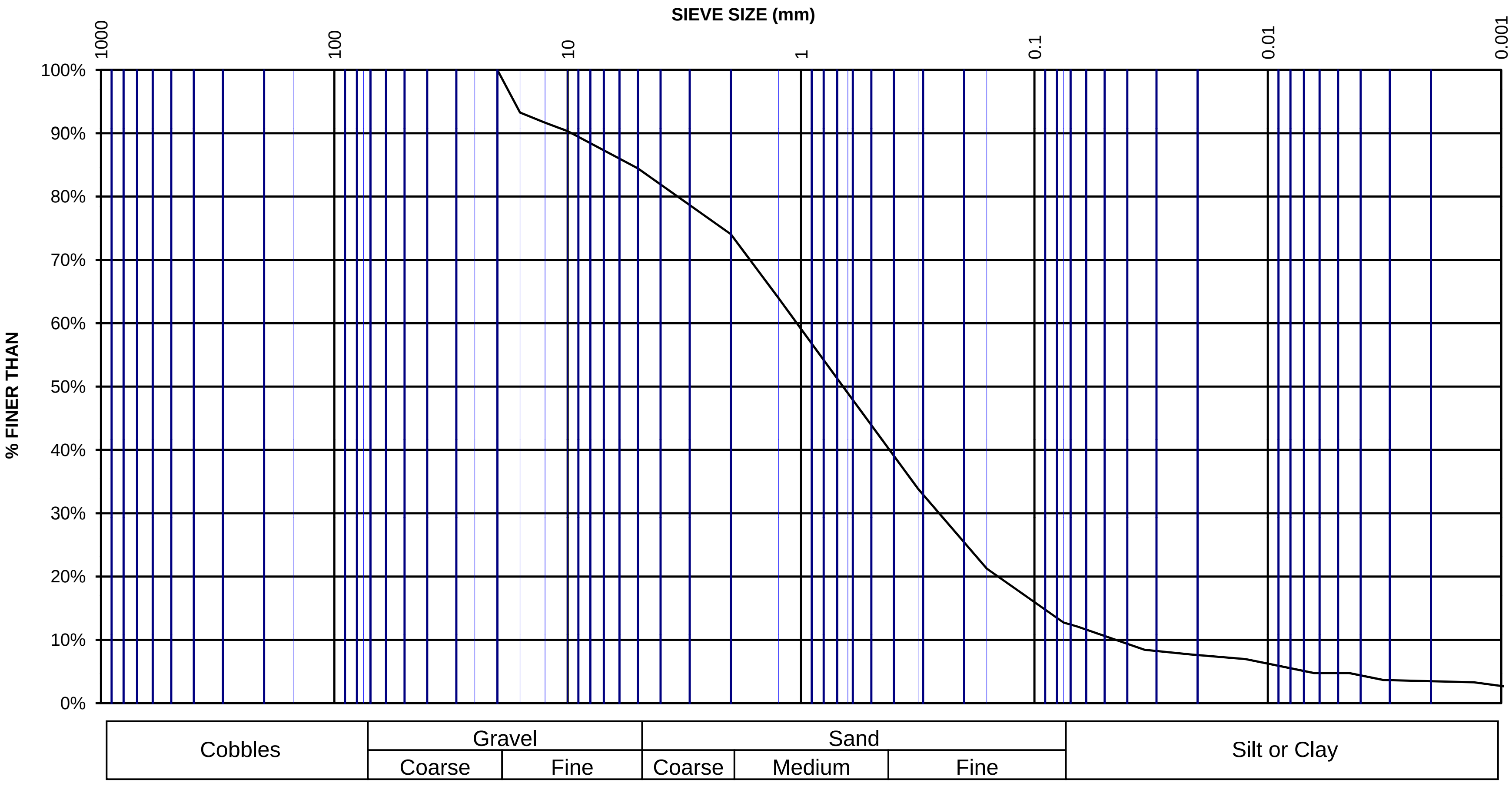
CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-04
DEPTH : 0.2-0.6m
DATE : September 16, 2013
TECHNICIAN : AH

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	450.4	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	350.4	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0	23.6	7%	93.3%	
Dry+Tare		12,500	1/2	12.5	29.2	8%	91.7%	
Tare		10,000	3/8	10.0	33.9	10%	90.3%	
MC (%)		5,000	0.185	5.0	54.5	16%	84.4%	
	Passing							
After Washing		2,000	0.0937	2.0	90.9	26%	74.1%	
Wt. Dry+Tare		1,250	0.0469	1.25	126.2	36%	64.0%	
Tare		630	0.0234	0.63	178.9	51%	49.0%	
Wt. Dry		315	0.0116	0.315	231.8	66%	33.8%	
Tare No.		160	0.0059	0.160	275.9	79%	21.3%	
		75	0.00295	0.075	305.8	87%	12.7%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	450.4	20	0.5	0.065	24	17	12.1%	
Wt Tare	100.0	18	1	0.047	24	14	10.3%	
Wt Dry	350.4	15	2	0.034	24	12	8.4%	
Sample Size :	100	14	5	0.021	24	11	7.7%	
Wt Retained 2 mm:	90.9	13	15	0.012	24	10	7.0%	
% Passing 2 mm:	74.1%	12	30	0.009	24	8	5.9%	
Specific Gravity :	2.70	10	60	0.006	24	7	4.8%	
Hydrometer No.:	43-9856	10	120	0.004	24	7	4.8%	
Solution (g/L) :	40	9	240	0.003	24	5	3.7%	
		8	1440	0.001	24	5	3.3%	
		7	2880	0.001	24	4	2.6%	

GRAIN SIZE ANALYSIS

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-04	DEPTH :	0.2-0.6m
DATE :	September 16, 2013	TECHNICIAN :	AH



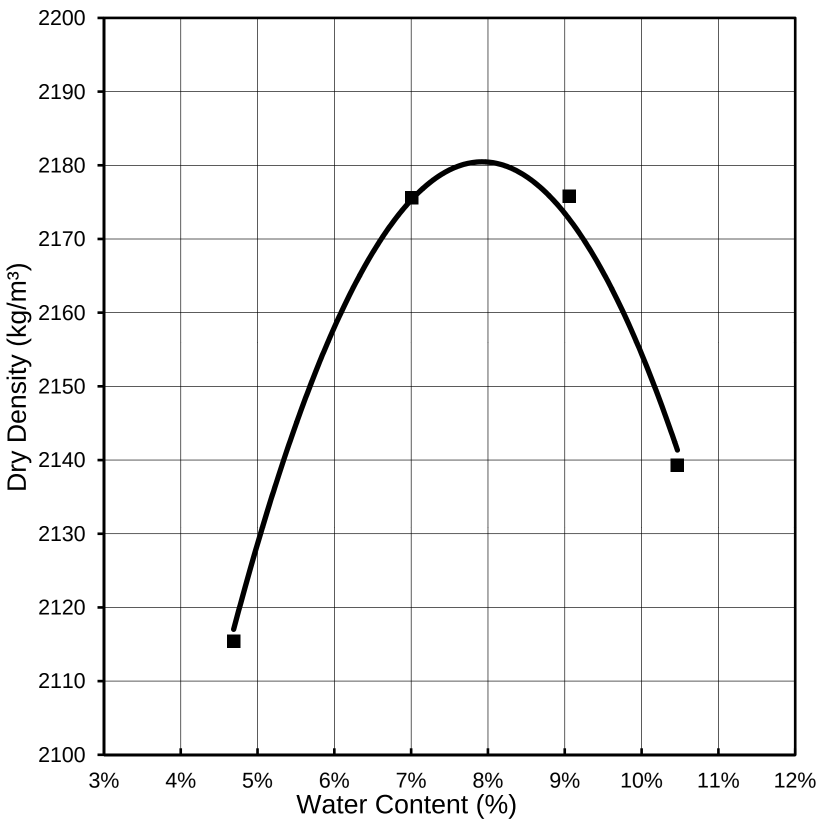
Resolution Hydro TP13-04.xls
18/09/2013

PROCTOR TEST

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : BA #1
SAMPLE:
BOREHOLE: TP13-04
DEPTH : 0.2-0.6m
DATE : 13-Sep-13
TECHNICIAN : AH

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11418.4	11514.0	11493.4	11176.4		
Wt. Mould (g)	6452.7	6452.7	6452.7	6452.7		
Wet Density (kg/m³)	2328	2373	2363	2215		
Dry Density (kg/m³)	2176	2176	2139	2115		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	657.9	909.3	596.0	553.6		
Wt. Sample (dry+tare)(g)	615.7	834.9	540.8	529.4		
Wt. Tare (g)	13.5	13.4	13.4	13.3		
Wt. Dry Soil (g)	602.2	821.5	527.4	516.1		
Wt. Water (g)	42.2	74.4	55.2	24.2		
Water Content (%)	7.0%	9.1%	10.5%	4.7%		



At Optimum:

Water Content	8.0%
Dry Density (kg/m³)	2180

Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Sand (SP-SM) with 27% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
5%	2203	7.7%
10%	2226	7.3%
15%	2250	6.9%
20%	2274	6.5%
27%	2309	5.9%

Remarks:

FORM: Resolution Proctor TP13-04.xls
DATE: 9/16/2013

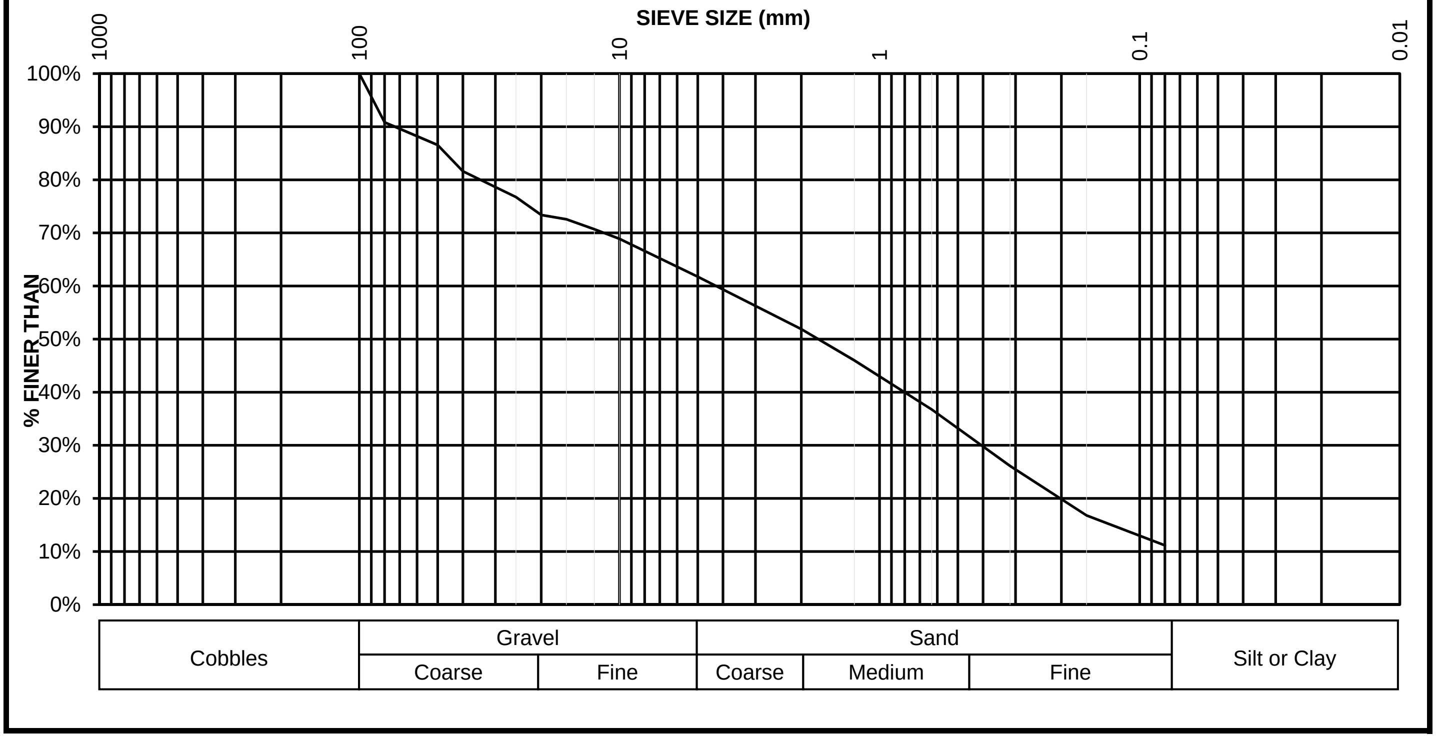
SIEVE ANALYSIS

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :	Lower Airstrip Borrow Area 1	SAMPLE:	
BOREHOLE:	TP13-04	DEPTH :	0.2-0.6m
DATE :	September 16, 2013	TECHNICIAN :	CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
Before Washing		10000	4	100.0			100%		
Wet + Tare		80000	3	80.0	2960.6	9%	91%		
Dry+Tare		50000	2	50.0	4342.0	13%	87%		
Tare		40000	1 1/2	40.0	5933.3	18%	82%		
Wt. Dry	32264.4	25000	1	25.0	7498.6	23%	77%		
Moisture Content		20000	3/4	20.0	8590.9	27%	73%		
Wet + Tare	384.4	16000	5/8	16.0	8851.9	27%	73%		
Dry+Tare	364.5	12500	1/2	12.5	9452.4	29%	71%		
Tare	13.1	10000	3/8	10.0	10038.2	31%	69%		
MC (%)	5.7%	5000	0.185	5.00	12341.1	38%	62%		
	Passing	5000							
After Washing		2000	0.0937	2.00	15524.2	48%	52%		
Wt. Dry+Tare		1250	0.0469	1.25	17426.7	54%	46%		
Tare		630	0.0234	0.630	20410.6	63%	37%		
Wt. Dry		315	0.0116	0.315	23835.0	74%	26%		
Tare No.		160	0.0059	0.160	26843.5	83%	17%		
		80	0.0029	0.080	28662.6	89%	11%		
		PAN							

Classification:	SP-SM
Cc	0.5
Cu	56

Description and Remarks: Type 2 gradation limits shown on Figure 1 in Appendix G. Cobbles and boulders present at ground surface (40-50% of area). Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-04-final.xls
DATE: 1/23/2014

D.3 TP13-10

GRAIN SIZE ANALYSIS

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-10
DEPTH : 0.0-1.0m
DATE : September 16, 2013
TECHNICIAN : AH

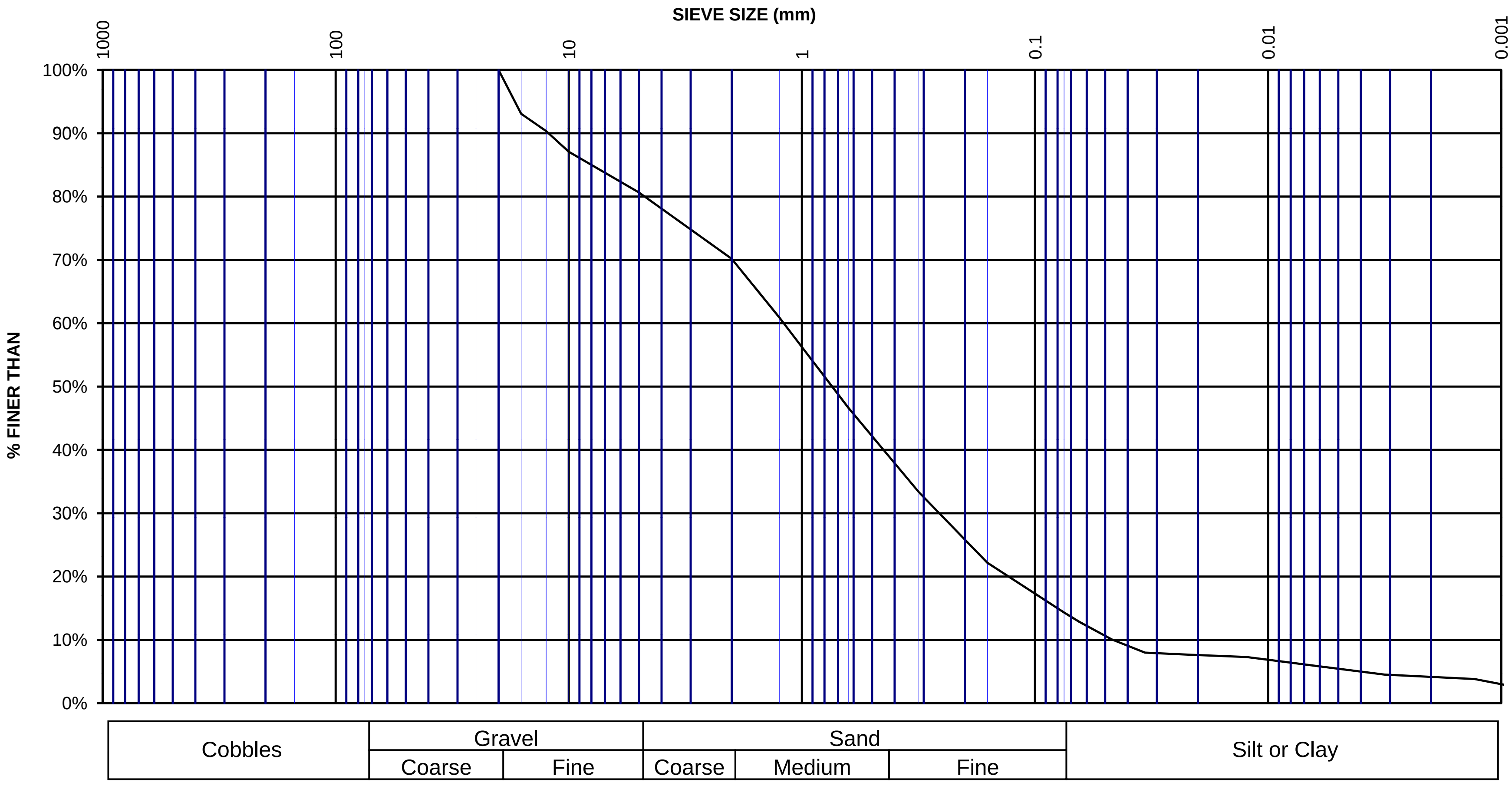
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	514.1	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	414.1	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0	28.7	7%	93.1%	
Dry+Tare		12,500	1/2	12.5	40.0	10%	90.3%	
Tare		10,000	3/8	10.0	53.5	13%	87.1%	
MC (%)		5,000	0.185	5.0	80.1	19%	80.7%	
	Passing							
After Washing		2,000	0.0937	2.0	123.5	30%	70.2%	
Wt. Dry+Tare		1,250	0.0469	1.25	161.9	39%	60.9%	
Tare		630	0.0234	0.63	221.1	53%	46.6%	
Wt. Dry		315	0.0116	0.315	276.1	67%	33.3%	
Tare No.		160	0.0059	0.160	322.3	78%	22.2%	
		75	0.00295	0.075	354.8	86%	14.3%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	514.1	22	0.5	0.065	24	19	12.9%	
Wt Tare	100.0	18	1	0.047	24	15	10.1%	
Wt Dry	414.1	15	2	0.034	24	12	8.0%	
Sample Size :	100	15	5	0.021	24	11	7.6%	
Wt Retained 2 mm:	123.5	14	15	0.012	24	11	7.3%	
% Passing 2 mm:	70.2%	13	30	0.009	24	10	6.6%	
Specific Gravity :	2.70	12	60	0.006	24	9	5.9%	
Hydrometer No.:	43-9856	11	120	0.004	24	8	5.2%	
Solution (g/L) :	40	10	240	0.003	24	7	4.5%	
		9	1440	0.001	24	6	3.8%	
		8	2880	0.001	24	4	2.8%	

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-10	DEPTH :	0.0-1.0m
DATE :	September 16, 2013	TECHNICIAN :	AH

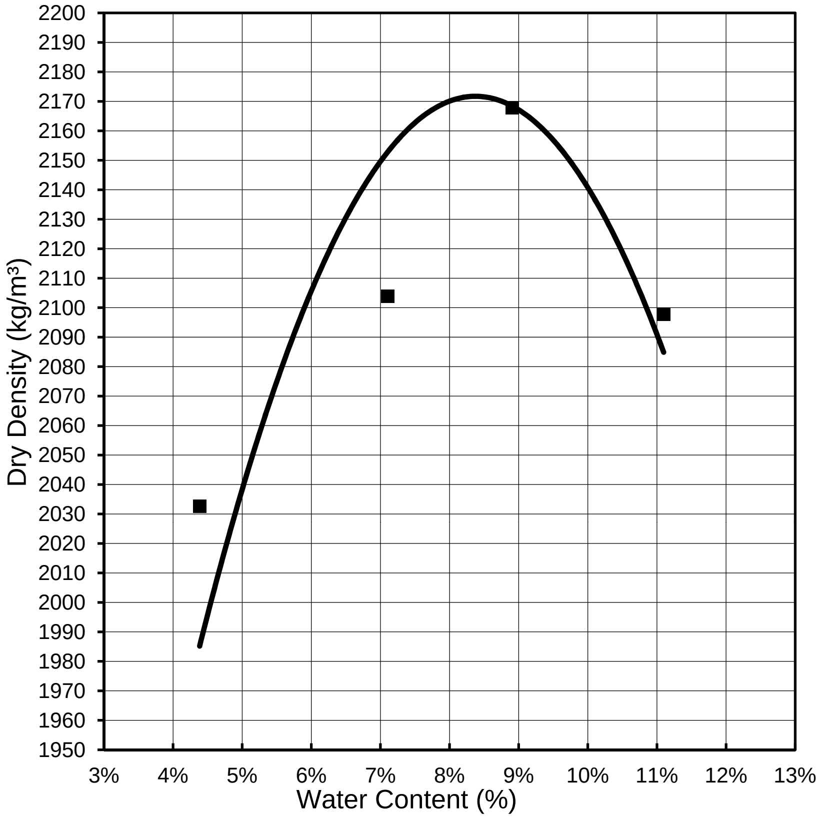


PROCTOR TEST

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : BA #2 - Lower Airstrip
SAMPLE:
BOREHOLE: TP13-10
DEPTH : 0-1.0m
DATE : 13-Sep-13
TECHNICIAN : AH

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11259.3	10978.5	11488.6	11424.0		
Wt. Mould (g)	6452.7	6452.7	6452.7	6452.7		
Wet Density (kg/m³)	2253	2122	2361	2331		
Dry Density (kg/m³)	2104	2033	2168	2098		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	555.8	510.7	618.4	618.0		
Wt. Sample (dry+tare)(g)	519.8	489.8	568.9	557.6		
Wt. Tare (g)	13.2	13.1	13.0	13.3		
Wt. Dry Soil (g)	506.6	476.7	555.9	544.3		
Wt. Water (g)	36	20.9	49.5	60.4		
Water Content (%)	7.1%	4.4%	8.9%	11.1%		



At Optimum:

Water Content	8.0%
Dry Density (kg/m³)	2170
Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Sand (SP-SM) with 27% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
5%	2193	7.7%
10%	2217	7.3%
15%	2241	6.9%
20%	2266	6.5%
27%	2301	5.9%

Remarks:

FORM: Resolution Proctor TP13-10.xls
DATE: 9/17/2013

SIEVE ANALYSIS

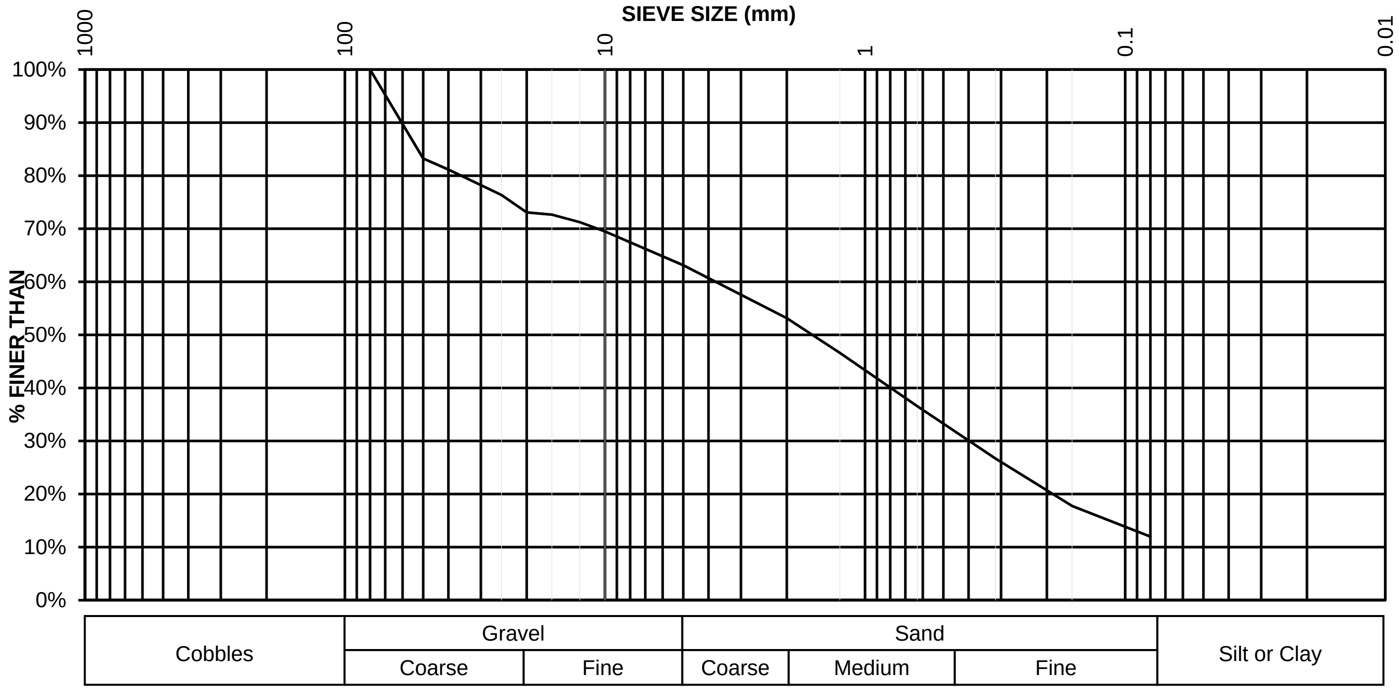
AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : Lower Airstrip Borrow Area 5
SAMPLE:
BOREHOLE: TP13-10
DEPTH : 0-1.0m
DATE : September 16, 2013
TECHNICIAN : CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
Before Washing		10000	4	100.0			100%		
Wet + Tare		80000	3	80.0			100%		
Dry+Tare		50000	2	50.0	5057.0	17%	83%		
Tare		40000	1 1/2	40.0	5684.0	19%	81%		
Wt. Dry	30155.7	25000	1	25.0	7126.0	24%	76%		
Moisture Content		20000	3/4	20.0	8117.0	27%	73%		
Wet + Tare	454.3	16000	5/8	16.0	8247.1	27%	73%		
Dry+Tare	427.9	12500	1/2	12.5	8670.8	29%	71%		
Tare	13.0	10000	3/8	10.0	9201.5	31%	69%		
MC (%)	6.4%	5000	0.185	5.00	11120.8	37%	63%		
	Passing	5000							
After Washing		2000	0.0937	2.00	14129.2	47%	53%		
Wt. Dry+Tare		1250	0.0469	1.25	16102.6	53%	47%		
Tare		630	0.0234	0.630	19130.6	63%	37%		
Wt. Dry		315	0.0116	0.315	22104.5	73%	27%		
Tare No.		160	0.0059	0.160	24798.6	82%	18%		
		80	0.0029	0.080	26538.2	88%	12%		
		PAN							

Classification: SP-SM
Cc 0.5
Cu 51

Description and Remarks: Type 2 gradation limits shown on Figure 2 in Appendix G. Boulders present at ground surface in some areas. Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-10-final.xls
DATE: 1/23/2014

D.4 TP13-12

GRAIN SIZE ANALYSIS

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-12
DEPTH : 0.3-0.9m
DATE : September 16, 2013
TECHNICIAN : AH

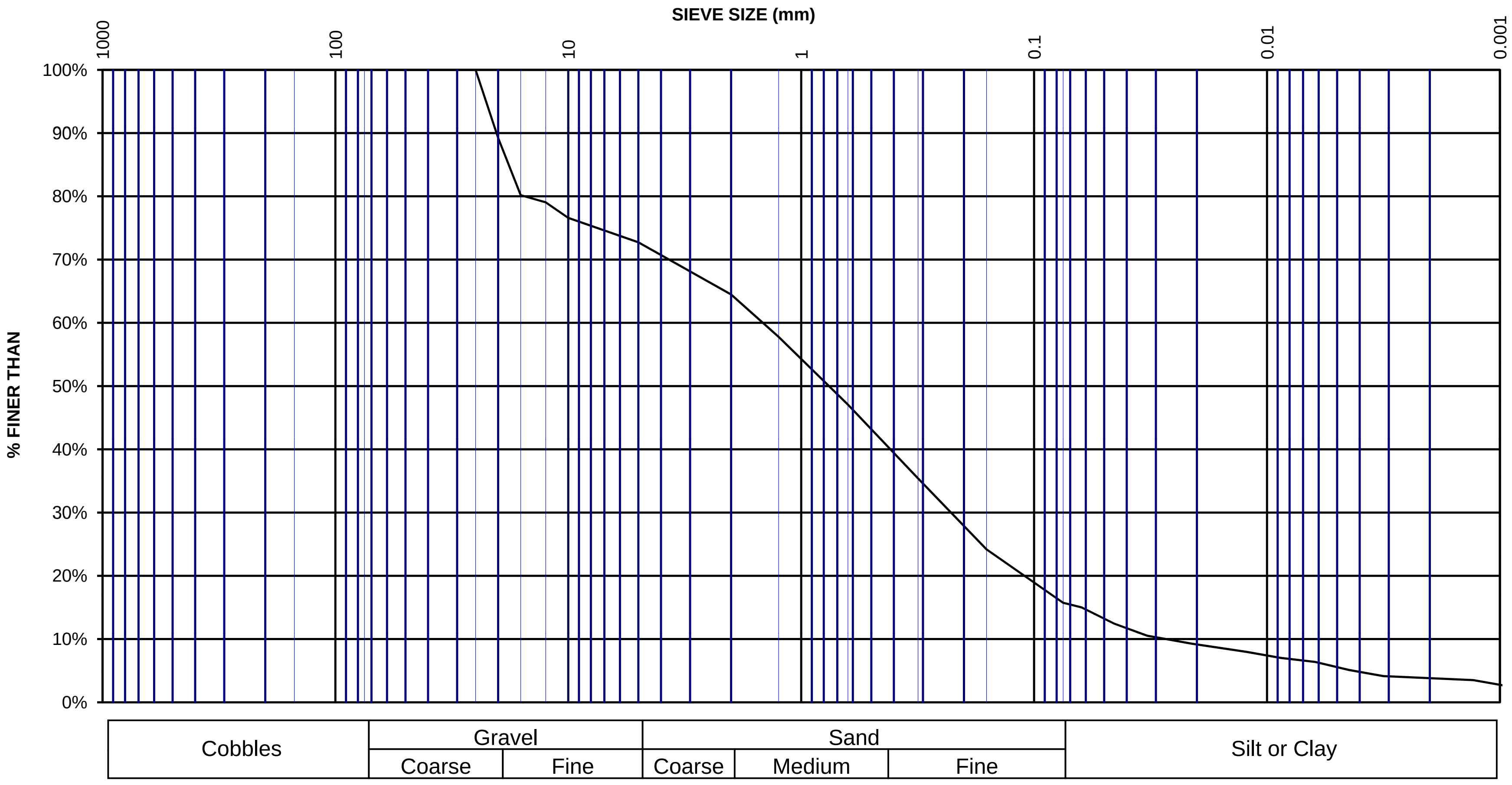
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING APPROX. INCHES	SIZE OF OPENING mm	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	531.9	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	431.9	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0	46.5	11%	89.2%	
Wet + Tare		16,000	5/8	16.0	85.6	20%	80.2%	
Dry+Tare		12,500	1/2	12.5	90.5	21%	79.0%	
Tare		10,000	3/8	10.0	101.1	23%	76.6%	
MC (%)		5,000	0.185	5.0	117.8	27%	72.7%	
	Passing							
After Washing		2,000	0.0937	2.0	153.4	36%	64.5%	
Wt. Dry+Tare		1,250	0.0469	1.25	182.4	42%	57.8%	
Tare		630	0.0234	0.63	228.6	53%	47.1%	
Wt. Dry		315	0.0116	0.315	279.0	65%	35.4%	
Tare No.		160	0.0059	0.160	327.5	76%	24.2%	
		75	0.00295	0.075	363.9	84%	15.7%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	531.9	27	0.5	0.062	24	24	15.0%	
Wt Tare	100.0	23	1	0.045	24	20	12.4%	
Wt Dry	431.9	20	2	0.033	24	17	10.5%	
Sample Size :	100	18	5	0.021	24	15	9.3%	
Wt Retained 2 mm:	153.4	16	15	0.012	24	13	8.0%	
% Passing 2 mm:	64.5%	15	30	0.009	24	11	7.0%	
Specific Gravity :	2.70	14	60	0.006	24	10	6.4%	
Hydrometer No.:	43-9856	12	120	0.004	24	8	5.1%	
Solution (g/L) :	40	10	240	0.003	24	7	4.1%	
		9	1440	0.001	24	6	3.5%	
		8	2880	0.001	24	4	2.6%	

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-12	DEPTH :	0.3-0.9m
DATE :	September 16, 2013	TECHNICIAN :	AH



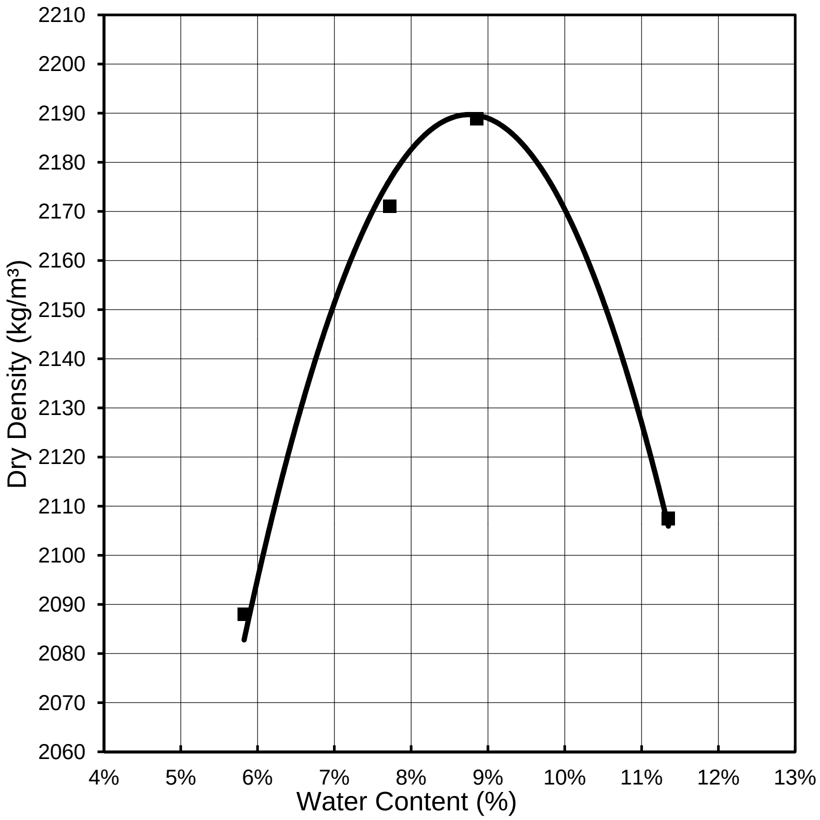
Resolution Hydro TP13-12.xls
18/09/2013

PROCTOR TEST

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
BOREHOLE: TP13-12
DEPTH : 0.3-0.9m
DATE : 16-Sep-13
TECHNICIAN : AH/CK

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11534.9	11458.2	11441.1	11165.8		
Wt. Mould (g)	6452.7	6452.7	6452.7	6452.7		
Wet Density (kg/m³)	2383	2347	2339	2210		
Dry Density (kg/m³)	2189	2108	2171	2088		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	582.2	669.4	623.0	602.1		
Wt. Sample (dry+tare)(g)	535.9	602.5	579.3	569.7		
Wt. Tare (g)	12.9	13.0	13.4	13.5		
Wt. Dry Soil (g)	523	589.5	565.9	556.2		
Wt. Water (g)	46.3	66.9	43.7	32.4		
Water Content (%)	8.9%	11.3%	7.7%	5.8%		



At Optimum:

Water Content	8.8%
Dry Density (kg/m³)	2190

Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Sand (SM or SC) with 18% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
5%	2213	8.4%
10%	2236	8.0%
15%	2259	7.5%
18%	2273	7.3%

Remarks:

FORM: Resolution Proctor TP13-12.xls
DATE: 9/17/2013

SIEVE ANALYSIS

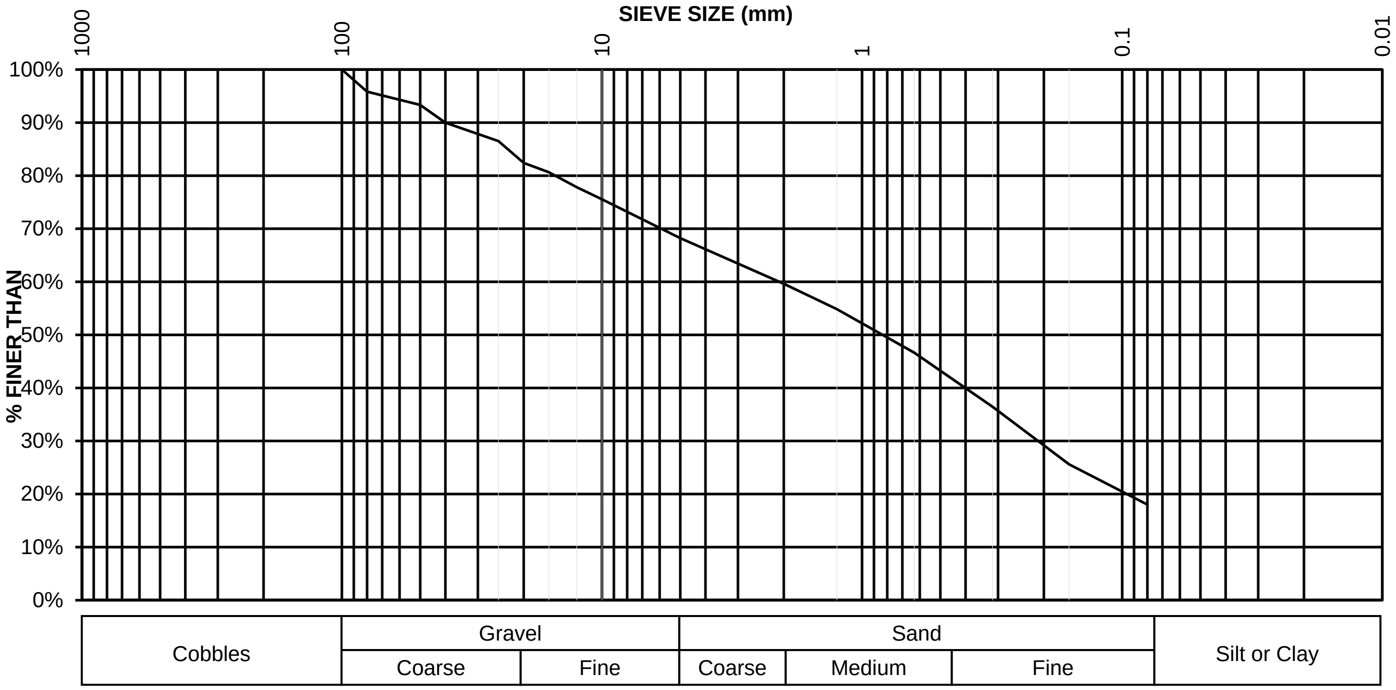
AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : Lower Airstrip Borrow Area 4
SAMPLE:
BOREHOLE: TP13-12
DEPTH : 0.3-0.9m
DATE : September 16, 2013
TECHNICIAN : CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
<u>Before Washing</u>		10000	4	100.0			100%		
Wet + Tare		80000	3	80.0	1239.0	4%	96%		
Dry+Tare		50000	2	50.0	1983.0	7%	93%		
Tare		40000	1 1/2	40.0	2979.0	10%	90%		
Wt. Dry	29728.3	25000	1	25.0	4009.0	13%	87%		
<u>Moisture Content</u>		20000	3/4	20.0	5230.0	18%	82%		
Wet + Tare	494.0	16000	5/8	16.0	5753.4	19%	81%		
Dry+Tare	445.9	12500	1/2	12.5	6592.4	22%	78%		
Tare	13.4	10000	3/8	10.0	7270.0	24%	76%		
MC (%)	11.1%	5000	0.185	5.00	9445.3	32%	68%		
	Passing	5000							
<u>After Washing</u>		2000	0.0937	2.00	12002.8	40%	60%		
Wt. Dry+Tare		1250	0.0469	1.25	13422.1	45%	55%		
Tare		630	0.0234	0.630	15862.1	53%	47%		
Wt. Dry		315	0.0116	0.315	18890.7	64%	36%		
Tare No.		160	0.0059	0.160	22117.5	74%	26%		
		80	0.0029	0.080	24373.5	82%	18%		
		PAN							

Classification: SM or SC
Cc #N/A
Cu #N/A

Description and Remarks: Type 2 gradation limits shown on Figure 3 in Appendix G. Boulders present at ground surface in 40% of area. Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-12-final.xls
DATE: 1/23/2014

D.5 TP13-14

GRAIN SIZE ANALYSIS

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-14	DEPTH :	0.2-1.0m
DATE :	September 16, 2013	TECHNICIAN :	AH

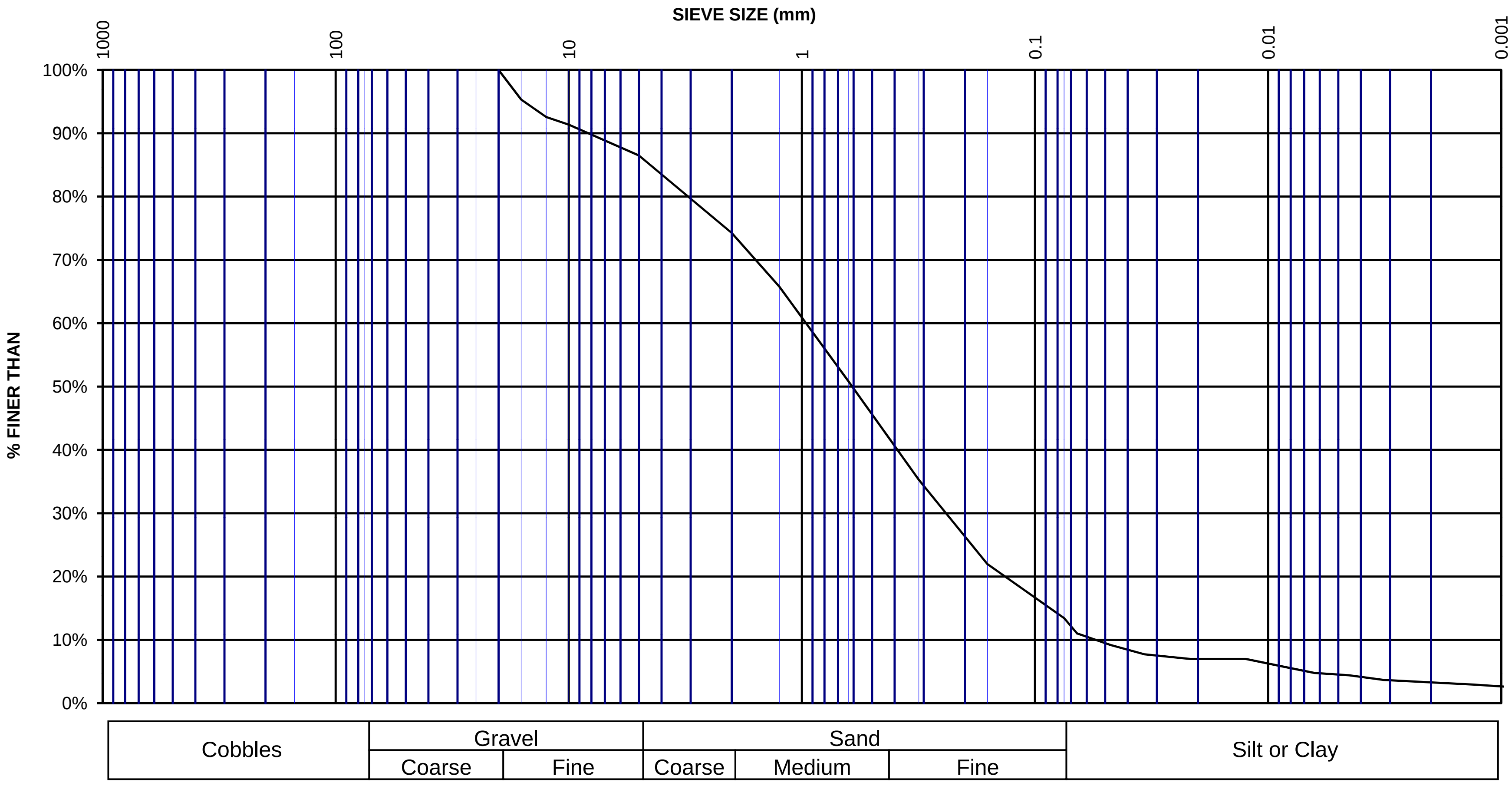
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	580.4	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	480.4	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0	22.5	5%	95.3%	
Dry+Tare		12,500	1/2	12.5	35.7	7%	92.6%	
Tare		10,000	3/8	10.0	41.5	9%	91.4%	
MC (%)		5,000	0.185	5.0	64.9	14%	86.5%	
	Passing							
After Washing		2,000	0.0937	2.0	123.7	26%	74.3%	
Wt. Dry+Tare		1,250	0.0469	1.25	164.4	34%	65.8%	
Tare		630	0.0234	0.63	236.4	49%	50.8%	
Wt. Dry		315	0.0116	0.315	311.0	65%	35.3%	
Tare No.		160	0.0059	0.160	374.8	78%	22.0%	
		75	0.00295	0.075	415.8	87%	13.4%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	580.4	19	0.5	0.066	24	15	11.0%	
Wt Tare	100.0	16	1	0.047	24	13	9.2%	
Wt Dry	480.4	14	2	0.034	24	11	7.7%	
Sample Size :	100	13	5	0.022	24	10	7.0%	
Wt Retained 2 mm:	123.7	13	15	0.012	24	10	7.0%	
% Passing 2 mm:	74.3%	12	30	0.009	24	8	5.9%	
Specific Gravity :	2.70	10	60	0.006	24	7	4.8%	
Hydrometer No.:	43-9856	10	120	0.004	24	6	4.4%	
Solution (g/L) :	40	9	240	0.003	24	5	3.7%	
		8	1440	0.001	24	4	2.9%	
		7	2880	0.001	24	4	2.6%	

GRAIN SIZE ANALYSIS

AECOM

CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-14	DEPTH :	0.2-1.0m
DATE :	September 16, 2013	TECHNICIAN :	AH



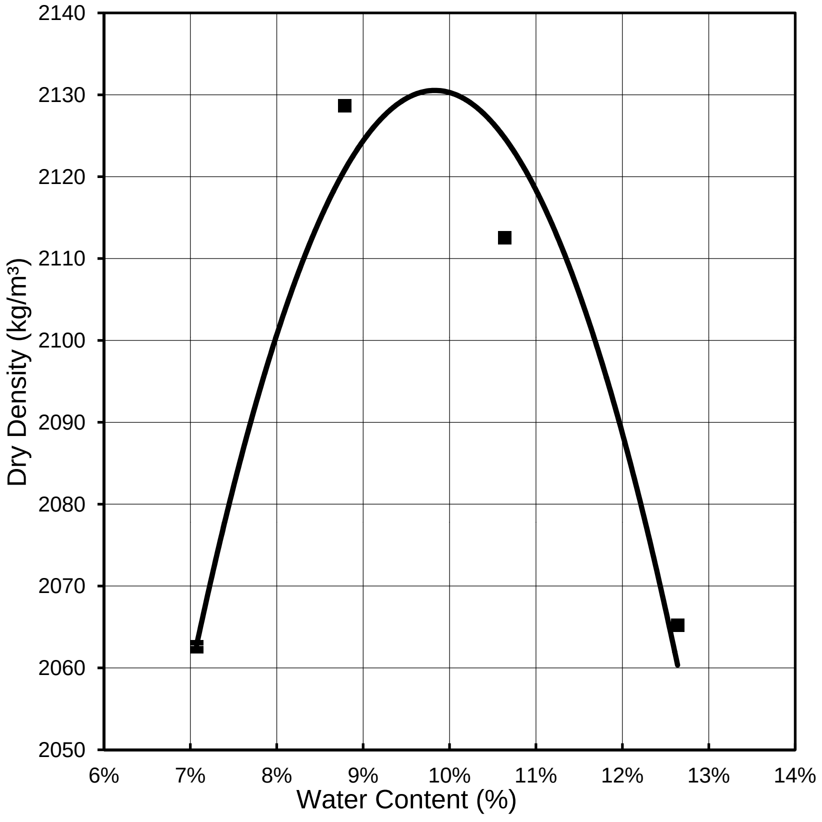
Resolution Hydro TP13-14.xls
18/09/2013

PROCTOR TEST

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
BOREHOLE: TP13-14
DEPTH : 0.2-1.0m
DATE : 16-Sep-13
TECHNICIAN : AH/CK

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11163.4	11392.1	11438.1	11414.6		
Wt. Mould (g)	6452.7	6452.7	6452.7	6452.7		
Wet Density (kg/m³)	2208	2316	2337	2326		
Dry Density (kg/m³)	2063	2129	2113	2065		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	546.0	515.8	608.8	631.8		
Wt. Sample (dry+tare)(g)	510.8	475.2	551.5	562.4		
Wt. Tare (g)	13.1	13.1	12.8	13.3		
Wt. Dry Soil (g)	497.7	462.1	538.7	549.1		
Wt. Water (g)	35.2	40.6	57.3	69.4		
Water Content (%)	7.1%	8.8%	10.6%	12.6%		



At Optimum:

Water Content	9.5%
Dry Density (kg/m³)	2130

Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Gravel and Sand (GP-GM) with 33% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
10%	2179	8.6%
15%	2205	8.1%
20%	2231	7.7%
25%	2257	7.2%
33%	2301	6.4%

Remarks:

FORM: Resolution Proctor TP13-14.xls
DATE: 9/17/2013

SIEVE ANALYSIS

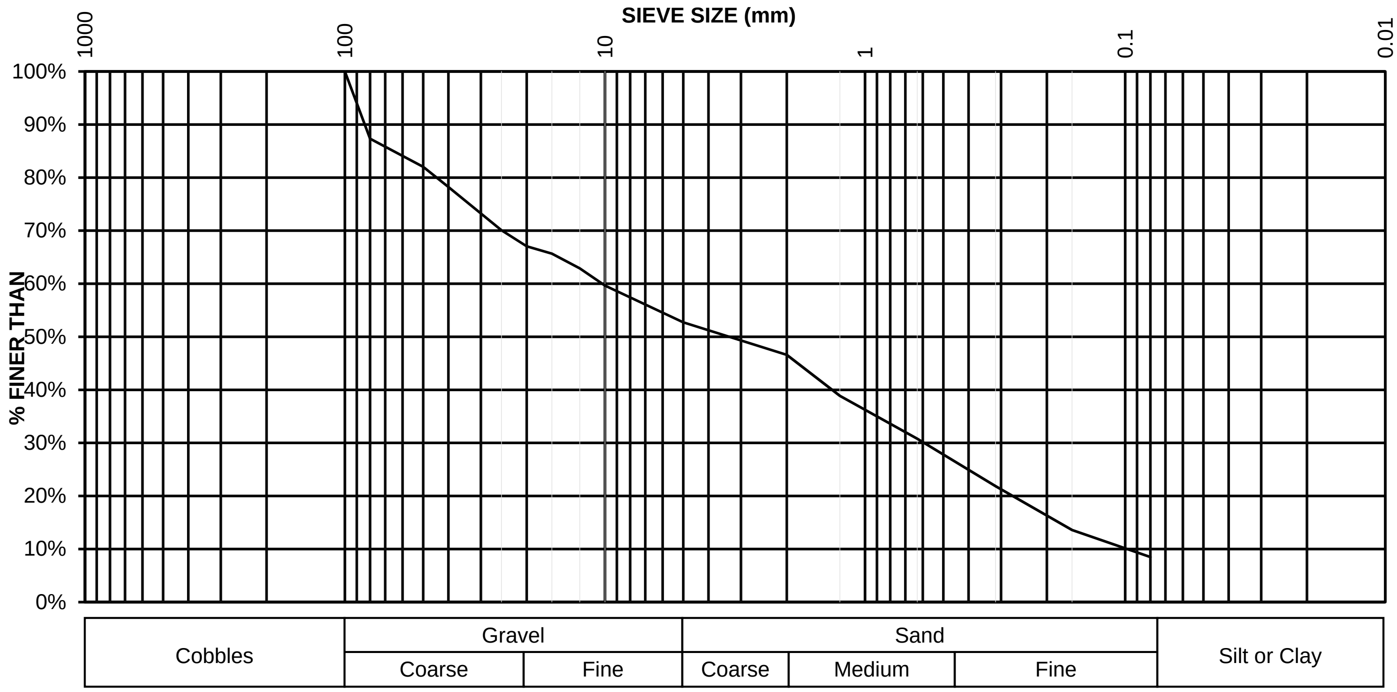
AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : Lower Airstrip Borrow Area 4
SAMPLE:
BOREHOLE: TP13-14
DEPTH : 0.2-1.0m
DATE : September 13, 2013
TECHNICIAN : CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
Before Washing		10000	4	100.0			100%		
Wet + Tare		80000	3	80.0	4091.7	13%	87%		
Dry+Tare		50000	2	50.0	5806.4	18%	82%		
Tare		40000	1 1/2	40.0	7031.6	22%	78%		
Wt. Dry	32294.1	25000	1	25.0	9663.4	30%	70%		
Moisture Content		20000	3/4	20.0	10638.0	33%	67%		
Wet + Tare	3092.7	16000	5/8	16.0	11088.9	34%	66%		
Dry+Tare	2907.9	12500	1/2	12.5	11985.4	37%	63%		
Tare	252.5	10000	3/8	10.0	13029.9	40%	60%		
MC (%)	7.0%	5000	0.185	5.00	15267.6	47%	53%		
	Passing	5000							
After Washing		2000	0.0937	2.00	17249.3	53%	47%		
Wt. Dry+Tare		1250	0.0469	1.25	19736.9	61%	39%		
Tare		630	0.0234	0.630	22349.4	69%	31%		
Wt. Dry		315	0.0116	0.315	25236.5	78%	22%		
Tare No.		160	0.0059	0.160	27905.6	86%	14%		
		80	0.0029	0.080	29552.5	92%	8%		
		PAN							

Classification: GP-GM
Cc 0.3
Cu 99

Description and Remarks: Type 2 gradation limits shown on Figure 4 in Appendix G. Boulders present at ground surface in 40% of area. Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-14.xls
DATE: 1/23/2014

D.6 TP13-15

GRAIN SIZE ANALYSIS

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-15
DEPTH : 0.2-0.6m
DATE : September 16, 2013
TECHNICIAN : AH

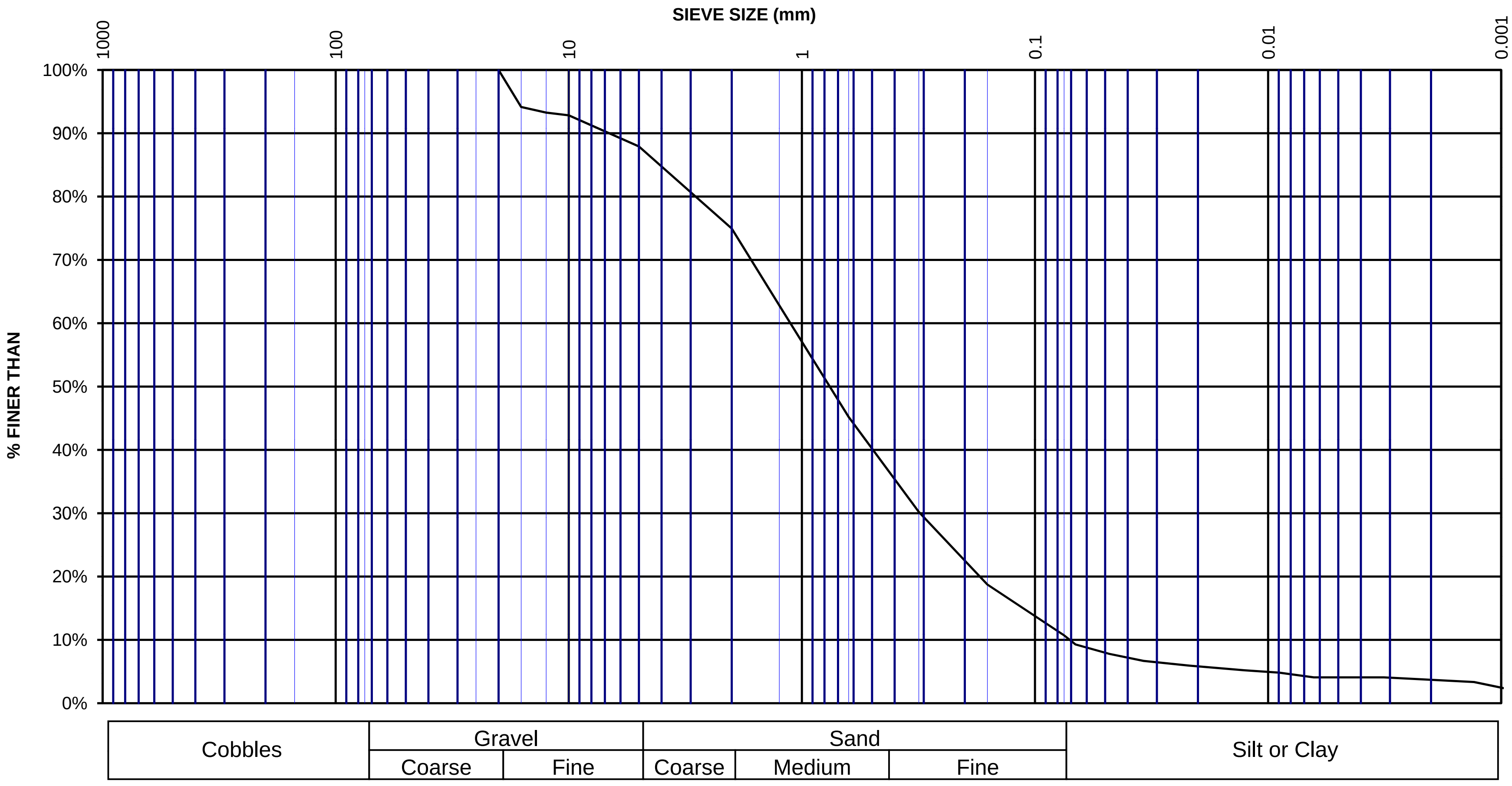
TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
			APPROX. INCHES	mm				
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	540.9	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	440.9	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0		0%	100%	
Wet + Tare		16,000	5/8	16.0	25.8	6%	94.1%	
Dry+Tare		12,500	1/2	12.5	29.7	7%	93.3%	
Tare		10,000	3/8	10.0	31.6	7%	92.8%	
MC (%)		5,000	0.185	5.0	53.3	12%	87.9%	
	Passing							
After Washing		2,000	0.0937	2.0	110.4	25%	75.0%	
Wt. Dry+Tare		1,250	0.0469	1.25	163.9	37%	62.8%	
Tare		630	0.0234	0.63	241.6	55%	45.2%	
Wt. Dry		315	0.0116	0.315	307.7	70%	30.2%	
Tare No.		160	0.0059	0.160	358.3	81%	18.7%	
		75	0.00295	0.075	393.6	89%	10.7%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	540.9	16	0.5	0.067	24	13	9.3%	
Wt Tare	100.0	14	1	0.048	24	11	7.8%	
Wt Dry	440.9	13	2	0.034	24	9	6.7%	
Sample Size :	100	12	5	0.022	24	8	5.9%	
Wt Retained 2 mm:	110.4	11	15	0.013	24	7	5.2%	
% Passing 2 mm:	75.0%	10	30	0.009	24	7	4.8%	
Specific Gravity :	2.70	9	60	0.006	24	6	4.1%	
Hydrometer No.:	43-9856	9	120	0.005	24	6	4.1%	
Solution (g/L) :	40	9	240	0.003	24	6	4.1%	
		8	1440	0.001	24	5	3.3%	
		7	2880	0.001	24	3	2.2%	

GRAIN SIZE ANALYSIS

AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-15
DEPTH : 0.2-0.6m
DATE : September 16, 2013
TECHNICIAN : AH

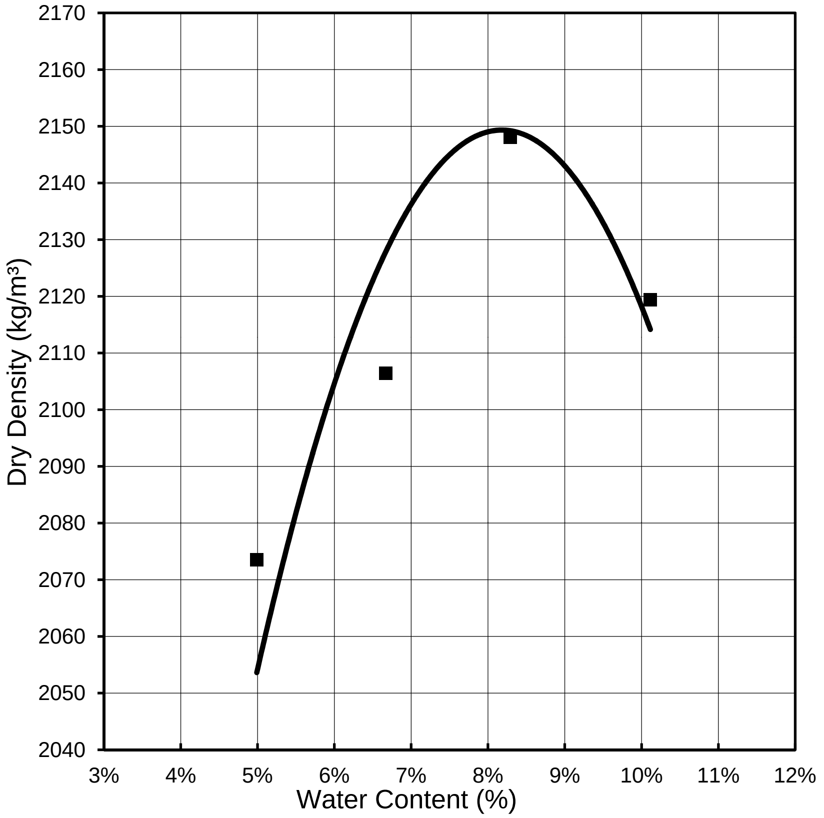


Resolution Hydro TP13-15.xls
18/09/2013

PROCTOR TEST

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
BOREHOLE: TP13-15
DEPTH : 0.2-0.6m
DATE : 13-Sep-13
TECHNICIAN : AH

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11096.3	11245.5	11414.4	11430.6		
Wt. Mould (g)	6452.7	6452.7	6452.7	6452.7		
Wet Density (kg/m³)	2177	2247	2326	2334		
Dry Density (kg/m³)	2074	2106	2148	2119		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	555.7	563.3	611.5	590.1		
Wt. Sample (dry+tare)(g)	529.9	528.9	565.7	537.1		
Wt. Tare (g)	12.9	13.2	13.2	13.1		
Wt. Dry Soil (g)	517	515.7	552.5	524		
Wt. Water (g)	25.8	34.4	45.8	53.0		
Water Content (%)	5.0%	6.7%	8.3%	10.1%		



At Optimum:

Water Content	8.2%
Dry Density (kg/m³)	2149

Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Gravel and Sand (GP) with 43% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
10%	2197	7.4%
20%	2247	6.6%
30%	2300	5.8%
40%	2355	5.0%
43%	2372	4.7%

Remarks:

FORM: Resolution Proctor TP13-15.xls
DATE: 9/17/2013

SIEVE ANALYSIS

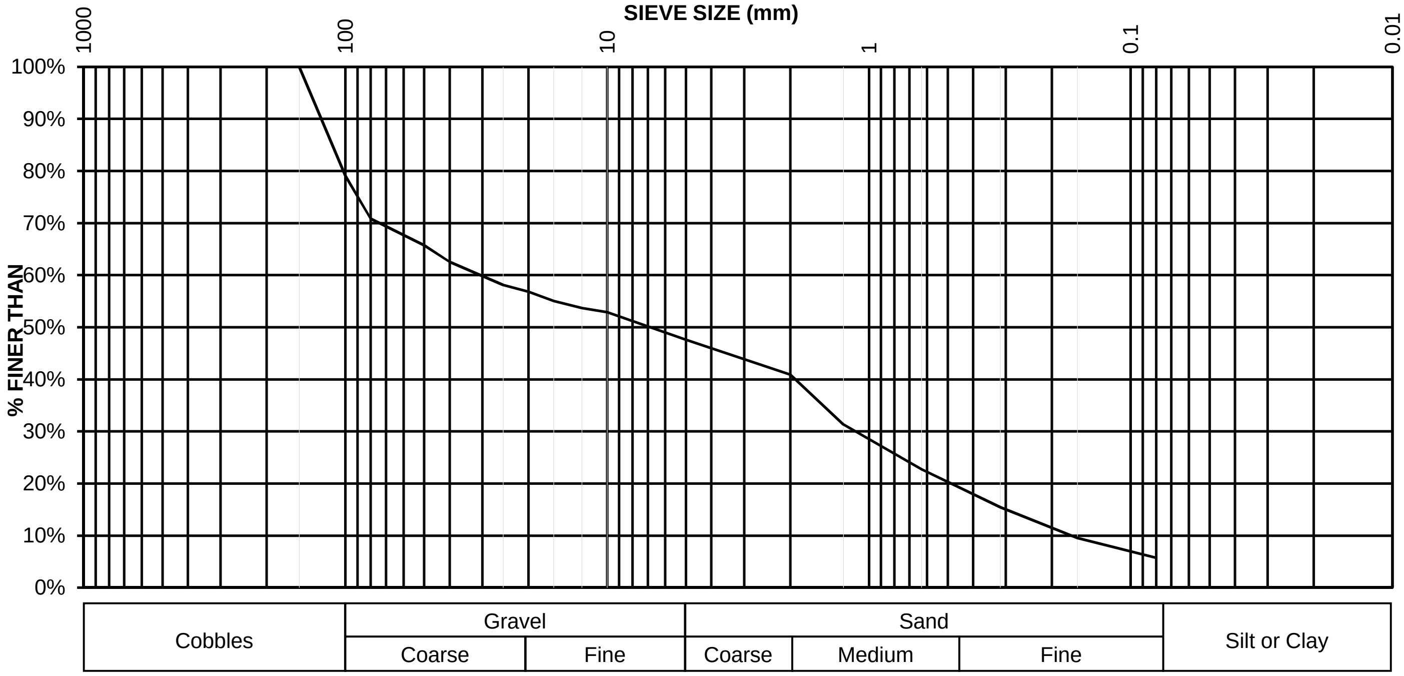
AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : Freshwater Lake Borrow Area 3
SAMPLE:
BOREHOLE: TP13-15
DEPTH : 0.2-0.6m
DATE : September 13, 2013
TECHNICIAN : CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
		150000	6	150.0			100%		
Before Washing		10000	4	100.0	7046.3	21%	79%		
Wet + Tare		80000	3	80.0	9825.0	29%	71%		
Dry+Tare		50000	2	50.0	11541.0	34%	66%		
Tare		40000	1 1/2	40.0	12617.0	37%	63%		
Wt. Dry	33657.9	25000	1	25.0	14094.3	42%	58%		
Moisture Content		20000	3/4	20.0	14525.8	43%	57%		
Wet + Tare	2604.2	16000	5/8	16.0	15138.8	45%	55%		
Dry+Tare	2498.8	12500	1/2	12.5	15598.8	46%	54%		
Tare	253.9	10000	3/8	10.0	15850.0	47%	53%		
MC (%)	4.7%	5000	0.185	5.00	17631.1	52%	48%		
	Passing	5000							
After Washing		2000	0.0937	2.00	19892.3	59%	41%		
Wt. Dry+Tare		1250	0.0469	1.25	23130.6	69%	31%		
Tare		630	0.0234	0.630	26026.4	77%	23%		
Wt. Dry		315	0.0116	0.315	28463.0	85%	15%		
Tare No.		160	0.0059	0.160	30444.4	90%	10%		
		80	0.0029	0.080	31729.9	94%	6%		
		PAN							

Classification: GP
Cc 0.2
Cu 183

Description and Remarks:
Type 2 gradation limits shown on Figure 5 in Appendix G. Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-15-final.xls
DATE: 1/23/2014

D.7 TP13-17

GRAIN SIZE ANALYSIS

AECOM

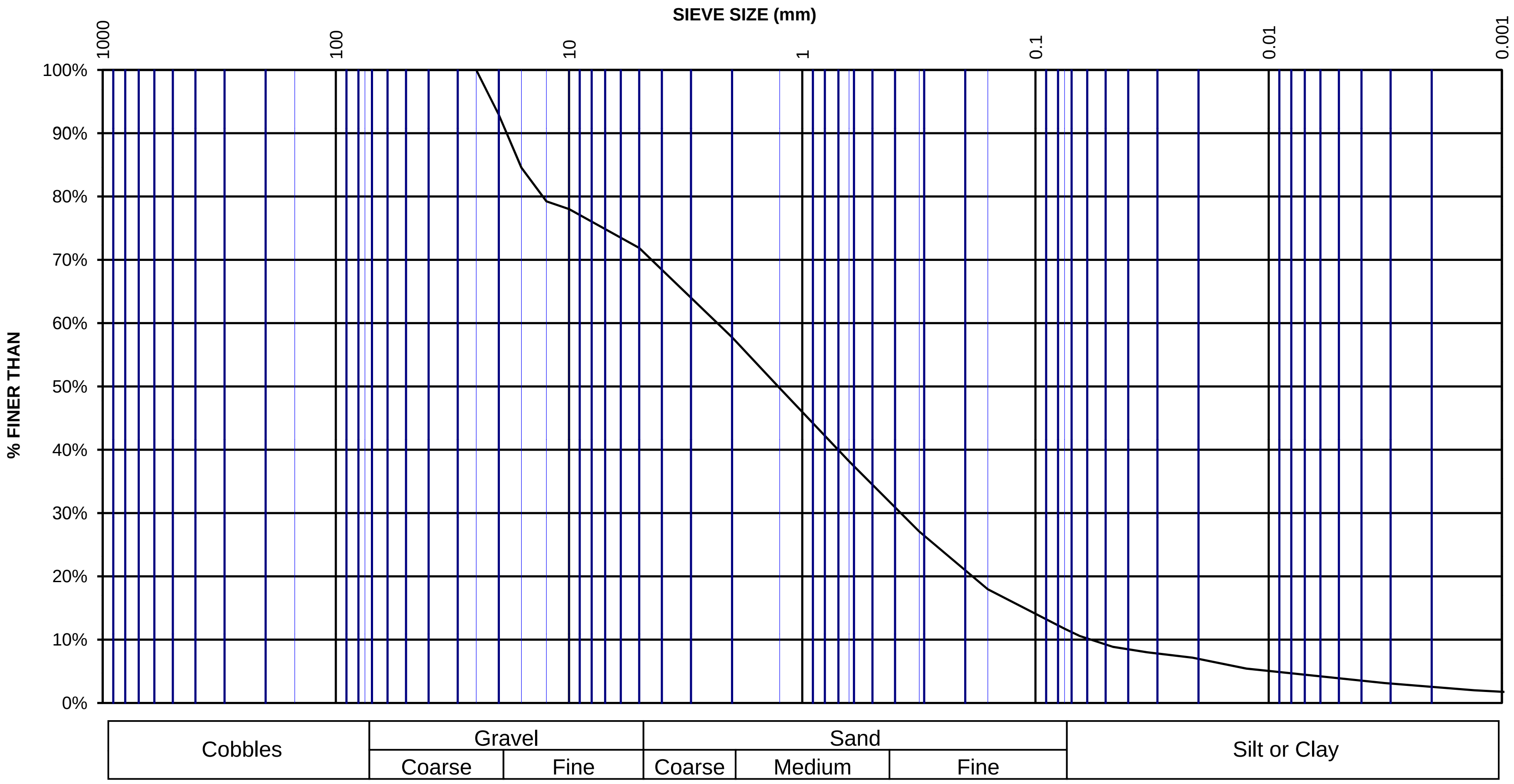
CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
TESTHOLE: TP13-17
DEPTH : 0.5-1.2m
DATE : September 16, 2013
TECHNICIAN : AH

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (μm)	SIZE OF OPENING APPROX. INCHES	SIZE OF OPENING mm	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	REMARKS
Before Washing		150,000	6	150.0		0%	100%	
Wet + Tare		75,000	3	75.0		0%	100%	
Dry+Tare	476.2	50,000	2	50.0		0%	100%	
Tare	100.0	40,000	1 1/2	40.0		0%	100%	
Wt. Dry	376.2	25,000	1	25.0		0%	100%	
Moisture Content		20,000	3/4	20.0	26.7	7%	92.9%	
Wet + Tare		16,000	5/8	16.0	58.1	15%	84.6%	
Dry+Tare		12,500	1/2	12.5	78.1	21%	79.2%	
Tare		10,000	3/8	10.0	82.7	22%	78.0%	
MC (%)		5,000	0.185	5.0	105.8	28%	71.9%	
	Passing							
After Washing		2,000	0.0937	2.0	158.9	42%	57.8%	
Wt. Dry+Tare		1,250	0.0469	1.25	189.1	50%	49.7%	
Tare		630	0.0234	0.63	232.6	62%	38.2%	
Wt. Dry		315	0.0116	0.315	274.3	73%	27.1%	
Tare No.		160	0.0059	0.160	308.6	82%	18.0%	
		75	0.00295	0.075	332.1	88%	11.7%	
		PAN						

HYDROMETER DATA		READING	TIME (min)	DIAMETER (mm)	TEMP. (°C)	CORR. READING	PERCENT FINER THAN	REMARKS
Wt Dry+Tare	476.2	22	0.5	0.065	24	19	10.6%	
Wt Tare	100.0	19	1	0.047	24	16	8.9%	
Wt Dry	376.2	18	2	0.033	24	14	8.0%	
Sample Size :	100	16	5	0.021	24	13	7.1%	
Wt Retained 2 mm:	158.9	13	15	0.012	24	10	5.4%	
% Passing 2 mm:	57.8%	12	30	0.009	24	9	4.9%	
Specific Gravity :	2.70	11	60	0.006	24	8	4.3%	
Hydrometer No.:	43-9856	10	120	0.004	24	7	3.7%	
Solution (g/L) :	40	9	240	0.003	24	6	3.1%	
		7	1440	0.001	24	4	2.0%	
		7	2880	0.001	24	3	1.7%	

GRAIN SIZE ANALYSIS

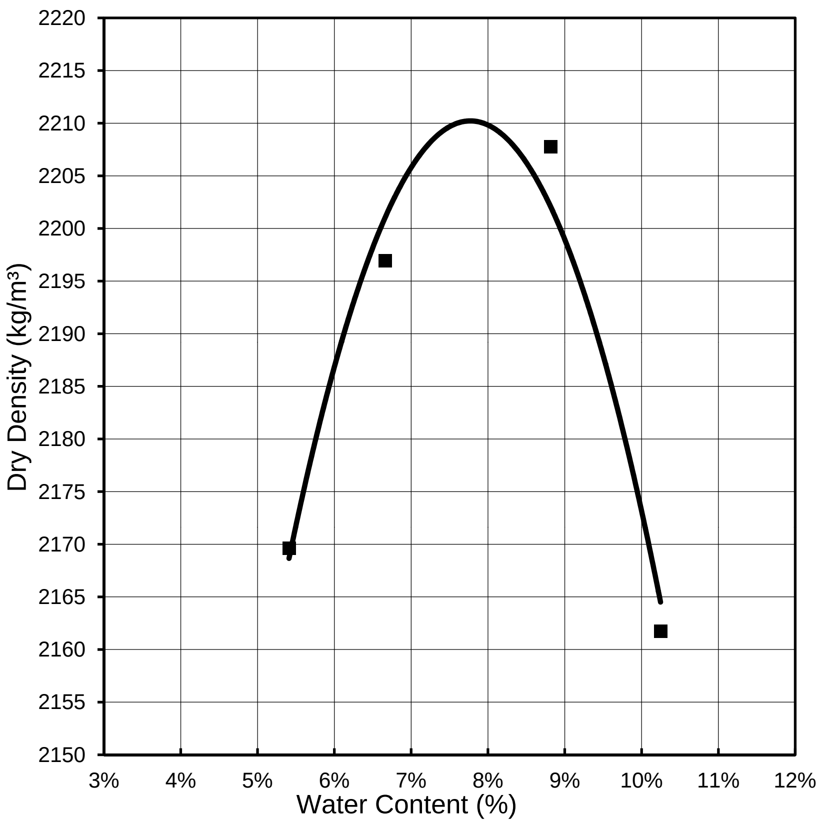
CLIENT :	Public Works Government Services Canada		
PROJECT :	Resolution Island Maintenance Assessment		
JOB No. :	60304883		
LOCATION :		SAMPLE:	
TESTHOLE:	TP13-17	DEPTH :	0.5-1.2m
DATE :	September 16, 2013	TECHNICIAN :	AH



PROCTOR TEST

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION :
SAMPLE:
BOREHOLE: TP13-17
DEPTH : 0.5-1.2m
DATE : 16-Sep-13
TECHNICIAN : CK/AH

TRIAL No.	1	2	3	4		
DENSITY DETERMINATION						
Mould Number						
Volume of Mould (cm³)	2133.0	2133.0	2133.0	2133.0		
Wt. Sample (wet+mould)(g)	11450.0	11576.1	11535.3	11330.0		
Wt. Mould (g)	6451.8	6451.8	6451.8	6451.8		
Wet Density (kg/m³)	2343	2402	2383	2287		
Dry Density (kg/m³)	2197	2208	2162	2170		
WATER CONTENT DETERMINATION						
Tare Number						
Wt. Sample (wet+tare)(g)	588.1	648.7	785.8	671.8		
Wt. Sample (dry+tare)(g)	552.2	597.2	714.0	638.0		
Wt. Tare (g)	13.2	13.0	13.3	13.2		
Wt. Dry Soil (g)	539	584.2	700.7	624.8		
Wt. Water (g)	35.9	51.5	71.8	33.8		
Water Content (%)	6.7%	8.8%	10.2%	5.4%		



At Optimum:

Water Content	7.8%
Dry Density (kg/m³)	2210

Method of Compaction:	D-698
Dia. of Mould (cm):	15
No. of Layers:	3
No. Blows per Layer:	56
Ht. of Free Fall (cm):	30
Wt. of Tamper (g)	2500
Shape of Tamping Face:	FLAT

Description of Sample:
Sand (SP-SM) with 26% rock >20mm

Rock Corrections:

% Rock	Density	Optimum
5%	2232	7.5%
10%	2254	7.1%
15%	2277	6.7%
20%	2300	6.3%
26%	2329	5.8%

Remarks:

FORM: Resolution Proctor TP13-17.xls
DATE: 9/17/2013

SIEVE ANALYSIS

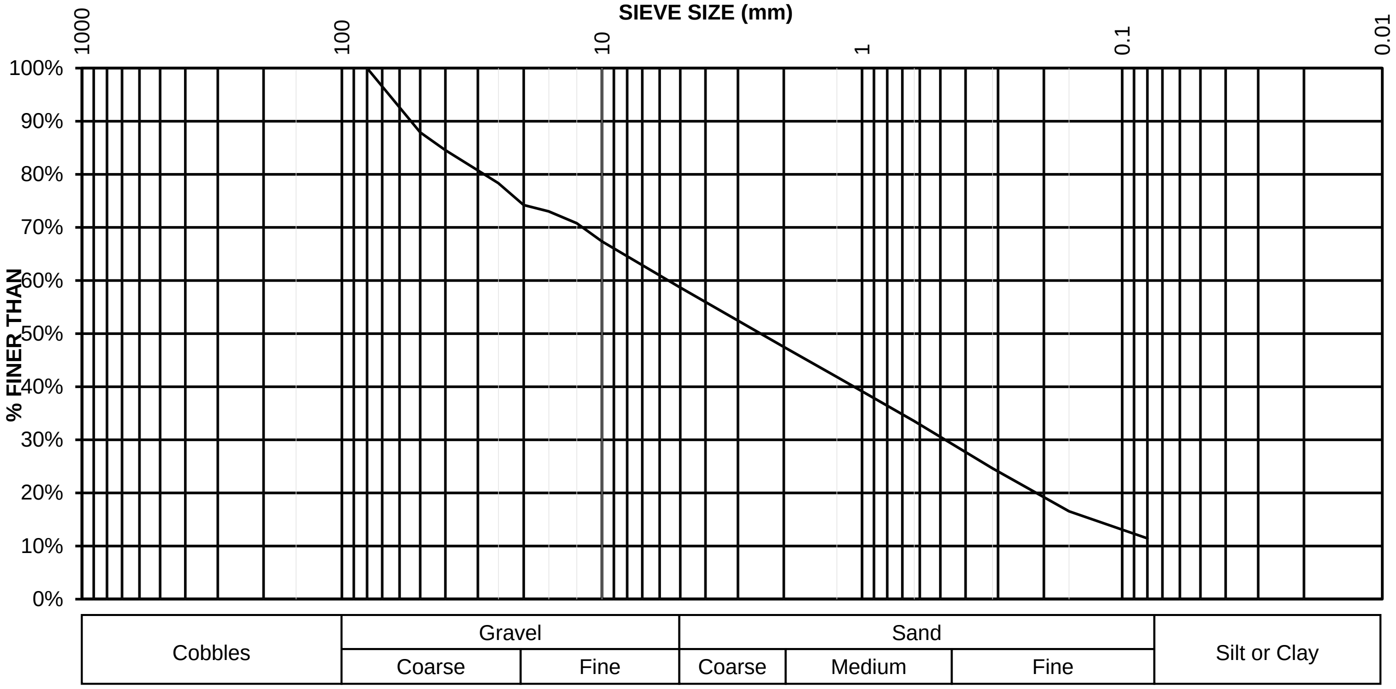
AECOM

CLIENT : Public Works Government Services Canada
PROJECT : Resolution Island Maintenance Assessment
JOB No. : 60304883
LOCATION : Lower Airstrip Borrow Area 5
SAMPLE:
BOREHOLE: TP13-17
DEPTH : 0.5-1.2m
DATE : September 16, 2013
TECHNICIAN : CK

TOTAL DRY WEIGHT OF SAMPLE		SIEVE NO. (µm)	SIZE OF OPENING		WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT FINER THAN	SPECIFICATION	
			APPROX. INCHES	mm				LOWER	UPPER
		150000	6	150.0			100%		
Before Washing		10000	4	100.0			100%		
Wet + Tare		80000	3	80.0			100%		
Dry+Tare		50000	2	50.0	4325.0	12%	88%		
Tare		40000	1 1/2	40.0	5530.8	15%	85%		
Wt. Dry	35771.5	25000	1	25.0	7756.0	22%	78%		
Moisture Content		20000	3/4	20.0	9225.0	26%	74%		
Wet + Tare	441.2	16000	5/8	16.0	9657.6	27%	73%		
Dry+Tare	419.7	12500	1/2	12.5	10446.9	29%	71%		
Tare	13.2	10000	3/8	10.0	11671.0	33%	67%		
MC (%)	5.3%	5000	0.185	5.00	14784.2	41%	59%		
	Passing	5000							
After Washing		2000	0.0937	2.00	18782.5	53%	47%		
Wt. Dry+Tare		1250	0.0469	1.25	20803.3	58%	42%		
Tare		630	0.0234	0.630	23782.8	66%	34%		
Wt. Dry		315	0.0116	0.315	26959.2	75%	25%		
Tare No.		160	0.0059	0.160	29855.6	83%	17%		
		80	0.0029	0.080	31675.4	89%	11%		
		PAN							

Classification: SP-SM
Cc 0.6
Cu 72

Description and Remarks: Type 2 gradation limits shown on Figure 6 in Appendix G. Particle size analysis based on gravel sized material and smaller. Refer to testpit logs for complete description of soil stratigraphy.



FORM: Resolution Sieve TP13-17-final.xls
DATE: 1/23/2014

D.8 Bedrock

CLIENT : AECOM
PROJECT : ARD Testing (AECOM Job# 60304883)
SGS Project # : 1340
Test : Modified Acid-Base Accounting
Date : September 25, 2013

Sample ID	**Paste pH Std. Units**	**TIC %**	**CaCO3 NP**	**S(T) %**	**S(SO4) %**	**S(S-2) %**	**AP**	**Modified NP**	**Net Modified NP**	**Fizz Test**
Method Code	Sobek	CSB02V	Calc.	CSA06V	CSA07V	Calc.	Calc.	Modified	Calc.	Sobek
LOD	0.20	0.01	#N/A	0.01	0.01	#N/A	#N/A	0.5	#N/A	#N/A
S13-01	6.98	<0.01	<0.8	<0.01	<0.01	<0.01	<0.3	0.9	0.9	None
S13-02	7.12	<0.01	<0.8	<0.01	<0.01	<0.01	<0.3	0.6	0.6	None
S13-03	7.69	<0.01	<0.8	<0.01	<0.01	<0.01	<0.3	1.1	1.1	None
Duplicates										
S13-01	6.97			<0.01				0.6		None
S13-02		<0.01			<0.01					
QC										
GTS-2A				0.33						
PD-1					4.15					
SY-4		0.91								
NBM-1								40.8	Slight	
Expected Value		0.95		0.35	4.27			42.0	Slight	
Tolerance +/-		0.06		0.03	0.3			3.0		

Note:

AP = Acid potential in tonnes CaCO3 equivalent per 1000 tonnes of material. AP is determined from the calculated sulphide sulphur content: S(T) - S(SO4).

Modified NP = Neutralization potential in tonnes CaCO3 equivalent per 1000 tonnes of material.

NET Modified NP = Modified NP - AP

Carbonate NP is calculated from TIC originating from carbonate minerals and is expressed in kg CaCO3/tonne.

CLIENT : **AECOM**
PROJECT : **ARD Testing (AECOM Job# 60304883)**
SGS Project # : **1340**
Test
: **24 Hour Nanopure Water Leach Extraction Test at 3:1 Liquid to Solid Ratio**
Date : **September 26, 2013**

Leachate Analysis

Sample ID			**S13-01**	**S13-02**	**S13-03**	**Blank**
Parameter	**Method**	**Units**				
Volume Nanopure Water		mL	750	750	750	750
Sample Weight		g	250	250	250	250
pH	meter		7.74	6.89	6.70	7.01
Redox	meter	mV	305.2	342.3	346.7	-
Conductivity	meter	uS/cm	8	6	8	1
Acidity (to pH 4.5)	titration	mg CaCO3/L	#N/A	#N/A	#N/A	-
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	3.4	3.0	3.2	-
Alkalinity	titration	mg CaCO3/L	3.8	1.5	1.7	-
Sulphate	Turbidity	mg/L	2.5	2	3	-
Ion Balance						
Major Anions	Calc	meq/L	0.13	0.07	0.10	#N/A
Major Cations	Calc	meq/L	0.06	0.05	0.07	#N/A
Difference	Calc	meq/L	0.06	0.02	0.03	#N/A
Balance (%)	Calc	%	33.2%	18.3%	18.7%	#N/A
Dissolved Metals						
Hardness CaCO3		mg/L	1.63	0.99	1.34	-
Aluminum Al	ICP-MS	mg/L	0.0086	0.0031	0.0077	-
Antimony Sb	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	-
Arsenic As	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	-
Barium Ba	ICP-MS	mg/L	0.00088	0.00061	0.00072	-
Beryllium Be	ICP-MS	mg/L	< 0.00002	< 0.00002	< 0.00002	-
Bismuth Bi	ICP-MS	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Boron B	ICP-MS	mg/L	0.0039	0.0062	0.0049	-
Cadmium Cd	ICP-MS	mg/L	0.000011	0.000006	0.000009	-
Calcium Ca	ICP-MS	mg/L	0.44	0.21	0.33	-
Chromium Cr	ICP-MS	mg/L	< 0.0005	< 0.0005	< 0.0005	-
Cobalt Co	ICP-MS	mg/L	0.000300	0.000148	0.00326	-
Copper Cu	ICP-MS	mg/L	0.0014	0.0008	0.0013	-
Iron Fe	ICP-MS	mg/L	0.009	0.004	0.006	-
Lead Pb	ICP-MS	mg/L	0.00005	< 0.00002	0.00003	-
Lithium Li	ICP-MS	mg/L	< 0.001	< 0.001	< 0.001	-
Magnesium Mg	ICP-MS	mg/L	0.127	0.112	0.123	-
Manganese Mn	ICP-MS	mg/L	0.0056	0.0025	0.0078	-
Mercury Hg	ICP-MS	ug/L	< 0.01	< 0.01	< 0.01	-
Molybdenum Mo	ICP-MS	mg/L	0.00005	0.00003	0.00002	-
Nickel Ni	ICP-MS	mg/L	0.0076	0.0044	0.0145	-
Phosphorus P	ICP-MS	mg/L	0.009	< 0.009	< 0.009	-
Potassium K	ICP-MS	mg/L	0.449	0.335	0.563	-
Selenium Se	ICP-MS	mg/L	0.00013	0.00019	0.00008	-
Silicon Si	ICP-MS	mg/L	0.30	0.25	0.46	-
Silver Ag	ICP-MS	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Sodium Na	ICP-MS	mg/L	0.39	0.43	0.49	-
Strontium Sr	ICP-MS	mg/L	0.0030	0.0016	0.0019	-
Sulphur (S)	ICP-MS	mg/L	0.91	0.65	0.90	-
Thallium Tl	ICP-MS	mg/L	< 0.00002	< 0.00002	< 0.00002	-
Tin Sn	ICP-MS	mg/L	0.00006	0.00001	0.00003	-
Titanium Ti	ICP-MS	mg/L	< 0.0001	< 0.0001	< 0.0001	-
Uranium U	ICP-MS	mg/L	0.000004	0.000001	< 0.000001	-
Vanadium V	ICP-MS	mg/L	< 0.00003	< 0.00003	< 0.00003	-
Zinc Zn	ICP-MS	mg/L	0.012	0.007	0.004	-
Zirconium Zr	ICP-MS	mg/L	0.00001	< 0.00001	< 0.00001	-

Appendix E

Environmental Analytical Results

Your Project #: 60304883
Site Location: RESOLUTION ISLAND

Attention: REBECCA MORLEY
AECOM
EDMONTON
17007 - 107 Avenue
, Edmonton, AB
CANADA T5S 1G3

Your C.O.C. #: 22541, 22542, 22540, 22539, 22536, 22537, 22538

Report Date: 2013/09/18
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B376231
Received: 2013/08/26, 10:10

Sample Matrix: Soil
Samples Received: 68

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract) (1)	8	2013/08/28	2013/08/30	AB SOP-00039	CCME, EPA 8260C
BTEX/F1 by HS GC/MS (MeOH extract) (1)	9	2013/09/11	2013/09/15	AB SOP-00039	CCME, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil) (1)	7	2013/08/28	2013/09/03	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil) (1)	1	2013/08/28	2013/09/04	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil) (1)	9	2013/09/11	2013/09/13	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F4G in soil) (1)	4	2013/08/28	2013/09/05	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Elements by ICPMS - Soils (1)	1	2013/08/30	2013/08/31	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (1)	12	2013/08/30	2013/09/01	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (1)	9	2013/08/31	2013/09/04	AB SOP-00043	EPA 200.8
Elements by ICPMS - Soils (1)	8	2013/09/17	2013/09/17	AB SOP-00043	EPA 200.8
Moisture (1)	42	N/A	2013/08/28	AB SOP-00002	CCME PHC-CWS
Moisture (1)	14	N/A	2013/08/29	AB SOP-00002	CCME PHC-CWS
Moisture (1)	12	N/A	2013/09/12	AB SOP-00002	CCME PHC-CWS
Polychlorinated Biphenyls (1)	16	2013/08/28	2013/08/30	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	3	2013/08/28	2013/08/31	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	1	2013/08/28	2013/09/04	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	17	2013/08/29	2013/08/30	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	2	2013/08/29	2013/08/31	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	1	2013/08/29	2013/09/04	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	1	2013/08/31	2013/09/04	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	9	2013/09/01	2013/09/03	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	4	2013/09/01	2013/09/04	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	9	2013/09/13	2013/09/16	CAL SOP-00149	EPA 3550C, EPA 8082A
Polychlorinated Biphenyls (1)	3	2013/09/13	2013/09/17	CAL SOP-00149	EPA 3550C, EPA 8082A

Your Project #: 60304883
Site Location: RESOLUTION ISLAND

Attention: REBECCA MORLEY
AECOM
EDMONTON
17007 - 107 Avenue
, Edmonton, AB
CANADA T5S 1G3

Your C.O.C. #: 22541, 22542, 22540, 22539, 22536, 22537, 22538

Report Date: 2013/09/18
This report supersedes all previous reports with the same Maxxam job number

CERTIFICATE OF ANALYSIS

-2-

Sample Matrix: Water
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 in Water by HS GC/MS (1)	1	N/A	2013/08/28	AB SOP-00039	CCME, EPA 8260C
Mercury - Low Level (Total) (1)	1	2013/08/30	2013/08/30	CAL SOP-00007	EPA 1631
Elements by ICPMS - Dissolved - Filtered (1)	1	N/A	2013/09/05	AB SOP-00043	EPA 200.8
Elements by ICPMS - Total (1)	1	2013/08/30	2013/09/03	AB SOP-00043	EPA 200.8
Oil and Grease by IR (1)	1	2013/08/30	2013/08/31	CAL SOP-00096	SM 5520C
Polychlorinated Biphenyls (1)	1	2013/08/28	2013/08/29	CAL SOP-00149	EPA 3510C, EPA 8082A
pH @25C (1)	1	N/A	2013/08/27	AB SOP-00005	SM 4500-H B

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Calgary Environmental

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Geraldyn Gouthro, Client Service Specialist
Email: GGouthro@maxxam.ca
Phone# (780) 577-7173

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		HI1748	HI1749	HI1750	HI1751	HI1752		
Sampling Date		2013/08/19 12:10	2013/08/19 13:00	2013/08/19 13:10	2013/08/19 13:25	2013/08/19 13:30		
COC Number		22541	22541	22541	22541	22541		
	UNITS	**13-200**	**13-201**	**13-202**	**13-203**	**13-204**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	7.7	6.6	14	12	18	0.30	7123017

RDL = Reportable Detection Limit

Maxxam ID		HI1753	HI1754	HI1755	HI1756	HI1757		
Sampling Date		2013/08/19 14:38	2013/08/19 14:45	2013/08/19 15:23	2013/08/19 15:15	2013/08/19 15:10		
COC Number		22541	22541	22541	22541	22541		
	UNITS	**13-205**	**13-206**	**13-207**	**13-208**	**13-209**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	15	13	13	16	15	0.30	7163290

RDL = Reportable Detection Limit

Maxxam ID		HI1763		HI1764	HI1764		HI1765		
Sampling Date		2013/08/19 15:38		2013/08/19 15:38	2013/08/19 15:38		2013/08/19 15:46		
COC Number		22542		22542	22542		22542		
	UNITS	**13-210**	**QC Batch**	**13-211**	**13-211 Lab-Dup**	**QC Batch**	**13-212**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	13	7163290	12	13	7163244	12	0.30	7163290

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		HI1766		HI1767		HI1768	HI1769		
Sampling Date		2013/08/19 15:49		2013/08/20 11:18		2013/08/20 11:36	2013/08/20 11:49		
COC Number		22542		22542		22542	22542		
	UNITS	**13-213**	**QC Batch**	**13-214**	**QC Batch**	**13-215**	**13-216**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	14	7163290	7.9	7123017	9.4	20	0.30	7163290

RDL = Reportable Detection Limit

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		HI1770		HI1771		HI1772	HI1772		
Sampling Date		2013/08/20 11:55		2013/08/20 13:49		2013/08/20 14:03	2013/08/20 14:03		
COC Number		22542		22542		22542	22542		
	UNITS	**13-217**	**QC Batch**	**13-218**	**QC Batch**	**13-219**	**13-219 Lab-Dup**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	13	7163290	6.1	7123017	7.5	7.9	0.30	7122086

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		HI1774	HI1775	HI1776		HI1777		
Sampling Date		2013/08/20 14:14	2013/08/20 14:14	2013/08/20 14:28		2013/08/20 14:41		
COC Number		22540	22540	22540		22540		
	UNITS	**13-220**	**13-221**	**13-222**	**QC Batch**	**13-223**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	6.5	6.5	5.3	7123017	13	0.30	7122086

RDL = Reportable Detection Limit

Maxxam ID		HI1778		HI1779	HI1780		HI1781		
Sampling Date		2013/08/20 14:57		2013/08/20 15:06	2013/08/20 15:24		2013/08/20 15:29		
COC Number		22540		22540	22540		22540		
	UNITS	**13-224**	**QC Batch**	**13-225**	**13-226**	**QC Batch**	**13-227**	**RDL**	**QC Batch**
Physical Properties									
Moisture	%	9.4	7123017	49	6.4	7122086	7.9	0.30	7123017

RDL = Reportable Detection Limit

Maxxam ID		HI1782	HI1783	HI1784	HI1785	HI1786		
Sampling Date		2013/08/20 16:26	2013/08/20 16:30	2013/08/20 16:49	2013/08/20 16:49	2013/08/20 16:53		
COC Number		22540	22540	22539	22539	22539		
	UNITS	**13-228**	**13-229**	**13-230**	**13-231**	**13-232**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	5.3	5.6	5.9	4.9	6.3	0.30	7123017

RDL = Reportable Detection Limit

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		HI1787	HI1787	HI1788		HI1789		
Sampling Date		2013/08/20 17:13	2013/08/20 17:13	2013/08/20 18:00		2013/08/20 18:06		
COC Number		22539	22539	22539		22539		
	UNITS	**13-233**	**13-233 Lab-Dup**	**13-234**	**QC Batch**	**13-235**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	5.2	4.7	4.9	7123017	2.2	0.30	7122086

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		HI1790	HI1791	HI1792	HI1793	HI1812		
Sampling Date		2013/08/21 08:52	2013/08/21 08:59	2013/08/21 10:00	2013/08/21 10:05	2013/08/21 10:20		
COC Number		22539	22539	22539	22539	22536		
	UNITS	**13-236**	**13-237**	**13-238**	**13-239**	**13-240**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	7.3	6.2	6.3	6.2	7.6	0.30	7122086

RDL = Reportable Detection Limit

Maxxam ID		HI1813	HI1814	HI1815		HI1816		
Sampling Date		2013/08/21 10:20	2013/08/21 10:37	2013/08/21 10:51		2013/08/21 11:01		
COC Number		22536	22536	22536		22536		
	UNITS	**13-241**	**13-242**	**13-243**	**QC Batch**	**13-244**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	7.4	8.3	9.8	7122086	7.1	0.30	7124688

RDL = Reportable Detection Limit

Maxxam ID		HI1817		HI1818	HI1819	HI1820		
Sampling Date		2013/08/21 11:05		2013/08/21 14:00	2013/08/21 14:26	2013/08/21 14:32		
COC Number		22536		22536	22536	22536		
	UNITS	**13-245**	**QC Batch**	**13-246**	**13-247**	**13-248**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	4.1	7124688	20	7.2	4.3	0.30	7126847

RDL = Reportable Detection Limit

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		HI1821		HI1823		HI1824		
Sampling Date		2013/08/21 15:37		2013/08/21 15:35		2013/08/21 15:35		
COC Number		22536		22537		22537		
	UNITS	**13-249**	**QC Batch**	**13-250**	**QC Batch**	**13-251**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	17	7126847	14	7122086	12	0.30	7124688

RDL = Reportable Detection Limit

Maxxam ID		HI1825		HI1826	HI1827	HI1827		
Sampling Date		2013/08/21 15:58		2013/08/21 16:02	2013/08/21 16:09	2013/08/21 16:09		
COC Number		22537		22537	22537	22537		
	UNITS	**13-252**	**QC Batch**	**13-253**	**13-254**	**13-254 Lab-Dup**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	18	7122086	20	25	24	0.30	7124688

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		HI1828		HI1829	HI1830	HI1831		
Sampling Date		2013/08/21 18:15		2013/08/22 09:07	2013/08/22 09:12	2013/08/22 09:19		
COC Number		22537		22537	22537	22537		
	UNITS	**13-255**	**QC Batch**	**13-256**	**13-257**	**13-258**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	8.2	7124688	9.4	11	23	0.30	7126847

RDL = Reportable Detection Limit

Maxxam ID		HI1831	HI1832	HI1899	HI1900	HI1901		
Sampling Date		2013/08/22 09:19	2013/08/22 09:25	2013/08/22 09:35	2013/08/22 09:35	2013/08/22 13:51		
COC Number		22537	22537	22538	22538	22538		
	UNITS	**13-258 Lab-Dup**	**13-259**	**13-260**	**13-261**	**13-262**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	24	21	16	15	5.8	0.30	7126847

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		HI1902	HI1903	HI1904		HI1905		
Sampling Date		2013/08/22 14:05	2013/08/22 14:52	2013/08/22 14:58		2013/08/22 15:15		
COC Number		22538	22538	22538		22538		
	UNITS	**13-263**	**13-264**	**13-265**	**QC Batch**	**13-266**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	5.1	8.7	6.5	7126847	11	0.30	7122086

RDL = Reportable Detection Limit

Maxxam ID		HI1906		
Sampling Date		2013/08/22 15:25		
COC Number		22538		
	UNITS	**13-267**	**RDL**	**QC Batch**
Physical Properties				
Moisture	%	18	0.30	7122086

RDL = Reportable Detection Limit

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		HI1753	HI1754	HI1755	HI1756		
Sampling Date		2013/08/19 14:38	2013/08/19 14:45	2013/08/19 15:23	2013/08/19 15:15		
COC Number		22541	22541	22541	22541		
	UNITS	**13-205**	**13-206**	**13-207**	**13-208**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	1000	1800	1400	860	10	7163266
F3 (C16-C34 Hydrocarbons)	mg/kg	1200	950	2600	1200	50	7163266
F4 (C34-C50 Hydrocarbons)	mg/kg	210	120	410	190	50	7163266
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	7163266
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	92	89	96	98	N/A	7163266

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		HI1757	HI1763	HI1764	HI1765		
Sampling Date		2013/08/19 15:10	2013/08/19 15:38	2013/08/19 15:38	2013/08/19 15:46		
COC Number		22541	22542	22542	22542		
	UNITS	**13-209**	**13-210**	**13-211**	**13-212**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	1000	12	<10	140	10	7163266
F3 (C16-C34 Hydrocarbons)	mg/kg	820	100	140	370	50	7163266
F4 (C34-C50 Hydrocarbons)	mg/kg	110	<50	57	87	50	7163266
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	7163266
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	91	82	94	87	N/A	7163266

N/A = Not Applicable
RDL = Reportable Detection Limit

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		HI1766		HI1829	HI1830		
Sampling Date		2013/08/19 15:49		2013/08/22 09:07	2013/08/22 09:12		
COC Number		22542		22537	22537		
	UNITS	**13-213**	**QC Batch**	**13-256**	**13-257**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	14	7163266	47	29	10	7134112
F3 (C16-C34 Hydrocarbons)	mg/kg	380	7163266	360	460	50	7134112
F4 (C34-C50 Hydrocarbons)	mg/kg	110	7163266	120	190	50	7134112
Reached Baseline at C50	mg/kg	Yes	7163266	Yes	Yes	N/A	7134112
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	86	7163266	93	94	N/A	7134112

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		HI1831	HI1832	HI1899	HI1900		
Sampling Date		2013/08/22 09:19	2013/08/22 09:25	2013/08/22 09:35	2013/08/22 09:35		
COC Number		22537	22537	22538	22538		
	UNITS	**13-258**	**13-259**	**13-260**	**13-261**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	3200	45	350	340	10	7134112
F3 (C16-C34 Hydrocarbons)	mg/kg	6400	3000	1200	1100	50	7134112
F4 (C34-C50 Hydrocarbons)	mg/kg	2000	1700	410	360	50	7134112
Reached Baseline at C50	mg/kg	No	No	No	No	N/A	7134112
F4G-SG (Heavy Hydrocarbons-Grav.)	mg/kg	8900	7200	2000	2800	500	7134119
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	94	91	85	92	N/A	7134112

N/A = Not Applicable
RDL = Reportable Detection Limit

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		HI1901	HI1902		
Sampling Date		2013/08/22 13:51	2013/08/22 14:05		
COC Number		22538	22538		
	UNITS	**13-262**	**13-263**	**RDL**	**QC Batch**

Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	5300	40	10	7134112
F3 (C16-C34 Hydrocarbons)	mg/kg	150	58	50	7134112
F4 (C34-C50 Hydrocarbons)	mg/kg	<50	<50	50	7134112
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	7134112
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	93	94	N/A	7134112

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1748	HI1749	HI1750		HI1751		
Sampling Date		2013/08/19 12:10	2013/08/19 13:00	2013/08/19 13:10		2013/08/19 13:25		
COC Number		22541	22541	22541		22541		
	UNITS	**13-200**	**13-201**	**13-202**	**RDL**	**13-203**	**RDL**	**QC Batch**

Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1221	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1232	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1242	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1248	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1254	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1260	mg/kg	0.39	0.75	0.18	0.10	0.040	0.010	7124176
Aroclor 1262	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Aroclor 1268	mg/kg	<0.10	<0.10	<0.10	0.10	<0.010	0.010	7124176
Total Aroclors	mg/kg	0.39	0.75	0.18	0.10	0.040	0.010	7124176
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	89	92	91	N/A	93	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1752			HI1753		HI1754		
Sampling Date		2013/08/19 13:30			2013/08/19 14:38		2013/08/19 14:45		
COC Number		22541			22541		22541		
	UNITS	**13-204**	**RDL**	**QC Batch**	**13-205**	**RDL**	**13-206**	**RDL**	**QC Batch**
Polychlorinated Biphenyls									
Aroclor 1016	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1221	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1232	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1242	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1248	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1254	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1260	mg/kg	0.031	0.010	7124176	0.12	0.020	0.074	0.010	7165537
Aroclor 1262	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Aroclor 1268	mg/kg	<0.010	0.010	7124176	<0.020	0.020	<0.010	0.010	7165537
Total Aroclors	mg/kg	0.031	0.010	7124176	0.12	0.020	0.074	0.010	7165537
Surrogate Recovery (%)									
NONACHLOROBIPHENYL (sur.)	%	98	N/A	7124176	101	N/A	106	N/A	7165537

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1755		HI1756		HI1757		
Sampling Date		2013/08/19 15:23		2013/08/19 15:15		2013/08/19 15:10		
COC Number		22541		22541		22541		
	UNITS	**13-207**	**RDL**	**13-208**	**RDL**	**13-209**	**RDL**	**QC Batch**

Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1221	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1232	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1242	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1248	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1254	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1260	mg/kg	0.19	0.050	0.11	0.010	0.14	0.020	7165537
Aroclor 1262	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Aroclor 1268	mg/kg	<0.050	0.050	<0.010	0.010	<0.020	0.020	7165537
Total Aroclors	mg/kg	0.19	0.050	0.11	0.010	0.14	0.020	7165537
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	78	N/A	93	N/A	109	N/A	7165537

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1763	HI1764	HI1765	HI1766		
Sampling Date		2013/08/19 15:38	2013/08/19 15:38	2013/08/19 15:46	2013/08/19 15:49		
COC Number		22542	22542	22542	22542		
	UNITS	**13-210**	**13-211**	**13-212**	**13-213**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1260	mg/kg	0.066	0.048	0.059	0.063	0.010	7165537
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7165537
Total Aroclors	mg/kg	0.066	0.048	0.059	0.063	0.010	7165537
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	111	101	104	102	N/A	7165537

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1767			HI1768	HI1769		
Sampling Date		2013/08/20 11:18			2013/08/20 11:36	2013/08/20 11:49		
COC Number		22542			22542	22542		
	UNITS	**13-214**	**RDL**	**QC Batch**	**13-215**	**13-216**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1221	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1232	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1242	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1248	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1254	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1260	mg/kg	0.12	0.050	7124176	0.024	<0.010	0.010	7165537
Aroclor 1262	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Aroclor 1268	mg/kg	<0.050	0.050	7124176	<0.010	<0.010	0.010	7165537
Total Aroclors	mg/kg	0.12	0.050	7124176	0.024	<0.010	0.010	7165537
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	73	N/A	7124176	107	101	N/A	7165537

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1770		HI1771		HI1772		
Sampling Date		2013/08/20 11:55		2013/08/20 13:49		2013/08/20 14:03		
COC Number		22542		22542		22542		
	UNITS	**13-217**	**QC Batch**	**13-218**	**RDL**	**13-219**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1221	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1232	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1242	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1248	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1254	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1260	mg/kg	<0.010	7165537	0.011	0.010	<1.0 (1)	1.0	7124176
Aroclor 1262	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Aroclor 1268	mg/kg	<0.010	7165537	<0.010	0.010	<1.0	1.0	7124176
Total Aroclors	mg/kg	<0.010	7165537	0.011	0.010	<1.0	1.0	7124176
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	109	7165537	79	N/A	N/A	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Matrix Spike recovery non calculable due to matrix interference. Original sample diluted to remove interference.

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1772		HI1774		HI1775		
Sampling Date		2013/08/20 14:03		2013/08/20 14:14		2013/08/20 14:14		
COC Number		22542		22540		22540		
	UNITS	**13-219 Lab-Dup**	**RDL**	**13-220**	**RDL**	**13-221**	**RDL**	**QC Batch**

Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1221	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1232	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1242	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1248	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1254	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1260	mg/kg	<1.0	1.0	0.054	0.010	<0.10	0.10	7124176
Aroclor 1262	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Aroclor 1268	mg/kg	<1.0	1.0	<0.010	0.010	<0.10	0.10	7124176
Total Aroclors	mg/kg	<1.0	1.0	0.054	0.010	<0.10	0.10	7124176
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	N/A	N/A	92	N/A	76	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1776		HI1777	HI1778		
Sampling Date		2013/08/20 14:28		2013/08/20 14:41	2013/08/20 14:57		
COC Number		22540		22540	22540		
	UNITS	**13-222**	**RDL**	**13-223**	**13-224**	**RDL**	**QC Batch**

Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1221	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1232	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1242	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1248	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1254	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1260	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1262	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Aroclor 1268	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Total Aroclors	mg/kg	<0.010	0.010	<0.10	<0.10	0.10	7124176
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	88	N/A	65	78	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1779	HI1780	HI1781	HI1782		
Sampling Date		2013/08/20 15:06	2013/08/20 15:24	2013/08/20 15:29	2013/08/20 16:26		
COC Number		22540	22540	22540	22540		
	UNITS	**13-225**	**13-226**	**13-227**	**13-228**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1260	mg/kg	0.14	<0.010	<0.010	0.013	0.010	7124176
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7124176
Total Aroclors	mg/kg	0.14	<0.010	<0.010	0.013	0.010	7124176
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	92	84	87	86	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1783	HI1784	HI1785		
Sampling Date		2013/08/20 16:30	2013/08/20 16:49	2013/08/20 16:49		
COC Number		22540	22539	22539		
	UNITS	**13-229**	**13-230**	**13-231**	**RDL**	**QC Batch**

Polychlorinated Biphenyls						
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	0.010	7124176
Surrogate Recovery (%)						
NONACHLOROBIPHENYL (sur.)	%	79	83	83	N/A	7124176

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1786	HI1786	HI1787	HI1788		
Sampling Date		2013/08/20 16:53	2013/08/20 16:53	2013/08/20 17:13	2013/08/20 18:00		
COC Number		22539	22539	22539	22539		
	UNITS	**13-232**	**13-232 Lab-Dup**	**13-233**	**13-234**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	84	81	84	88	N/A	7127072

N/A = Not Applicable
RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1789		HI1790		HI1791		
Sampling Date		2013/08/20 18:06		2013/08/21 08:52		2013/08/21 08:59		
COC Number		22539		22539		22539		
	UNITS	**13-235**	**RDL**	**13-236**	**RDL**	**13-237**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1221	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1232	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1242	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1248	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1254	mg/kg	<0.010	0.010	6.2	1.0	<0.010	0.010	7127072
Aroclor 1260	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1262	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Aroclor 1268	mg/kg	<0.010	0.010	<1.0	1.0	<0.010	0.010	7127072
Total Aroclors	mg/kg	<0.010	0.010	6.2	1.0	<0.010	0.010	7127072
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	88	N/A	N/A	N/A	85	N/A	7127072

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1792	HI1793	HI1812	HI1813		
Sampling Date		2013/08/21 10:00	2013/08/21 10:05	2013/08/21 10:20	2013/08/21 10:20		
COC Number		22539	22539	22536	22536		
	UNITS	**13-238**	**13-239**	**13-240**	**13-241**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	91	87	90	87	N/A	7127072

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1814	HI1815	HI1816	HI1817		
Sampling Date		2013/08/21 10:37	2013/08/21 10:51	2013/08/21 11:01	2013/08/21 11:05		
COC Number		22536	22536	22536	22536		
	UNITS	**13-242**	**13-243**	**13-244**	**13-245**	**RDL**	**QC Batch**
Polychlorinated Biphenyls							
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1260	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Total Aroclors	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127072
Surrogate Recovery (%)							
NONACHLOROBIPHENYL (sur.)	%	89	87	92	89	N/A	7127072

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1818	HI1819	HI1820		HI1821		
Sampling Date		2013/08/21 14:00	2013/08/21 14:26	2013/08/21 14:32		2013/08/21 15:37		
COC Number		22536	22536	22536		22536		
	UNITS	**13-246**	**13-247**	**13-248**	**RDL**	**13-249**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1221	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1232	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1242	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1248	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1254	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1260	mg/kg	0.019	0.062	0.017	0.010	<0.10	0.10	7127072
Aroclor 1262	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Aroclor 1268	mg/kg	<0.010	<0.010	<0.010	0.010	<0.10	0.10	7127072
Total Aroclors	mg/kg	0.019	0.062	0.017	0.010	<0.10	0.10	7127072
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	84	94	93	N/A	40	N/A	7127072

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1823	HI1824			HI1825		
Sampling Date		2013/08/21 15:35	2013/08/21 15:35			2013/08/21 15:58		
COC Number		22537	22537			22537		
	UNITS	**13-250**	**13-251**	**RDL**	**QC Batch**	**13-252**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1221	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1232	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1242	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1248	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1254	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1260	mg/kg	0.10	<0.10	0.10	7127072	0.070	0.010	7134353
Aroclor 1262	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Aroclor 1268	mg/kg	<0.10	<0.10	0.10	7127072	<0.010	0.010	7134353
Total Aroclors	mg/kg	0.10	<0.10	0.10	7127072	0.070	0.010	7134353
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	42	40	N/A	7127072	100	N/A	7134353

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1826		HI1827		HI1828		
Sampling Date		2013/08/21 16:02		2013/08/21 16:09		2013/08/21 18:15		
COC Number		22537		22537		22537		
	UNITS	**13-253**	**RDL**	**13-254**	**RDL**	**13-255**	**RDL**	**QC Batch**
Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1221	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1232	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1242	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1248	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1254	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1260	mg/kg	0.097	0.010	0.10	0.020	0.012	0.010	7134353
Aroclor 1262	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Aroclor 1268	mg/kg	<0.010	0.010	<0.020	0.020	<0.010	0.010	7134353
Total Aroclors	mg/kg	0.097	0.010	0.10	0.020	0.012	0.010	7134353
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	87	N/A	60	N/A	102	N/A	7134353

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1829	HI1830		HI1831	HI1832		
Sampling Date		2013/08/22 09:07	2013/08/22 09:12		2013/08/22 09:19	2013/08/22 09:25		
COC Number		22537	22537		22537	22537		
	UNITS	**13-256**	**13-257**	**RDL**	**13-258**	**13-259**	**RDL**	**QC Batch**

Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1221	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1232	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1242	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1248	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1254	mg/kg	0.024	0.036	0.010	0.31	0.23	0.10	7134353
Aroclor 1260	mg/kg	0.035	0.044	0.010	0.25	0.11	0.10	7134353
Aroclor 1262	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Aroclor 1268	mg/kg	<0.010	<0.010	0.010	<0.10	<0.10	0.10	7134353
Total Aroclors	mg/kg	0.059	0.080	0.010	0.56	0.33	0.10	7134353
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	99	93	N/A	85	75	N/A	7134353

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1899	HI1900		HI1903	HI1904		
Sampling Date		2013/08/22 09:35	2013/08/22 09:35		2013/08/22 14:52	2013/08/22 14:58		
COC Number		22538	22538		22538	22538		
	UNITS	**13-260**	**13-261**	**RDL**	**13-264**	**13-265**	**RDL**	**QC Batch**

Polychlorinated Biphenyls								
Aroclor 1016	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1221	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1232	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1242	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1248	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1254	mg/kg	0.15	0.12	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1260	mg/kg	0.057	0.070	0.050	<0.010	0.028	0.010	7134353
Aroclor 1262	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Aroclor 1268	mg/kg	<0.050	<0.050	0.050	<0.010	<0.010	0.010	7134353
Total Aroclors	mg/kg	0.21	0.19	0.050	<0.010	0.028	0.010	7134353
Surrogate Recovery (%)								
NONACHLOROBIPHENYL (sur.)	%	89	79	N/A	68	98	N/A	7134353

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		HI1905	HI1906		
Sampling Date		2013/08/22 15:15	2013/08/22 15:25		
COC Number		22538	22538		
	UNITS	**13-266**	**13-267**	**RDL**	**QC Batch**

Polychlorinated Biphenyls					
Aroclor 1016	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1221	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1232	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1242	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1248	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1254	mg/kg	<0.010	0.019	0.010	7134353
Aroclor 1260	mg/kg	<0.010	0.053	0.010	7134353
Aroclor 1262	mg/kg	<0.010	<0.010	0.010	7134353
Aroclor 1268	mg/kg	<0.010	<0.010	0.010	7134353
Total Aroclors	mg/kg	<0.010	0.073	0.010	7134353
Surrogate Recovery (%)					
NONACHLOROBIPHENYL (sur.)	%	96	94	N/A	7134353

N/A = Not Applicable
RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1748	HI1748	HI1749	HI1750		
Sampling Date		2013/08/19 12:10	2013/08/19 12:10	2013/08/19 13:00	2013/08/19 13:10		
COC Number		22541	22541	22541	22541		
	UNITS	**13-200**	**13-200 Lab-Dup**	**13-201**	**13-202**	**RDL**	**QC Batch**
Elements							
Total Arsenic (As)	mg/kg	1.2	1.2	<1.0	<1.0	1.0	7133778
Total Cadmium (Cd)	mg/kg	0.12	0.12	0.11	0.18	0.10	7133778
Total Chromium (Cr)	mg/kg	26	28	19	18	1.0	7133778
Total Cobalt (Co)	mg/kg	10	10	6.3	10	1.0	7133778
Total Copper (Cu)	mg/kg	60	62	39	34	5.0	7133778
Total Lead (Pb)	mg/kg	4.7	4.4	6.5	13	1.0	7133778
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	7133778
Total Nickel (Ni)	mg/kg	52	52	35	48	1.0	7133778
Total Zinc (Zn)	mg/kg	45	47	38	48	10	7133778

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1751	HI1752	HI1767		HI1768		
Sampling Date		2013/08/19 13:25	2013/08/19 13:30	2013/08/20 11:18		2013/08/20 11:36		
COC Number		22541	22541	22542		22542		
	UNITS	**13-203**	**13-204**	**13-214**	**QC Batch**	**13-215**	**RDL**	**QC Batch**
Elements								
Total Antimony (Sb)	mg/kg	N/A	N/A	N/A	N/A	<1.0	1.0	7173035
Total Arsenic (As)	mg/kg	1.1	<1.0	1.1	7133778	1.3	1.0	7173035
Total Barium (Ba)	mg/kg	N/A	N/A	N/A	N/A	51	10	7173035
Total Beryllium (Be)	mg/kg	N/A	N/A	N/A	N/A	<0.40	0.40	7173035
Total Cadmium (Cd)	mg/kg	1.5	0.82	0.11	7133778	<0.10	0.10	7173035
Total Chromium (Cr)	mg/kg	37	37	35	7133778	27	1.0	7173035
Total Cobalt (Co)	mg/kg	18	21	14	7133778	13	1.0	7173035
Total Copper (Cu)	mg/kg	87	85	69	7133778	65	5.0	7173035
Total Lead (Pb)	mg/kg	5.1	3.1	14	7133778	9.1	1.0	7173035
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	7133778	N/A	0.050	N/A
Total Molybdenum (Mo)	mg/kg	N/A	N/A	N/A	N/A	1.8	0.40	7173035
Total Nickel (Ni)	mg/kg	89	92	73	7133778	68	1.0	7173035
Total Selenium (Se)	mg/kg	N/A	N/A	N/A	N/A	0.84	0.50	7173035
Total Silver (Ag)	mg/kg	N/A	N/A	N/A	N/A	<1.0	1.0	7173035
Total Thallium (Tl)	mg/kg	N/A	N/A	N/A	N/A	<0.30	0.30	7173035
Total Tin (Sn)	mg/kg	N/A	N/A	N/A	N/A	<1.0	1.0	7173035
Total Uranium (U)	mg/kg	N/A	N/A	N/A	N/A	<1.0	1.0	7173035
Total Vanadium (V)	mg/kg	N/A	N/A	N/A	N/A	43	1.0	7173035
Total Zinc (Zn)	mg/kg	200	120	67	7133778	79	10	7173035

N/A = Not Applicable
RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1769	HI1770		HI1771	HI1777		
Sampling Date		2013/08/20 11:49	2013/08/20 11:55		2013/08/20 13:49	2013/08/20 14:41		
COC Number		22542	22542		22542	22540		
	UNITS	**13-216**	**13-217**	**QC Batch**	**13-218**	**13-223**	**RDL**	**QC Batch**
Elements								
Total Antimony (Sb)	mg/kg	1.4	<1.0	7173035	N/A	N/A	1.0	N/A
Total Arsenic (As)	mg/kg	1.1	1.1	7173035	1.1	<1.0	1.0	7133778
Total Barium (Ba)	mg/kg	54	49	7173035	N/A	N/A	10	N/A
Total Beryllium (Be)	mg/kg	<0.40	<0.40	7173035	N/A	N/A	0.40	N/A
Total Cadmium (Cd)	mg/kg	0.22	0.11	7173035	0.28	0.33	0.10	7133778
Total Chromium (Cr)	mg/kg	31	33	7173035	39	35	1.0	7133778
Total Cobalt (Co)	mg/kg	20	11	7173035	19	15	1.0	7133778
Total Copper (Cu)	mg/kg	68	80	7173035	96	78	5.0	7133778
Total Lead (Pb)	mg/kg	11	13	7173035	14	12	1.0	7133778
Total Mercury (Hg)	mg/kg	N/A	N/A	N/A	<0.050	<0.050	0.050	7133778
Total Molybdenum (Mo)	mg/kg	2.6	2.6	7173035	N/A	N/A	0.40	N/A
Total Nickel (Ni)	mg/kg	74	67	7173035	94	82	1.0	7133778
Total Selenium (Se)	mg/kg	1.2	1.5	7173035	N/A	N/A	0.50	N/A
Total Silver (Ag)	mg/kg	<1.0	<1.0	7173035	N/A	N/A	1.0	N/A
Total Thallium (Tl)	mg/kg	<0.30	<0.30	7173035	N/A	N/A	0.30	N/A
Total Tin (Sn)	mg/kg	1.9	1.5	7173035	N/A	N/A	1.0	N/A
Total Uranium (U)	mg/kg	<1.0	<1.0	7173035	N/A	N/A	1.0	N/A
Total Vanadium (V)	mg/kg	52	50	7173035	N/A	N/A	1.0	N/A
Total Zinc (Zn)	mg/kg	210	93	7173035	100	110	10	7133778

N/A = Not Applicable
RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1778		HI1779		HI1782		
Sampling Date		2013/08/20 14:57		2013/08/20 15:06		2013/08/20 16:26		
COC Number		22540		22540		22540		
	UNITS	**13-224**	**QC Batch**	**13-225**	**QC Batch**	**13-228**	**RDL**	**QC Batch**
Elements								
Total Arsenic (As)	mg/kg	1.4	7133778	3.1	7130503	<1.0	1.0	7130675
Total Cadmium (Cd)	mg/kg	0.71	7133778	5.6	7130503	0.15	0.10	7130675
Total Chromium (Cr)	mg/kg	43	7133778	86	7130503	28	1.0	7130675
Total Cobalt (Co)	mg/kg	26	7133778	65	7130503	15	1.0	7130675
Total Copper (Cu)	mg/kg	95	7133778	270	7130503	60	5.0	7130675
Total Lead (Pb)	mg/kg	21	7133778	84	7130503	5.5	1.0	7130675
Total Mercury (Hg)	mg/kg	0.068	7133778	0.11	7130503	<0.050	0.050	7130675
Total Nickel (Ni)	mg/kg	130	7133778	260	7130503	76	1.0	7130675
Total Zinc (Zn)	mg/kg	240	7133778	610	7130503	62	10	7130675

RDL = Reportable Detection Limit

Maxxam ID		HI1783	HI1783	HI1787	HI1816		
Sampling Date		2013/08/20 16:30	2013/08/20 16:30	2013/08/20 17:13	2013/08/21 11:01		
COC Number		22540	22540	22539	22536		
	UNITS	**13-229**	**13-229 Lab-Dup**	**13-233**	**13-244**	**RDL**	**QC Batch**
Elements							
Total Arsenic (As)	mg/kg	<1.0	<1.0	<1.0	<1.0	1.0	7130675
Total Cadmium (Cd)	mg/kg	<0.10	<0.10	0.18	0.15	0.10	7130675
Total Chromium (Cr)	mg/kg	26	29	34	33	1.0	7130675
Total Cobalt (Co)	mg/kg	12	12	17	17	1.0	7130675
Total Copper (Cu)	mg/kg	46	49	73	73	5.0	7130675
Total Lead (Pb)	mg/kg	2.3	2.5	3.6	2.5	1.0	7130675
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	7130675
Total Nickel (Ni)	mg/kg	58	62	86	84	1.0	7130675
Total Zinc (Zn)	mg/kg	42	45	65	60	10	7130675

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1818	HI1819	HI1820	HI1828		
Sampling Date		2013/08/21 14:00	2013/08/21 14:26	2013/08/21 14:32	2013/08/21 18:15		
COC Number		22536	22536	22536	22537		
	UNITS	**13-246**	**13-247**	**13-248**	**13-255**	**RDL**	**QC Batch**
Elements							
Total Arsenic (As)	mg/kg	<1.0	1.3	<1.0	1.0	1.0	7130675
Total Cadmium (Cd)	mg/kg	0.13	<0.10	<0.10	0.22	0.10	7130675
Total Chromium (Cr)	mg/kg	28	25	22	33	1.0	7130675
Total Cobalt (Co)	mg/kg	14	8.8	7.2	14	1.0	7130675
Total Copper (Cu)	mg/kg	73	55	47	82	5.0	7130675
Total Lead (Pb)	mg/kg	7.0	2.4	3.5	8.0	1.0	7130675
Total Mercury (Hg)	mg/kg	<0.050	<0.050	<0.050	<0.050	0.050	7130675
Total Nickel (Ni)	mg/kg	85	61	48	92	1.0	7130675
Total Zinc (Zn)	mg/kg	98	55	49	110	10	7130675

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1829	HI1831	HI1832	HI1899		
Sampling Date		2013/08/22 09:07	2013/08/22 09:19	2013/08/22 09:25	2013/08/22 09:35		
COC Number		22537	22537	22537	22538		
	UNITS	**13-256**	**13-258**	**13-259**	**13-260**	**RDL**	**QC Batch**

Elements							
Total Antimony (Sb)	mg/kg	<1.0	2.6	1.7	<1.0	1.0	7173035
Total Arsenic (As)	mg/kg	1.0	2.3	8.1	<1.0	1.0	7173035
Total Barium (Ba)	mg/kg	61	75	88	41	10	7173035
Total Beryllium (Be)	mg/kg	<0.40	<0.40	<0.40	<0.40	0.40	7173035
Total Cadmium (Cd)	mg/kg	0.20	0.28	0.54	0.10	0.10	7173035
Total Chromium (Cr)	mg/kg	36	33	33	21	1.0	7173035
Total Cobalt (Co)	mg/kg	16	11	16	5.6	1.0	7173035
Total Copper (Cu)	mg/kg	78	130	120	60	5.0	7173035
Total Lead (Pb)	mg/kg	6.5	82	43	26	1.0	7173035
Total Molybdenum (Mo)	mg/kg	2.8	2.9	2.9	1.8	0.40	7173035
Total Nickel (Ni)	mg/kg	81	63	63	33	1.0	7173035
Total Selenium (Se)	mg/kg	0.89	1.3	0.68	0.69	0.50	7173035
Total Silver (Ag)	mg/kg	<1.0	<1.0	<1.0	<1.0	1.0	7173035
Total Thallium (Tl)	mg/kg	<0.30	<0.30	<0.30	<0.30	0.30	7173035
Total Tin (Sn)	mg/kg	<1.0	47	38	2.8	1.0	7173035
Total Uranium (U)	mg/kg	<1.0	<1.0	<1.0	<1.0	1.0	7173035
Total Vanadium (V)	mg/kg	54	55	37	37	1.0	7173035
Total Zinc (Zn)	mg/kg	76	240	310	55	10	7173035

RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1900		HI1903	HI1904	HI1905		
Sampling Date		2013/08/22 09:35		2013/08/22 14:52	2013/08/22 14:58	2013/08/22 15:15		
COC Number		22538		22538	22538	22538		
	UNITS	**13-261**	**QC Batch**	**13-264**	**13-265**	**13-266**	**RDL**	**QC Batch**
Elements								
Total Antimony (Sb)	mg/kg	<1.0	7173035	N/A	N/A	N/A	1.0	N/A
Total Arsenic (As)	mg/kg	<1.0	7173035	<1.0	<1.0	1.0	1.0	7130675
Total Barium (Ba)	mg/kg	40	7173035	N/A	N/A	N/A	10	N/A
Total Beryllium (Be)	mg/kg	<0.40	7173035	N/A	N/A	N/A	0.40	N/A
Total Cadmium (Cd)	mg/kg	<0.10	7173035	<0.10	<0.10	<0.10	0.10	7130675
Total Chromium (Cr)	mg/kg	22	7173035	19	18	25	1.0	7130675
Total Cobalt (Co)	mg/kg	5.4	7173035	3.7	8.0	8.3	1.0	7130675
Total Copper (Cu)	mg/kg	53	7173035	29	36	49	5.0	7130675
Total Lead (Pb)	mg/kg	25	7173035	1.7	8.4	3.4	1.0	7130675
Total Mercury (Hg)	mg/kg	N/A	N/A	<0.050	<0.050	<0.050	0.050	7130675
Total Molybdenum (Mo)	mg/kg	1.7	7173035	N/A	N/A	N/A	0.40	N/A
Total Nickel (Ni)	mg/kg	34	7173035	18	39	42	1.0	7130675
Total Selenium (Se)	mg/kg	0.62	7173035	N/A	N/A	N/A	0.50	N/A
Total Silver (Ag)	mg/kg	<1.0	7173035	N/A	N/A	N/A	1.0	N/A
Total Thallium (Tl)	mg/kg	<0.30	7173035	N/A	N/A	N/A	0.30	N/A
Total Tin (Sn)	mg/kg	3.5	7173035	N/A	N/A	N/A	1.0	N/A
Total Uranium (U)	mg/kg	<1.0	7173035	N/A	N/A	N/A	1.0	N/A
Total Vanadium (V)	mg/kg	35	7173035	N/A	N/A	N/A	1.0	N/A
Total Zinc (Zn)	mg/kg	54	7173035	16	29	30	10	7130675

N/A = Not Applicable
RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (SOIL)

Maxxam ID		HI1906		
Sampling Date		2013/08/22 15:25		
COC Number		22538		
	UNITS	**13-267**	**RDL**	**QC Batch**

Elements				
Total Arsenic (As)	mg/kg	<1.0	1.0	7130675
Total Cadmium (Cd)	mg/kg	<0.10	0.10	7130675
Total Chromium (Cr)	mg/kg	16	1.0	7130675
Total Cobalt (Co)	mg/kg	6.0	1.0	7130675
Total Copper (Cu)	mg/kg	31	5.0	7130675
Total Lead (Pb)	mg/kg	3.7	1.0	7130675
Total Mercury (Hg)	mg/kg	<0.050	0.050	7130675
Total Nickel (Ni)	mg/kg	35	1.0	7130675
Total Zinc (Zn)	mg/kg	24	10	7130675

RDL = Reportable Detection Limit

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		HI1753	HI1754	HI1755	HI1756		
Sampling Date		2013/08/19 14:38	2013/08/19 14:45	2013/08/19 15:23	2013/08/19 15:15		
COC Number		22541	22541	22541	22541		
	UNITS	**13-205**	**13-206**	**13-207**	**13-208**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7169309
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7169309
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7169309
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7169309
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7169309
o-Xylene	mg/kg	0.036	<0.020	<0.020	<0.020	0.020	7169309
F1 (C6-C10) - BTEX	mg/kg	<12	62	<12	<12	12	7169309
(C6-C10)	mg/kg	<12	62	<12	<12	12	7169309
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	104	103	99	102	N/A	7169309
4-BROMOFLUOROBENZENE (sur.)	%	90	87	91	86	N/A	7169309
D10-ETHYLBENZENE (sur.)	%	86	89	85	90	N/A	7169309
D4-1,2-DICHLOROETHANE (sur.)	%	98	101	95	96	N/A	7169309

N/A = Not Applicable
RDL = Reportable Detection Limit

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		HI1757	HI1763	HI1764	HI1765		
Sampling Date		2013/08/19 15:10	2013/08/19 15:38	2013/08/19 15:38	2013/08/19 15:46		
COC Number		22541	22542	22542	22542		
	UNITS	**13-209**	**13-210**	**13-211**	**13-212**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7169309
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7169309
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7169309
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7169309
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7169309
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7169309
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	7169309
(C6-C10)	mg/kg	<12	<12	<12	<12	12	7169309
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	102	102	103	104	N/A	7169309
4-BROMOFLUOROBENZENE (sur.)	%	87	85	84	84	N/A	7169309
D10-ETHYLBENZENE (sur.)	%	89	88	89	92	N/A	7169309
D4-1,2-DICHLOROETHANE (sur.)	%	97	94	98	97	N/A	7169309

N/A = Not Applicable
RDL = Reportable Detection Limit

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		HI1765	HI1766		HI1829		
Sampling Date		2013/08/19 15:46	2013/08/19 15:49		2013/08/22 09:07		
COC Number		22542	22542		22537		
	UNITS	**13-212 Lab-Dup**	**13-213**	**QC Batch**	**13-256**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	0.018	7169309	<0.0050	0.0050	7127442
Toluene	mg/kg	<0.020	<0.020	7169309	<0.020	0.020	7127442
Ethylbenzene	mg/kg	<0.010	<0.010	7169309	<0.010	0.010	7127442
Xylenes (Total)	mg/kg	<0.040	0.10	7169309	<0.040	0.040	7127442
m & p-Xylene	mg/kg	<0.040	0.059	7169309	<0.040	0.040	7127442
o-Xylene	mg/kg	<0.020	0.046	7169309	<0.020	0.020	7127442
F1 (C6-C10) - BTEX	mg/kg	<12	<12	7169309	<12	12	7127442
(C6-C10)	mg/kg	<12	<12	7169309	<12	12	7127442
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	99	100	7169309	92	N/A	7127442
4-BROMOFLUOROBENZENE (sur.)	%	82	83	7169309	86	N/A	7127442
D10-ETHYLBENZENE (sur.)	%	86	88	7169309	89	N/A	7127442
D4-1,2-DICHLOROETHANE (sur.)	%	95	93	7169309	139	N/A	7127442

N/A = Not Applicable
RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		HI1830	HI1831	HI1832	HI1899		
Sampling Date		2013/08/22 09:12	2013/08/22 09:19	2013/08/22 09:25	2013/08/22 09:35		
COC Number		22537	22537	22537	22538		
	UNITS	**13-257**	**13-258**	**13-259**	**13-260**	**RDL**	**QC Batch**

Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7127442
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7127442
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	7127442
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7127442
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	7127442
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7127442
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	7127442
(C6-C10)	mg/kg	<12	<12	<12	<12	12	7127442
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	91	89	86	96	N/A	7127442
4-BROMOFLUOROBENZENE (sur.)	%	85	89	102	90	N/A	7127442
D10-ETHYLBENZENE (sur.)	%	87	82	79	76	N/A	7127442
D4-1,2-DICHLOROETHANE (sur.)	%	136	137	106	119	N/A	7127442

N/A = Not Applicable
RDL = Reportable Detection Limit

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		HI1900	HI1901	HI1901	HI1902		
Sampling Date		2013/08/22 09:35	2013/08/22 13:51	2013/08/22 13:51	2013/08/22 14:05		
COC Number		22538	22538	22538	22538		
	UNITS	**13-261**	**13-262**	**13-262 Lab-Dup**	**13-263**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	7127442
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	7127442
Ethylbenzene	mg/kg	<0.010	0.040	0.043	<0.010	0.010	7127442
Xylenes (Total)	mg/kg	<0.040	0.35	0.38	<0.040	0.040	7127442
m & p-Xylene	mg/kg	<0.040	0.15	0.16	<0.040	0.040	7127442
o-Xylene	mg/kg	<0.020	0.20	0.22	<0.020	0.020	7127442
F1 (C6-C10) - BTEX	mg/kg	<12	280	280	<12	12	7127442
(C6-C10)	mg/kg	<12	280	280	<12	12	7127442
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	92	78	79	94	N/A	7127442
4-BROMOFLUOROBENZENE (sur.)	%	97	138	133	103	N/A	7127442
D10-ETHYLBENZENE (sur.)	%	79	92	102	98	N/A	7127442
D4-1,2-DICHLOROETHANE (sur.)	%	110	95	81	92	N/A	7127442

N/A = Not Applicable
RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		HI1908	HI1908		
Sampling Date		2013/08/21 17:31	2013/08/21 17:31		
COC Number		22538	22538		
	UNITS	**CAMP TANK DISCHARGE**	**CAMP TANK DISCHARGE Lab-Dup**	**RDL**	**QC Batch**
Misc. Inorganics					
pH	N/A	6.99	7.18	N/A	7121587
Misc. Organics					
Oil and grease	mg/L	<2.0	N/A	2.0	7115661

N/A = Not Applicable
RDL = Reportable Detection Limit

POLYCHLORINATED BIPHENYLS BY GC-ECD (WATER)

Maxxam ID		HI1908		
Sampling Date		2013/08/21 17:31		
COC Number		22538		
	UNITS	**CAMP TANK DISCHARGE**	**RDL**	**QC Batch**
Polychlorinated Biphenyls				
Aroclor 1016	mg/L	<0.000050	0.000050	7111674
Aroclor 1221	mg/L	<0.000050	0.000050	7111674
Aroclor 1232	mg/L	<0.000050	0.000050	7111674
Aroclor 1242	mg/L	<0.000050	0.000050	7111674
Aroclor 1248	mg/L	<0.000050	0.000050	7111674
Aroclor 1254	mg/L	<0.000050	0.000050	7111674
Aroclor 1260	mg/L	<0.000050	0.000050	7111674
Aroclor 1262	mg/L	<0.000050	0.000050	7111674
Aroclor 1268	mg/L	<0.000050	0.000050	7111674
Total Aroclors	mg/L	<0.000050	0.000050	7111674
Surrogate Recovery (%)				
NONACHLOROBIPHENYL (sur.)	%	72	N/A	7111674

N/A = Not Applicable
RDL = Reportable Detection Limit

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		HI1908		
Sampling Date		2013/08/21 17:31		
COC Number		22538		
	UNITS	**CAMP TANK DISCHARGE**	**RDL**	**QC Batch**

Elements				
Total Arsenic (As)	mg/L	<0.00020	0.00020	7131192
Dissolved Cadmium (Cd)	mg/L	0.00014	0.0000050	7141075
Dissolved Chromium (Cr)	mg/L	<0.0010	0.0010	7141075
Dissolved Cobalt (Co)	mg/L	0.00039	0.00030	7141075
Dissolved Copper (Cu)	mg/L	0.0021	0.00020	7141075
Dissolved Lead (Pb)	mg/L	0.00028	0.00020	7141075
Dissolved Nickel (Ni)	mg/L	0.0058	0.00050	7141075
Total Zinc (Zn)	mg/L	<0.0030	0.0030	7131192
Low Level Elements				
Total Mercury (Hg)	ug/L	<0.0020	0.0020	7131833

RDL = Reportable Detection Limit

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		HI1908		
Sampling Date		2013/08/21 17:31		
COC Number		22538		
	UNITS	**CAMP TANK DISCHARGE**	**RDL**	**QC Batch**
Volatiles				
Benzene	ug/L	<0.40	0.40	7122068
Toluene	ug/L	<0.40	0.40	7122068
Ethylbenzene	ug/L	<0.40	0.40	7122068
m & p-Xylene	ug/L	<0.80	0.80	7122068
o-Xylene	ug/L	<0.40	0.40	7122068
Xylenes (Total)	ug/L	<0.80	0.80	7122068
F1 (C6-C10) - BTEX	ug/L	<100	100	7122068
(C6-C10)	ug/L	<100	100	7122068
Surrogate Recovery (%)				
1,4-Difluorobenzene (sur.)	%	107	N/A	7122068
4-BROMOFLUOROBENZENE (sur.)	%	109	N/A	7122068
D4-1,2-DICHLOROETHANE (sur.)	%	104	N/A	7122068

N/A = Not Applicable
RDL = Reportable Detection Limit

General Comments

Revised Report: additional analysis included as per request. 2013/09/18

Note: 13-205, 13-206, 13-207, 13-208, 13-210, 12-211, 13-212, 13-213 were extracted past recommended holdtime for BTEX F1-F4.

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL) Comments

Sample HI1748-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1749-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1750-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1753-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1755-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1757-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1767-02 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1772-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1775-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1777-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1778-02 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1790-02 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1821-01 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1823-01 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1824-01 Polychlorinated Biphenyls: Detection limits raised due to matrix interference.

Sample HI1827-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1831-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1832-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1899-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Sample HI1900-01 Polychlorinated Biphenyls: Detection limits raised due to dilution to bring analyte within the calibrated range.

Results relate only to the items tested.

AECOM
Attention: REBECCA MORLEY
Client Project #: 60304883
P.O. #:
Site Location: RESOLUTION ISLAND

Quality Assurance Report

Maxxam Job Number: EYKB376231

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7111674 SJ1	Matrix Spike	NONACHLOROBIPHENYL (sur.)	2013/08/29		56	%	30 - 130
		Aroclor 1260	2013/08/29		49	%	30 - 130
	Spiked Blank	NONACHLOROBIPHENYL (sur.)	2013/08/29		76	%	30 - 130
		Aroclor 1260	2013/08/29		69	%	30 - 130
	Method Blank	NONACHLOROBIPHENYL (sur.)	2013/08/29		101	%	30 - 130
		Aroclor 1016	2013/08/29	<0.000050		mg/L	
		Aroclor 1221	2013/08/29	<0.000050		mg/L	
		Aroclor 1232	2013/08/29	<0.000050		mg/L	
		Aroclor 1242	2013/08/29	<0.000050		mg/L	
		Aroclor 1248	2013/08/29	<0.000050		mg/L	
		Aroclor 1254	2013/08/29	<0.000050		mg/L	
		Aroclor 1260	2013/08/29	<0.000050		mg/L	
		Aroclor 1262	2013/08/29	<0.000050		mg/L	
		Aroclor 1268	2013/08/29	<0.000050		mg/L	
		Total Aroclors	2013/08/29	<0.000050		mg/L	
	RPD	Aroclor 1016	2013/08/29	NC		%	40
		Aroclor 1221	2013/08/29	NC		%	40
		Aroclor 1232	2013/08/29	NC		%	40
		Aroclor 1242	2013/08/29	NC		%	40
		Aroclor 1248	2013/08/29	NC		%	40
		Aroclor 1254	2013/08/29	NC		%	40
		Aroclor 1260	2013/08/29	NC		%	40
		Aroclor 1262	2013/08/29	NC		%	40
		Aroclor 1268	2013/08/29	NC		%	40
		Total Aroclors	2013/08/29	NC		%	40
7115661 GP4	Spiked Blank	Oil and grease	2013/08/30		99	%	70 - 130
	Method Blank	Oil and grease	2013/08/30	<2.0		mg/L	
7121587 FT2	Spiked Blank	pH	2013/08/27		99	%	97 - 102
	RPD [HI1908-01]	pH	2013/08/27	2.7		%	5
7122068 RSU	Matrix Spike	1,4-Difluorobenzene (sur.)	2013/08/29		109	%	70 - 130
		4-BROMOFLUOROBENZENE (sur.)	2013/08/29		120	%	70 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/29		106	%	70 - 130
		Benzene	2013/08/29		79	%	70 - 130
		Toluene	2013/08/29		86	%	70 - 130
		Ethylbenzene	2013/08/29		94	%	70 - 130
		m & p-Xylene	2013/08/29		95	%	70 - 130
		o-Xylene	2013/08/29		96	%	70 - 130
		(C6-C10)	2013/08/29		81	%	70 - 130
	Spiked Blank	1,4-Difluorobenzene (sur.)	2013/08/28		109	%	70 - 130
		4-BROMOFLUOROBENZENE (sur.)	2013/08/28		120	%	70 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/28		102	%	70 - 130
		Benzene	2013/08/28		88	%	70 - 130
		Toluene	2013/08/28		97	%	70 - 130
		Ethylbenzene	2013/08/28		106	%	70 - 130
		m & p-Xylene	2013/08/28		109	%	70 - 130
		o-Xylene	2013/08/28		106	%	70 - 130
		(C6-C10)	2013/08/28		99	%	70 - 130
	Method Blank	1,4-Difluorobenzene (sur.)	2013/08/28		106	%	70 - 130
		4-BROMOFLUOROBENZENE (sur.)	2013/08/28		107	%	70 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/28		101	%	70 - 130
		Benzene	2013/08/28	<0.40		ug/L	
		Toluene	2013/08/28	<0.40		ug/L	
		Ethylbenzene	2013/08/28	<0.40		ug/L	
		m & p-Xylene	2013/08/28	<0.80		ug/L	
		o-Xylene	2013/08/28	<0.40		ug/L	

AECOM
Attention: REBECCA MORLEY
Client Project #: 60304883
P.O. #:
Site Location: RESOLUTION ISLAND

Quality Assurance Report (Continued)

Maxxam Job Number: EYKB376231

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7122068	RSU	Method Blank	Xylenes (Total)	2013/08/28	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2013/08/28	<100		ug/L	
			(C6-C10)	2013/08/28	<100		ug/L	
		RPD	Benzene	2013/08/28	NC		%	40
			Toluene	2013/08/28	NC		%	40
			Ethylbenzene	2013/08/28	NC		%	40
			m & p-Xylene	2013/08/28	NC		%	40
			o-Xylene	2013/08/28	NC		%	40
			Xylenes (Total)	2013/08/28	NC		%	40
			F1 (C6-C10) - BTEX	2013/08/28	NC		%	40
			(C6-C10)	2013/08/28	NC		%	40
7122086	JA7	Method Blank	Moisture	2013/08/28	<0.30		%	
		RPD [HI1772-02]	Moisture	2013/08/28	5.2		%	20
7123017	JA7	Method Blank	Moisture	2013/08/28	<0.30		%	
		RPD [HI1787-02]	Moisture	2013/08/28	10.1		%	20
7124176	SJ1	Spiked Blank	NONACHLOROBIPHENYL (sur.)	2013/08/30		88	%	30 - 130
			Aroclor 1260	2013/08/30		83	%	30 - 130
		Method Blank	NONACHLOROBIPHENYL (sur.)	2013/08/30		89	%	30 - 130
			Aroclor 1016	2013/08/30	<0.010		mg/kg	
			Aroclor 1221	2013/08/30	<0.010		mg/kg	
			Aroclor 1232	2013/08/30	<0.010		mg/kg	
			Aroclor 1242	2013/08/30	<0.010		mg/kg	
			Aroclor 1248	2013/08/30	<0.010		mg/kg	
			Aroclor 1254	2013/08/30	<0.010		mg/kg	
			Aroclor 1260	2013/08/30	<0.010		mg/kg	
			Aroclor 1262	2013/08/30	<0.010		mg/kg	
			Aroclor 1268	2013/08/30	<0.010		mg/kg	
			Total Aroclors	2013/08/30	<0.010		mg/kg	
		RPD [HI1772-02]	Aroclor 1016	2013/08/30	NC		%	50
			Aroclor 1221	2013/08/30	NC		%	50
			Aroclor 1232	2013/08/30	NC		%	50
			Aroclor 1242	2013/08/30	NC		%	50
			Aroclor 1248	2013/08/30	NC		%	50
			Aroclor 1254	2013/08/30	NC		%	50
			Aroclor 1260	2013/08/30	NC		%	50
			Aroclor 1262	2013/08/30	NC		%	50
			Aroclor 1268	2013/08/30	NC		%	50
			Total Aroclors	2013/08/30	NC		%	50
7124688	JA7	Method Blank	Moisture	2013/08/28	<0.30		%	
		RPD [HI1827-01]	Moisture	2013/08/28	4.5		%	20
7126847	KSA	Method Blank	Moisture	2013/08/29	<0.30		%	
		RPD [HI1831-01]	Moisture	2013/08/29	2.6		%	20
7127072	SJ1	Matrix Spike [HI1786-02]	NONACHLOROBIPHENYL (sur.)	2013/08/30		82	%	30 - 130
			Aroclor 1260	2013/08/30		79	%	30 - 130
		Spiked Blank	NONACHLOROBIPHENYL (sur.)	2013/08/30		93	%	30 - 130
			Aroclor 1260	2013/08/30		80	%	30 - 130
		Method Blank	NONACHLOROBIPHENYL (sur.)	2013/08/30		84	%	30 - 130
			Aroclor 1016	2013/08/30	<0.010		mg/kg	
			Aroclor 1221	2013/08/30	<0.010		mg/kg	
			Aroclor 1232	2013/08/30	<0.010		mg/kg	
			Aroclor 1242	2013/08/30	<0.010		mg/kg	
			Aroclor 1248	2013/08/30	<0.010		mg/kg	
			Aroclor 1254	2013/08/30	<0.010		mg/kg	
			Aroclor 1260	2013/08/30	<0.010		mg/kg	

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QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7127072 SJ1	Method Blank	Aroclor 1262	2013/08/30	<0.010		mg/kg	
		Aroclor 1268	2013/08/30	<0.010		mg/kg	
		Total Aroclors	2013/08/30	<0.010		mg/kg	
	RPD [HI1786-02]	Aroclor 1016	2013/08/30	NC		%	50
		Aroclor 1221	2013/08/30	NC		%	50
		Aroclor 1232	2013/08/30	NC		%	50
		Aroclor 1242	2013/08/30	NC		%	50
		Aroclor 1248	2013/08/30	NC		%	50
		Aroclor 1254	2013/08/30	NC		%	50
		Aroclor 1260	2013/08/30	NC		%	50
		Aroclor 1262	2013/08/30	NC		%	50
		Aroclor 1268	2013/08/30	NC		%	50
		Total Aroclors	2013/08/30	NC		%	50
7127442 RSU	Matrix Spike [HI1901-01]	1,4-Difluorobenzene (sur.)	2013/08/30		105	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/08/30		125	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/08/30		122	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/30		80	%	60 - 140
		Benzene	2013/08/30		72	%	60 - 140
		Toluene	2013/08/30		97	%	60 - 140
		Ethylbenzene	2013/08/30		99	%	60 - 140
		m & p-Xylene	2013/08/30		114	%	60 - 140
		o-Xylene	2013/08/30		95	%	60 - 140
		(C6-C10)	2013/08/30		139	%	60 - 140
	Spiked Blank	1,4-Difluorobenzene (sur.)	2013/08/30		97	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/08/30		95	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/08/30		94	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/30		130	%	60 - 140
		Benzene	2013/08/30		106	%	60 - 140
		Toluene	2013/08/30		88	%	60 - 140
		Ethylbenzene	2013/08/30		90	%	60 - 140
		m & p-Xylene	2013/08/30		92	%	60 - 140
		o-Xylene	2013/08/30		94	%	60 - 140
		(C6-C10)	2013/08/30		97	%	60 - 140
	Method Blank	1,4-Difluorobenzene (sur.)	2013/08/30		85	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/08/30		83	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/08/30		95	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/08/30		122	%	60 - 140
		Benzene	2013/08/30	<0.0050		mg/kg	
		Toluene	2013/08/30	<0.020		mg/kg	
		Ethylbenzene	2013/08/30	<0.010		mg/kg	
		Xylenes (Total)	2013/08/30	<0.040		mg/kg	
		m & p-Xylene	2013/08/30	<0.040		mg/kg	
		o-Xylene	2013/08/30	<0.020		mg/kg	
		F1 (C6-C10) - BTEX	2013/08/30	<12		mg/kg	
		(C6-C10)	2013/08/30	<12		mg/kg	
	RPD [HI1901-01]	Benzene	2013/08/30	NC		%	50
		Toluene	2013/08/30	NC		%	50
		Ethylbenzene	2013/08/30	NC		%	50
		Xylenes (Total)	2013/08/30	10.2		%	50
		m & p-Xylene	2013/08/30	NC		%	50
		o-Xylene	2013/08/30	10.6		%	50
		F1 (C6-C10) - BTEX	2013/08/30	1		%	50
		(C6-C10)	2013/08/30	1		%	50
7130503 SCG	Matrix Spike	Total Arsenic (As)	2013/08/31		124	%	75 - 125

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QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7130503 SCG	Matrix Spike	Total Cadmium (Cd)	2013/08/31		89	%	75 - 125
		Total Chromium (Cr)	2013/08/31		129 (1)	%	75 - 125
		Total Cobalt (Co)	2013/08/31		99	%	75 - 125
		Total Copper (Cu)	2013/08/31		137 (1)	%	75 - 125
		Total Lead (Pb)	2013/08/31		NC	%	75 - 125
		Total Mercury (Hg)	2013/08/31		76	%	75 - 125
		Total Nickel (Ni)	2013/08/31		137 (1)	%	75 - 125
		Total Zinc (Zn)	2013/08/31		NC	%	75 - 125
	QC Standard	Total Arsenic (As)	2013/08/31		126	%	50 - 150
		Total Chromium (Cr)	2013/08/31		114	%	41 - 159
		Total Cobalt (Co)	2013/08/31		107	%	75 - 125
		Total Copper (Cu)	2013/08/31		106	%	73 - 127
		Total Lead (Pb)	2013/08/31		107	%	54 - 146
		Total Nickel (Ni)	2013/08/31		113	%	61 - 139
		Total Zinc (Zn)	2013/08/31		114	%	72 - 128
	Spiked Blank	Total Arsenic (As)	2013/08/31		107	%	75 - 125
		Total Cadmium (Cd)	2013/08/31		103	%	75 - 125
		Total Chromium (Cr)	2013/08/31		107	%	75 - 125
		Total Cobalt (Co)	2013/08/31		107	%	75 - 125
		Total Copper (Cu)	2013/08/31		107	%	75 - 125
		Total Lead (Pb)	2013/08/31		104	%	75 - 125
		Total Mercury (Hg)	2013/08/31		106	%	75 - 125
		Total Nickel (Ni)	2013/08/31		106	%	75 - 125
		Total Zinc (Zn)	2013/08/31		111	%	75 - 125
	Method Blank	Total Arsenic (As)	2013/08/31	<1.0		mg/kg	
		Total Cadmium (Cd)	2013/08/31	<0.10		mg/kg	
		Total Chromium (Cr)	2013/08/31	<1.0		mg/kg	
		Total Cobalt (Co)	2013/08/31	<1.0		mg/kg	
		Total Copper (Cu)	2013/08/31	<5.0		mg/kg	
		Total Lead (Pb)	2013/08/31	<1.0		mg/kg	
		Total Mercury (Hg)	2013/08/31	<0.050		mg/kg	
		Total Nickel (Ni)	2013/08/31	<1.0		mg/kg	
		Total Zinc (Zn)	2013/08/31	<10		mg/kg	
	RPD	Total Arsenic (As)	2013/08/31	16.0		%	35
		Total Cadmium (Cd)	2013/08/31	NC		%	35
		Total Chromium (Cr)	2013/08/31	1.2		%	35
		Total Cobalt (Co)	2013/08/31	NC		%	35
		Total Copper (Cu)	2013/08/31	NC		%	35
		Total Lead (Pb)	2013/08/31	34.3		%	35
		Total Mercury (Hg)	2013/08/31	NC		%	35
		Total Nickel (Ni)	2013/08/31	25.7		%	35
		Total Zinc (Zn)	2013/08/31	1.3		%	35
7130675 HC7	Matrix Spike						
	[HI1783-01]	Total Arsenic (As)	2013/09/01		88	%	75 - 125
		Total Cadmium (Cd)	2013/09/01		87	%	75 - 125
		Total Chromium (Cr)	2013/09/01		NC	%	75 - 125
		Total Cobalt (Co)	2013/09/01		87	%	75 - 125
		Total Copper (Cu)	2013/09/01		NC	%	75 - 125
		Total Lead (Pb)	2013/09/01		86	%	75 - 125
		Total Mercury (Hg)	2013/09/01		88	%	75 - 125
		Total Nickel (Ni)	2013/09/01		NC	%	75 - 125
		Total Zinc (Zn)	2013/09/01		NC	%	75 - 125
	QC Standard	Total Arsenic (As)	2013/09/01		127	%	50 - 150
		Total Chromium (Cr)	2013/09/01		110	%	41 - 159
		Total Cobalt (Co)	2013/09/01		111	%	75 - 125

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QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7130675	HC7	QC Standard	Total Copper (Cu)	2013/09/01		116	%	73 - 127
			Total Lead (Pb)	2013/09/01		112	%	54 - 146
			Total Nickel (Ni)	2013/09/01		121	%	61 - 139
			Total Zinc (Zn)	2013/09/01		119	%	72 - 128
		Spiked Blank	Total Arsenic (As)	2013/09/01		108	%	75 - 125
			Total Cadmium (Cd)	2013/09/01		106	%	75 - 125
			Total Chromium (Cr)	2013/09/01		108	%	75 - 125
			Total Cobalt (Co)	2013/09/01		107	%	75 - 125
			Total Copper (Cu)	2013/09/01		109	%	75 - 125
			Total Lead (Pb)	2013/09/01		107	%	75 - 125
			Total Mercury (Hg)	2013/09/01		109	%	75 - 125
			Total Nickel (Ni)	2013/09/01		109	%	75 - 125
			Total Zinc (Zn)	2013/09/01		114	%	75 - 125
		Method Blank	Total Arsenic (As)	2013/09/01	<1.0		mg/kg	
			Total Cadmium (Cd)	2013/09/01	<0.10		mg/kg	
			Total Chromium (Cr)	2013/09/01	<1.0		mg/kg	
			Total Cobalt (Co)	2013/09/01	<1.0		mg/kg	
			Total Copper (Cu)	2013/09/01	<5.0		mg/kg	
			Total Lead (Pb)	2013/09/01	<1.0		mg/kg	
			Total Mercury (Hg)	2013/09/01	<0.050		mg/kg	
			Total Nickel (Ni)	2013/09/01	<1.0		mg/kg	
			Total Zinc (Zn)	2013/09/01	<10		mg/kg	
		RPD [HI1783-01]	Total Arsenic (As)	2013/09/01	NC		%	35
			Total Cadmium (Cd)	2013/09/01	NC		%	35
			Total Chromium (Cr)	2013/09/01	10.6		%	35
			Total Cobalt (Co)	2013/09/01	4.2		%	35
			Total Copper (Cu)	2013/09/01	7.7		%	35
			Total Lead (Pb)	2013/09/01	NC		%	35
			Total Mercury (Hg)	2013/09/01	NC		%	35
			Total Nickel (Ni)	2013/09/01	7.1		%	35
			Total Zinc (Zn)	2013/09/01	NC		%	35
7131192	MB5	Matrix Spike	Total Arsenic (As)	2013/09/03		109	%	80 - 120
			Total Zinc (Zn)	2013/09/03		104	%	80 - 120
		Spiked Blank	Total Arsenic (As)	2013/09/03		103	%	80 - 120
			Total Zinc (Zn)	2013/09/03		108	%	80 - 120
		Method Blank	Total Arsenic (As)	2013/09/03	<0.00020		mg/L	
			Total Zinc (Zn)	2013/09/03	<0.0030		mg/L	
		RPD	Total Arsenic (As)	2013/09/03	NC		%	20
			Total Zinc (Zn)	2013/09/03	NC		%	20
7131833	AM0	Matrix Spike	Total Mercury (Hg)	2013/08/30		106	%	80 - 120
		Spiked Blank	Total Mercury (Hg)	2013/08/30		111	%	80 - 120
		Method Blank	Total Mercury (Hg)	2013/08/30	<0.0020		ug/L	
		RPD	Total Mercury (Hg)	2013/08/30	NC		%	20
7133778	MB5	Matrix Spike [HI1748-01]	Total Arsenic (As)	2013/09/04		100	%	75 - 125
			Total Cadmium (Cd)	2013/09/04		98	%	75 - 125
			Total Chromium (Cr)	2013/09/04		NC	%	75 - 125
			Total Cobalt (Co)	2013/09/04		100	%	75 - 125
			Total Copper (Cu)	2013/09/04		NC	%	75 - 125
			Total Lead (Pb)	2013/09/04		96	%	75 - 125
			Total Mercury (Hg)	2013/09/04		98	%	75 - 125
			Total Nickel (Ni)	2013/09/04		NC	%	75 - 125
			Total Zinc (Zn)	2013/09/04		NC	%	75 - 125
		QC Standard	Total Arsenic (As)	2013/09/04		128	%	50 - 150
			Total Chromium (Cr)	2013/09/04		115	%	41 - 159

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QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7133778 MB5	QC Standard	Total Cobalt (Co)	2013/09/04		113	%	75 - 125
		Total Copper (Cu)	2013/09/04		116	%	73 - 127
		Total Lead (Pb)	2013/09/04		114	%	54 - 146
		Total Nickel (Ni)	2013/09/04		121	%	61 - 139
		Total Zinc (Zn)	2013/09/04		123	%	72 - 128
	Spiked Blank	Total Arsenic (As)	2013/09/04		98	%	75 - 125
		Total Cadmium (Cd)	2013/09/04		94	%	75 - 125
		Total Chromium (Cr)	2013/09/04		98	%	75 - 125
		Total Cobalt (Co)	2013/09/04		97	%	75 - 125
		Total Copper (Cu)	2013/09/04		98	%	75 - 125
		Total Lead (Pb)	2013/09/04		96	%	75 - 125
		Total Mercury (Hg)	2013/09/04		95	%	75 - 125
		Total Nickel (Ni)	2013/09/04		105	%	75 - 125
		Total Zinc (Zn)	2013/09/04		103	%	75 - 125
	Method Blank	Total Arsenic (As)	2013/09/04	<1.0		mg/kg	
		Total Cadmium (Cd)	2013/09/04	<0.10		mg/kg	
		Total Chromium (Cr)	2013/09/04	<1.0		mg/kg	
		Total Cobalt (Co)	2013/09/04	<1.0		mg/kg	
		Total Copper (Cu)	2013/09/04	<5.0		mg/kg	
		Total Lead (Pb)	2013/09/04	<1.0		mg/kg	
		Total Mercury (Hg)	2013/09/04	<0.050		mg/kg	
		Total Nickel (Ni)	2013/09/04	<1.0		mg/kg	
		Total Zinc (Zn)	2013/09/04	<10		mg/kg	
	RPD [HI1748-01]	Total Arsenic (As)	2013/09/04	NC		%	35
		Total Cadmium (Cd)	2013/09/04	NC		%	35
		Total Chromium (Cr)	2013/09/04	6.3		%	35
		Total Cobalt (Co)	2013/09/04	2.7		%	35
		Total Copper (Cu)	2013/09/04	2.9		%	35
		Total Lead (Pb)	2013/09/04	NC		%	35
		Total Mercury (Hg)	2013/09/04	NC		%	35
		Total Nickel (Ni)	2013/09/04	0.6		%	35
		Total Zinc (Zn)	2013/09/04	NC		%	35
7134112 JP0	Matrix Spike	O-TERPHENYL (sur.)	2013/09/03		84	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/03		91	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2013/09/03		91	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2013/09/03		91	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2013/09/03		82	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/03		92	%	70 - 130
		F3 (C16-C34 Hydrocarbons)	2013/09/03		93	%	70 - 130
		F4 (C34-C50 Hydrocarbons)	2013/09/03		94	%	70 - 130
	Method Blank	O-TERPHENYL (sur.)	2013/09/03		89	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/03	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2013/09/03	<50		mg/kg	
		F4 (C34-C50 Hydrocarbons)	2013/09/03	<50		mg/kg	
	RPD	F2 (C10-C16 Hydrocarbons)	2013/09/03	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2013/09/03	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2013/09/03	NC		%	50
7134119 HL	Spiked Blank	F4G-SG (Heavy Hydrocarbons-Grav.)	2013/09/05		86	%	70 - 130
	Method Blank	F4G-SG (Heavy Hydrocarbons-Grav.)	2013/09/05	<500		mg/kg	
7134353 SJ1	Matrix Spike	NONACHLOROBIPHENYL (sur.)	2013/09/03		96	%	30 - 130
		Aroclor 1260	2013/09/03		97	%	30 - 130
	Spiked Blank	NONACHLOROBIPHENYL (sur.)	2013/09/03		90	%	30 - 130
		Aroclor 1260	2013/09/03		99	%	30 - 130
	Method Blank	NONACHLOROBIPHENYL (sur.)	2013/09/03		89	%	30 - 130
		Aroclor 1016	2013/09/03	<0.010		mg/kg	

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QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7134353 SJ1	Method Blank	Aroclor 1221	2013/09/03	<0.010		mg/kg	
		Aroclor 1232	2013/09/03	<0.010		mg/kg	
		Aroclor 1242	2013/09/03	<0.010		mg/kg	
		Aroclor 1248	2013/09/03	<0.010		mg/kg	
		Aroclor 1254	2013/09/03	<0.010		mg/kg	
		Aroclor 1260	2013/09/03	<0.010		mg/kg	
		Aroclor 1262	2013/09/03	<0.010		mg/kg	
		Aroclor 1268	2013/09/03	<0.010		mg/kg	
		Total Aroclors	2013/09/03	<0.010		mg/kg	
	RPD	Aroclor 1016	2013/09/03	NC		%	50
		Aroclor 1221	2013/09/03	NC		%	50
		Aroclor 1232	2013/09/03	NC		%	50
		Aroclor 1242	2013/09/03	NC		%	50
		Aroclor 1248	2013/09/03	NC		%	50
		Aroclor 1254	2013/09/03	NC		%	50
		Aroclor 1260	2013/09/03	NC		%	50
		Aroclor 1262	2013/09/03	NC		%	50
		Aroclor 1268	2013/09/03	NC		%	50
		Total Aroclors	2013/09/03	NC		%	50
7141075 TDB	Matrix Spike	Dissolved Cadmium (Cd)	2013/09/05		99	%	80 - 120
		Dissolved Chromium (Cr)	2013/09/05		98	%	80 - 120
		Dissolved Cobalt (Co)	2013/09/05		98	%	80 - 120
		Dissolved Copper (Cu)	2013/09/05		98	%	80 - 120
		Dissolved Lead (Pb)	2013/09/05		95	%	80 - 120
		Dissolved Nickel (Ni)	2013/09/05		97	%	80 - 120
	Spiked Blank	Dissolved Cadmium (Cd)	2013/09/05		99	%	80 - 120
		Dissolved Chromium (Cr)	2013/09/05		100	%	80 - 120
		Dissolved Cobalt (Co)	2013/09/05		100	%	80 - 120
		Dissolved Copper (Cu)	2013/09/05		101	%	80 - 120
		Dissolved Lead (Pb)	2013/09/05		101	%	80 - 120
		Dissolved Nickel (Ni)	2013/09/05		100	%	80 - 120
	Method Blank	Dissolved Cadmium (Cd)	2013/09/05	<0.0000050		mg/L	
		Dissolved Chromium (Cr)	2013/09/05	<0.0010		mg/L	
		Dissolved Cobalt (Co)	2013/09/05	<0.00030		mg/L	
		Dissolved Copper (Cu)	2013/09/05	<0.00020		mg/L	
		Dissolved Lead (Pb)	2013/09/05	<0.00020		mg/L	
		Dissolved Nickel (Ni)	2013/09/05	<0.00050		mg/L	
	RPD	Dissolved Chromium (Cr)	2013/09/05	NC		%	20
		Dissolved Cobalt (Co)	2013/09/05	NC		%	20
		Dissolved Copper (Cu)	2013/09/05	NC		%	20
		Dissolved Lead (Pb)	2013/09/05	NC		%	20
		Dissolved Nickel (Ni)	2013/09/05	NC		%	20
7163244 KSA	Method Blank	Moisture	2013/09/12	<0.30		%	
	RPD [HI1764-01]	Moisture	2013/09/12	1.6		%	20
7163266 JW0	Matrix Spike	O-TERPHENYL (sur.)	2013/09/13		83	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/13		87	%	50 - 130
		F3 (C16-C34 Hydrocarbons)	2013/09/13		93	%	50 - 130
		F4 (C34-C50 Hydrocarbons)	2013/09/13		89	%	50 - 130
	Spiked Blank	O-TERPHENYL (sur.)	2013/09/13		86	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/13		89	%	70 - 130
		F3 (C16-C34 Hydrocarbons)	2013/09/13		94	%	70 - 130
		F4 (C34-C50 Hydrocarbons)	2013/09/13		89	%	70 - 130
	Method Blank	O-TERPHENYL (sur.)	2013/09/13		93	%	50 - 130
		F2 (C10-C16 Hydrocarbons)	2013/09/13	<10		mg/kg	
		F3 (C16-C34 Hydrocarbons)	2013/09/13	<50		mg/kg	

Quality Assurance Report (Continued)

Maxxam Job Number: EYKB376231

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7163266 JW0	Method Blank	F4 (C34-C50 Hydrocarbons)	2013/09/13	<50		mg/kg	
	RPD	F2 (C10-C16 Hydrocarbons)	2013/09/13	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2013/09/13	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2013/09/13	NC		%	50
7163290 KSA	Method Blank	Moisture	2013/09/12	<0.30		%	
	RPD	Moisture	2013/09/12	5.0		%	20
7165537 JC7	Matrix Spike	NONACHLOROBIPHENYL (sur.)	2013/09/13		115	%	30 - 130
		Aroclor 1260	2013/09/13		91	%	30 - 130
	Spiked Blank	NONACHLOROBIPHENYL (sur.)	2013/09/13		101	%	30 - 130
		Aroclor 1260	2013/09/13		78	%	30 - 130
	Method Blank	NONACHLOROBIPHENYL (sur.)	2013/09/13		96	%	30 - 130
		Aroclor 1016	2013/09/13	<0.010		mg/kg	
		Aroclor 1221	2013/09/13	<0.010		mg/kg	
		Aroclor 1232	2013/09/13	<0.010		mg/kg	
		Aroclor 1242	2013/09/13	<0.010		mg/kg	
		Aroclor 1248	2013/09/13	<0.010		mg/kg	
		Aroclor 1254	2013/09/13	<0.010		mg/kg	
		Aroclor 1260	2013/09/13	<0.010		mg/kg	
		Aroclor 1262	2013/09/13	<0.010		mg/kg	
		Aroclor 1268	2013/09/13	<0.010		mg/kg	
		Total Aroclors	2013/09/13	<0.010		mg/kg	
	RPD	Aroclor 1016	2013/09/13	NC		%	50
		Aroclor 1221	2013/09/13	NC		%	50
		Aroclor 1232	2013/09/13	NC		%	50
		Aroclor 1242	2013/09/13	NC		%	50
		Aroclor 1248	2013/09/13	NC		%	50
		Aroclor 1254	2013/09/13	NC		%	50
		Aroclor 1260	2013/09/13	NC		%	50
		Aroclor 1262	2013/09/13	NC		%	50
		Aroclor 1268	2013/09/13	NC		%	50
		Total Aroclors	2013/09/13	NC		%	50
7169309 RSU	Matrix Spike						
	[HI1765-01]	1,4-Difluorobenzene (sur.)	2013/09/15		100	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/09/15		92	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/09/15		96	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/09/15		96	%	60 - 140
		Benzene	2013/09/15		99	%	60 - 140
		Toluene	2013/09/15		97	%	60 - 140
		Ethylbenzene	2013/09/15		103	%	60 - 140
		m & p-Xylene	2013/09/15		101	%	60 - 140
		o-Xylene	2013/09/15		102	%	60 - 140
		(C6-C10)	2013/09/15		110	%	60 - 140
	Spiked Blank	1,4-Difluorobenzene (sur.)	2013/09/15		106	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/09/15		93	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/09/15		107	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2013/09/15		102	%	60 - 140
		Benzene	2013/09/15		103	%	60 - 140
		Toluene	2013/09/15		97	%	60 - 140
		Ethylbenzene	2013/09/15		103	%	60 - 140
		m & p-Xylene	2013/09/15		101	%	60 - 140
		o-Xylene	2013/09/15		100	%	60 - 140
		(C6-C10)	2013/09/15		91	%	60 - 140
	Method Blank	1,4-Difluorobenzene (sur.)	2013/09/15		101	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2013/09/15		85	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2013/09/15		101	%	60 - 130

Quality Assurance Report (Continued)

Maxxam Job Number: EYKB376231

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7169309	RSU	Method Blank	D4-1,2-DICHLOROETHANE (sur.)	2013/09/15		100	%	60 - 140
			Benzene	2013/09/15	<0.0050		mg/kg	
			Toluene	2013/09/15	<0.020		mg/kg	
			Ethylbenzene	2013/09/15	<0.010		mg/kg	
			Xylenes (Total)	2013/09/15	<0.040		mg/kg	
			m & p-Xylene	2013/09/15	<0.040		mg/kg	
			o-Xylene	2013/09/15	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2013/09/15	<12		mg/kg	
			(C6-C10)	2013/09/15	<12		mg/kg	
		RPD [HI1765-01]	Benzene	2013/09/15	NC		%	50
			Toluene	2013/09/15	NC		%	50
			Ethylbenzene	2013/09/15	NC		%	50
			Xylenes (Total)	2013/09/15	NC		%	50
			m & p-Xylene	2013/09/15	NC		%	50
			o-Xylene	2013/09/15	NC		%	50
			F1 (C6-C10) - BTEX	2013/09/15	NC		%	50
			(C6-C10)	2013/09/15	NC		%	50
7173035	TDB	Matrix Spike	Total Antimony (Sb)	2013/09/18		83	%	75 - 125
			Total Arsenic (As)	2013/09/18		97	%	75 - 125
			Total Barium (Ba)	2013/09/18		NC	%	75 - 125
			Total Beryllium (Be)	2013/09/18		96	%	75 - 125
			Total Cadmium (Cd)	2013/09/18		94	%	75 - 125
			Total Chromium (Cr)	2013/09/18		104	%	75 - 125
			Total Cobalt (Co)	2013/09/18		96	%	75 - 125
			Total Copper (Cu)	2013/09/18		98	%	75 - 125
			Total Lead (Pb)	2013/09/18		96	%	75 - 125
			Total Molybdenum (Mo)	2013/09/18		93	%	75 - 125
			Total Nickel (Ni)	2013/09/18		NC	%	75 - 125
			Total Selenium (Se)	2013/09/18		94	%	75 - 125
			Total Silver (Ag)	2013/09/18		96	%	75 - 125
			Total Thallium (Tl)	2013/09/18		88	%	75 - 125
			Total Tin (Sn)	2013/09/18		98	%	75 - 125
			Total Uranium (U)	2013/09/18		85	%	75 - 125
			Total Vanadium (V)	2013/09/18		NC	%	75 - 125
			Total Zinc (Zn)	2013/09/18		NC	%	75 - 125
		QC Standard	Total Arsenic (As)	2013/09/17		118	%	50 - 150
			Total Barium (Ba)	2013/09/17		108	%	69 - 131
			Total Chromium (Cr)	2013/09/17		102	%	41 - 159
			Total Cobalt (Co)	2013/09/17		105	%	75 - 125
			Total Copper (Cu)	2013/09/17		106	%	73 - 127
			Total Lead (Pb)	2013/09/17		100	%	54 - 146
			Total Nickel (Ni)	2013/09/17		120	%	61 - 139
			Total Vanadium (V)	2013/09/17		119	%	50 - 150
			Total Zinc (Zn)	2013/09/17		115	%	72 - 128
		Spiked Blank	Total Antimony (Sb)	2013/09/17		104	%	75 - 125
			Total Arsenic (As)	2013/09/17		101	%	75 - 125
			Total Barium (Ba)	2013/09/17		100	%	75 - 125
			Total Beryllium (Be)	2013/09/17		100	%	75 - 125
			Total Cadmium (Cd)	2013/09/17		98	%	75 - 125
			Total Chromium (Cr)	2013/09/17		100	%	75 - 125
			Total Cobalt (Co)	2013/09/17		101	%	75 - 125
			Total Copper (Cu)	2013/09/17		102	%	75 - 125
			Total Lead (Pb)	2013/09/17		101	%	75 - 125
			Total Molybdenum (Mo)	2013/09/17		100	%	75 - 125
			Total Nickel (Ni)	2013/09/17		104	%	75 - 125

Quality Assurance Report (Continued)

Maxxam Job Number: EYKB376231

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
7173035 TDB	Spiked Blank	Total Selenium (Se)	2013/09/17		103	%	75 - 125
		Total Silver (Ag)	2013/09/17		100	%	75 - 125
		Total Thallium (Tl)	2013/09/17		99	%	75 - 125
		Total Tin (Sn)	2013/09/17		98	%	75 - 125
		Total Uranium (U)	2013/09/17		100	%	75 - 125
		Total Vanadium (V)	2013/09/17		105	%	75 - 125
		Total Zinc (Zn)	2013/09/17		103	%	75 - 125
	Method Blank	Total Antimony (Sb)	2013/09/17	<1.0		mg/kg	
		Total Arsenic (As)	2013/09/17	<1.0		mg/kg	
		Total Barium (Ba)	2013/09/17	<10		mg/kg	
		Total Beryllium (Be)	2013/09/17	<0.40		mg/kg	
		Total Cadmium (Cd)	2013/09/17	<0.10		mg/kg	
		Total Chromium (Cr)	2013/09/17	<1.0		mg/kg	
		Total Cobalt (Co)	2013/09/17	<1.0		mg/kg	
		Total Copper (Cu)	2013/09/17	<5.0		mg/kg	
		Total Lead (Pb)	2013/09/17	<1.0		mg/kg	
		Total Molybdenum (Mo)	2013/09/17	<0.40		mg/kg	
		Total Nickel (Ni)	2013/09/17	<1.0		mg/kg	
		Total Selenium (Se)	2013/09/17	<0.50		mg/kg	
		Total Silver (Ag)	2013/09/17	<1.0		mg/kg	
		Total Thallium (Tl)	2013/09/17	<0.30		mg/kg	
		Total Tin (Sn)	2013/09/17	<1.0		mg/kg	
		Total Uranium (U)	2013/09/17	<1.0		mg/kg	
		Total Vanadium (V)	2013/09/17	<1.0		mg/kg	
		Total Zinc (Zn)	2013/09/17	<10		mg/kg	
	RPD	Total Antimony (Sb)	2013/09/17	NC		%	35
		Total Arsenic (As)	2013/09/17	6.9		%	35
		Total Barium (Ba)	2013/09/17	9.6		%	35
		Total Beryllium (Be)	2013/09/17	NC		%	35
		Total Cadmium (Cd)	2013/09/17	NC		%	35
		Total Chromium (Cr)	2013/09/17	11.7		%	35
		Total Cobalt (Co)	2013/09/17	12.5		%	35
		Total Copper (Cu)	2013/09/17	NC		%	35
		Total Lead (Pb)	2013/09/17	9.5		%	35
		Total Molybdenum (Mo)	2013/09/17	NC		%	35
		Total Nickel (Ni)	2013/09/17	10.6		%	35
		Total Selenium (Se)	2013/09/17	NC		%	35
		Total Silver (Ag)	2013/09/17	NC		%	35
		Total Thallium (Tl)	2013/09/17	NC		%	35
		Total Tin (Sn)	2013/09/17	NC		%	35
		Total Uranium (U)	2013/09/17	NC		%	35
		Total Vanadium (V)	2013/09/17	12.4		%	35
		Total Zinc (Zn)	2013/09/17	11.1		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

Quality Assurance Report (Continued)

Maxxam Job Number: EYKB376231

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Validation Signature Page

Maxxam Job #: B376231

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Junzhi Gao

Janet Gao, Senior Analyst, Organics Department

Michael Sheppard, Organics Supervisor

Lucia McIntyre

Lucia Mcintyre, Organics Manager

Veronica Falk

Veronica Falk, Scientific Specialist

Jeanette Olivares, Senior Analyst

Validation Signature Page

Maxxam Job #: B376231

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Peng Liang

Peng Liang, Analyst II

LSH

Luba Shymushovska, Senior Analyst, Organic Department

==

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

22541

Page 1 of 7

INVOICE INFORMATION

Company Name: PWGSC
Contact Name: GISELLE COTTA
Address: 5th FLOOR TELUS TOWER 10025 JASPER AVE
EDMONTON, AB T5J 1S6
Phone: 780-497-3839 Fax:
Email: giselle.cotta@pwgsc-tpsgc.gc.ca

REPORT INFORMATION (if differs from invoice)

Company Name: AECOM
Contact Name: REBECCA MORLEY
Address: 17007 - 107 AVE
EDMONTON, AB T5S 1G3
Phone: 780-486-7012 Fax: 780-486-7070
Email: rebecca.morley@aecom.com

PROJECT INFORMATION

Quotation #: 20130807-174537
P.O. #:
Project #: 60304893
Site Location: RESOLUTION ISLAND
Site #:
Sampled By: RM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY

00

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ____

For RSC
☐ Yes
☒ No

Other Regulations

☒ CCME
☐ Reg. 558
☐ MISA
☐ PWQO
☒ Other (specify): INAC AWARP
☐ Sanitary Sewer Bylaw
☐ Storm Sewer Bylaw
Municipality: ____

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT: ☒
(5-7 working days for most tests)

Rush TAT:
Samples must be received by 3pm to guarantee your TAT

Rush Confirmation #: PN
☐ 1 day ☐ 2 days ☐ 3 days

Date Req'd:

TATs for certain te

27-Aug-13 08:50
Marnie Kolach
B376231 AT
SU2 INS-0001

REC'D IN OTTAWA

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (As, Cd, Cr, Pb, Hg, Ni, Zn, Cu, Co)	CCME BTEX F1-F4	PCBs - AROCLOR, TOTAL	# of Cont.	
1	13-200	2013/08/19	1210	SOIL			X		X	3	
2	13-201	2013/08/19	1300	SOIL			X		X	3	
3	13-202	2013/08/19	1310	SOIL			X		X	3	
4	13-203	2013/08/19	1325	SOIL			X		X	3	
5	13-204	2013/08/19	1330	SOIL			X		X	3	
6	13-205	2013/08/19	1438	SOIL					~~X~~	2	HOLD
7	13-206	2013/08/19	1445	SOIL					~~X~~	2	HOLD
8	13-207	2013/08/19	1523	SOIL					~~X~~	2	HOLD
9	13-208	2013/08/19	1515	SOIL					~~X~~	2	HOLD
10	13-209	2013/08/19	1510	SOIL					~~X~~	2	HOLD

On ice

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:	#JARS USED AND NOT SUBMITTED
Rebecca Morley	2013/08/25	1200	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10	
			Adepeju Akisi	2013/08/27	0850	

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/0/0
3/4/0 0/0/0
0/0/0
2/3/0

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

COC-1004 (06/12) - ENV. ENG. Maxxam Analytics International Corporation o/a Maxxam Analytics White: Maxxam Yellow: Mail Pink: Client

Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

22542

Page 2 of 7

INVOICE INFORMATION

Company Name: PWGSC
Contact Name: GISELLE CUTTA
Address: 5th FLOOR TELUS TOWER 10025 JASPER AVE
EDMONTON, AB T5J 1S6
Phone: 780-497-3839 Fax:
Email: giselle.cutta@pwgsc.tpsgc.gc.ca

REPORT INFORMATION (if differs from invoice)

Company Name: AECOM
Contact Name: REBECCA MORLEY
Address: 17007 - 107 AVE
EDMONTON, AB
Phone: 780-486-7012 Fax: 780-486-7070
Email: rebecca.morley@aecom.com

PROJECT INFORMATION

Quotation #: 20130807-174537
P.O. #:
Project #: 60304883
Site Location: RESOLUTION ISLAND
Site #: ~~RC~~
Sampled By: RM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY

00

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ____
For RSC ☐ Yes ☐ No

Other Regulations

☒ CCME
☐ Reg. 558
☐ MISA
☐ PWQO
☒ Other (specify): INAC AMSRP
☐ Sanitary Sewer Bylaw
☐ Storm Sewer Bylaw
Municipality: ____

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT: ☒
(5-7 working days for most tests)

Rush TAT:
Samples must be received by 3pm to guarantee your TAT
Rush Confirmation #: PN ____
☐ 1 day ☐ 2 days ☐ 3 days
Date Req'd:

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (As, Cd, Cr, Cu, Co, Pb, Hg, Ni, Zn)	CCME BTEX F1-F4	PCBs - AROCLOR, TOTAL	# of Cont.	COMMENTS / TAT COMMENTS
1	13-210	2013/08/19	1538	SOIL					~~X~~	2	HOLD
2	13-211	2013/08/19	1538	SOIL					~~X~~	2	HOLD
3	13-212	2013/08/19	1546	SOIL					~~X~~	2	HOLD
4	13-213	2013/08/19	1549	SOIL					~~X~~	2	HOLD
5	13-214	2013/08/20	1118	SOIL			X		X	3	on ice
6	13-215	2013/08/20	1136	SOIL			~~X~~		~~X~~	3	HOLD
7	13-216	2013/08/20	1149	SOIL			~~X~~		~~X~~	3	HOLD
8	13-217	2013/08/20	1155	SOIL			~~X~~		~~X~~	3	HOLD
9	13-218	2013/08/20	1349	SOIL			X		X	3	
10	13-219	2013/08/20	1403	SOIL			~~X~~		X	3	HOLD EXTRA SAMPLE CONTAINER

REC'D IN OTTAWA

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:
Rebecca Morley Rebecca Morley	2013/08/25	1200	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10
			Adepem Aksi	2013/08/27	0850

#JARS USED AND NOT SUBMITTED

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/0/0
3/4/0 0/0/0
2/3/0 0/0/0.

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

COC-1004 (06/12) - ENV. ENG.
Maxxam Analytics International Corporation o/a Maxxam Analytics
White: Maxxam Yellow: Mail Pink: Client

Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
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CHAIN OF CUSTODY RECORD

22540

Page 3 of 7

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Site #:
Sampled By: RM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY #

00

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ____

For RSC
☐ Yes
☐ No

Other Regulations

☒ CCME ☐ Sanitary Sewer Bylaw
☐ Reg. 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality: ________
☐ PWQO
☒ Other (specify): INAC ANSRP

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT: ☒
(5-7 working days for most tests)

Rush TAT:
Samples must be received by 3pm to guarantee your TAT

Rush Confirmation #: PN ________

☐ 1 day ☐ 2 days ☐ 3 days

Date Req'd:

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (AS, CD, Cu, Co, Cr, Pb, Hg, Ni, Zn)	CCME BTEX F1-F4	PCBs - AROCLOR, TOTAL	# of Cont.	COMMENTS / TAT COMMENTS
1	13-220	2013/08/20	1414	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
2	13-221	2013/08/20	1414	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
3	13-222	2013/08/20	1428	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
4	13-223	2013/08/20	1441	SOIL			X		X	3	
5	13-224	2013/08/20	1457	SOIL			X		X	3	on ice
6	13-225	2013/08/20	1506	SOIL			X		X	3	REC'D IN OTTAWA
7	13-226	2013/08/20	1524	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
8	13-227	2013/08/20	1529	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
9	13-228	2013/08/20	1626	SOIL			X		X	3	
10	13-229	2013/08/20	1630	SOIL			X		X	3	

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:	#JARS USED AND NOT SUBMITTED
Rebecca Morley Rebecca Morley	2013/08/25	1200	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10	
			Adepen Alesi	2013/08/27	0850	

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/4/0
3/4/0 0/0/0
2/3/0 0/0/0

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

COC-1004 (06/12) - ENV. ENG. Maxxam Analytics International Corporation o/a Maxxam Analytics White: Maxxam Yellow: Mail Pink: Client

Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

22539

Page 4 of 7

INVOICE INFORMATION

Company Name: PWGSC
Contact Name: GISELLE COTTA
Address: 5th FLOOR TELUS TOWER 10025 JASPER AVE
EDMONTON, AB T5J 1S6
Phone: 780-497-3839 Fax:
Email: giselle.cotta@pwgsc-tpsgc.gc.ca

REPORT INFORMATION (if differs from invoice)

Company Name: AECOM
Contact Name: REBECCA MORLEY
Address: 17007 · 107 AVE
EDMONTON, AB T5S 1G3
Phone: 780-486-7012 Fax: 780-486-7070
Email: rebecca.morley@aecom.com

PROJECT INFORMATION

Quotation #: 20130807-17537
P.O. #:
Project #: 60304883
Site Location: RESOLUTION ISLAND
Site #:
Sampled By: RM

MAXXAM JOB NUMBER

CHAIN OF COSTODY

00

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ____

For RSC
☐ Yes
☐ No

Other Regulations

☒ CCME ☐ Sanitary Sewer Bylaw
☐ Reg. 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality: ________
☐ PWQO
☒ Other (specify): INAC AMSRP

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

ANALYSIS REQUESTED (Please be specific)

TURNAROUND TIME (TAT) REQUIRED

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS.

Regular (Standard) TAT: ☒
(5-7 working days for most tests)

Rush TAT:
Samples must be received by 3pm to guarantee your TAT
Rush Confirmation #: PN ________
☐ 1 day ☐ 2 days ☐ 3 days
Date Req'd: ________

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (As, Cd, Cr, Cu, Co, Pb, Hg, Ni, Zn)	CCME BTEX F1-F4	PCB-AROCLOR, TOTAL										# of Cont.	COMMENTS / TAT COMMENTS
1	13-230	2013/08/20	1649	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
2	13-231	2013/08/20	1649	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
3	13-232	2013/08/20	1653	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
4	13-233	2013/08/20	1713	SOIL			X		X										3	
5	13-234	2013/08/20	1800	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
6	13-235	2013/08/20	1806	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
7	13-236	2013/08/21	852	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
8	13-237	2013/08/21	859	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
9	13-238	2013/08/21	1000	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER
10	13-239	2013/08/21	1005	SOIL					X										3	HOLD EXTRA SAMPLE CONTAINER

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:
Rebecca Morley Rebecca Morley	2013/08/25	1200	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10
			Adepeju Akbi	2013/08/27	0850

#JARS USED AND NOT SUBMITTED

Laboratory Use Only

Custody Seal	Yes	No	Temperature (°C) on Receipt
Present			0/0/1 4/0/0 3/4/0 0/0/0 2/3/0 0/0/0
Intact			

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

on ice

Maxxam 6740 Campobello Road, Mississauga, ON L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

22536

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INVOICE INFORMATION

Company Name: PWGSC
Contact Name: GISELLE COTTA
Address: 5th FLOOR TELUS TOWER 10025 JASPER AVE
EDMONTON, AB T5J 1S6
Phone: 780-497-3839 Fax:
Email: giselle.cotta@pwgsc-tpsgc.gc.ca

REPORT INFORMATION (if differs from invoice)

Company Name: AECOM
Contact Name: REBECCA MORLEY
Address: 17007-107 AVE
EDMONTON, AB T5S 1G3
Phone: 780-486-7012 Fax: 780-486-7070
Email: rebecca.morley@aecom.com

PROJECT INFORMATION

Quotation #: 20130807-174537
P.O. #:
Project #: 60304883
Site Location: RESOLUTION ISLAND
Site #:
Sampled By: RCM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY #

00

Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ____
For RSC ☐ Yes ☐ No

Other Regulations

☒ CCME ☐ Sanitary Sewer Bylaw
☐ Reg. 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality: ____
☐ PWQO
☒ Other (specify): INAC AMSRP

Include Criteria on Certificate of Analysis (Y/N)?

SAMPLES MUST BE KEPT COOL (<10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

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(5-7 working days for most tests)

Rush TAT:
Samples must be received by 3pm to guarantee your TAT
Rush Confirmation #: PN
☐ 1 day ☐ 2 days ☐ 3 days
Date Req'd:

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

ANALYSIS REQUESTED (Please be specific)

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (AS,Cd,Cr,Cu,Co,Pb,Hg,Ni,Zn)	CCME BTEX,F1-F4	PCB-AROCLOR, TOTAL	# of Cont.	COMMENTS / TAT COMMENTS
1	13-240	2013/08/21	1020	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
2	13-241	2013/08/21	1020	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
3	13-242	2013/08/21	1037	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
4	13-243	2013/08/21	1051	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER
5	13-244	2013/08/21	1101	SOIL			X		X	3	
6	13-245	2013/08/21	1105	SOIL					X	3	HOLD EXTRA SAMPLE CONTAINER.
7	13-246	2013/08/21	1400	SOIL			X		X	3	
8	13-247	2013/08/21	1426	SOIL			X		X	3	on ice
9	13-248	2013/08/21	1432	SOIL			X		X	3	REC'D IN OTTAWA
10	13-249	2013/08/21	1537	SOIL					X	2	

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:
Rebecca Morley	2013/08/25	1240	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10
			Adepen Alobi	2013/08/27	0850

#JARS USED AND NOT SUBMITTED

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/0/0
3/4/0 0/0/0
2/3/0 0/0/0

Page 66 of 68

***MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.**

COC-1004 (06/12) - ENV. ENG. Maxxam Analytics International Corporation o/a Maxxam Analytics White: Maxxam Yellow: Mail Pink: Client

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Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: (800) 563-6266

CHAIN OF CUSTODY RECORD

22537

Page 6 of 7

INVOICE INFORMATION

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Contact Name: GISELLE COTTA
Address: 5th FLOOR TELUS TOWER 10025 JASPER AVE
EDMONTON, AB T5J 1S6
Phone: 780-497-3839 Fax:
Email: giselle.cotta@pwgsc-tpsgc.gc.ca

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Email: rebecca.morley@aecom.com

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Quotation #: 20130807-174537
P.O. #:
Project #: 60304883
Site Location: RESOLUTION ISLAND
Site #:
Sampled By: RLM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY #

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Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

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☐ Table 3 ☐ Agri/Other
☐ Table ___

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☐ Reg. 558 ☐ Storm Sewer Bylaw
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ANALYSIS REQUESTED (Please be specific)

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (As, Cd, Cu, Co, Cr, Pb, Hg, Ni, Zn)	CCME BTEX F1-F4	PCB - AROCLOR, TOTAL	# of Cont.	COMMENTS / TAT COMMENTS
1	13-250	2013/08/21	1535	SOIL					X	2	
2	13-251	2013/08/21	1535	SOIL					X	2	
3	13-252	2013/08/21	1558	SOIL					X	2	
4	13-253	2013/08/21	1602	SOIL					X	2	
5	13-254	2013/08/21	1609	SOIL					X	2	
6	13-255	2013/08/21	1815	SOIL			X		X	3	on ice
7	13-256	2013/08/22	907	SOIL				X	X	4	REC'D IN OTTAWA
8	13-257	2013/08/22	912	SOIL				X	X	4	
9	13-258	2013/08/22	919	SOIL				X	X	4	
10	13-259	2013/08/22	925	SOIL				X	X	4	

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:
Rebecca Morley	2013/08/25	1200	Kelsey Pilon Kelsey Pilon	2013/08/26	10:10
			Adepeju Akibi	2013/08/27	0850

#JARS USED AND NOT SUBMITTED

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/0/0
3/4/0 0/0/0
2/3/0 0/0/0

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CHAIN OF CUSTODY RECORD

22538

Page 7 of 7

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P.O. #:
Project #: 60304883
Site Location: RESOLUTION ISLAND
Site #:
Sampled By: RCM

MAXXAM JOB NUMBER

CHAIN OF CUSTODY

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Note: For MOE Regulated Drinking Water samples, please use the Drinking Water CofC.

Regulation 153 (2011)

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC
☐ Yes
☐ No

Other Regulations

☒ CCME ☐ Sanitary Sewer Bylaw
☐ Reg. 558 ☐ Storm Sewer Bylaw
☐ MISA Municipality: ______
☐ PWQO
☒ Other (specify): INAC AANDC

Include Criteria on Certificate of Analysis (Y/N)?

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ANALYSIS REQUESTED (Please be specific)

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(5-7 working days for most tests)

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Rush Confirmation #: PN ______
☐ 1 day ☐ 2 days ☐ 3 days
Date Req'd: ______

TATs for certain tests are > 5 days. Please contact your Project Manager for details.

	Sample Identification	Date Sampled	Time Sampled	Matrix (GW, SW, Soil, etc.)	MOE Regulated Drinking Water? (Y / N)	Metals Field Filtered? (Y / N)	METALS (AS, Cd, Cr, Cu, Co, Pb, Hg, Ni, Zn)	CCME BTEX F1-F4	PCB - AROCLOR, TOTAL	METALS, DISS (Cd, Cr, Co, Cu, Pb, Ni)	METALS, TOTAL (As, Hg, Zn)	PH	OIL & GREASE, TOTAL	PCB - AROCLOR, TOTAL (IN WATER)	BTEX (IN WATER)				# of Cont.	COMMENTS / TAT COMMENTS
1	13-260	2013/08/22	935	SOIL				X	X										4	
2	13-261	2013/08/22	935	SOIL				X	X										4	REC'D IN OTTAWA
3	13-262	2013/08/22	1351	SOIL				X											4	
4	13-263	2013/08/22	1405	SOIL				X											4	
5	13-264	2013/08/22	1452	SOIL			X	~~X~~	X										3	
6	13-265	2013/08/22	1458	SOIL			X		X										3	
7	13-266	2013/08/22	1515	SOIL			X		X										3	on ice
8	13-267	2013/08/22	1525	SOIL			X		X										3	
9	13-268	2013/08/22	1825	SOIL															4	HOLD
10	CAMP TANK DISCHARGE	2013/08/21	1731	SW		N				X	X	X	X	X	X				9	

*RELINQUISHED BY (Signature/Print)	Date (YYYY/MM/DD)	Time:	RECEIVED BY: (Signature/Print)	Date (YYYY/MM/DD)	Time:	#JARS USED AND NOT SUBMITTED
Rebecca Morley RebeccaMorley	2013/08/25	1200	Kelsey Pilon KelseyPilon	2013/08/26	10:10	
			Adepeju Akb.	2013/08/27	0850	

Laboratory Use Only

Custody Seal	Yes	No
Present	✓	
Intact	✓	

Temperature (°C) on Receipt
0/0/1 4/0/0
3/4/0 0/0/0
2/3/0 0/0/0

*MANDATORY SECTIONS IN GREY MUST BE FILLED OUT. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

Appendix F

Geotechnical Testpit Logs

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-01**
LOCATION: Upper Airstrip Borrow Area 3	COORDINATES: N 6830678 E 411889	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◸ NO RECOVERY ◨ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND - gravelly, some cobbles, well-graded, trace silt, moist, brown, angular/subangular - clean, gravelly seams, approximately 60% gravel and 40% sand				
1			END OF TESTPIT AT 1.0 mBGS - No water detected. - End of testpit due to refusal at frost.				1
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.00 m
	REVIEWED BY: BF	COMPLETION DATE: 8/19/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-02**
LOCATION: Lower Airstrip Borrow Area 1	COORDINATES: N 6830412 E 411756	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◪ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - gravelly, some cobbles, trace silt, gap-graded, occasional boulders (20%), moist, brown.			SURFICIAL CONDITIONS - trace vegetation, partially disturbed OVERALL OVERSIZE CONTENT - >300 mm ~ 20% by mass	
1							1
			END OF TESTPIT at 1.1 mBGS - No water detected.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.10 m
	REVIEWED BY: BF	COMPLETION DATE: 8/19/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-03**
LOCATION: Lower Airstrip Borrow Area 1	COORDINATES: N 6830423 E 411734	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ▐ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - gravelly, some cobbles, trace to some silt, gap-graded, moist, brown, subangular rock			OVERALL OVERSIZE CONTENT - >150 mm ~ 20% by mass	
1							1
			END OF TESTPIT at 1.05 mBGS - No water detected. - End of testpit due to refusal at large boulder or bedrock.				
2							2
3							

AECOM

LOGGED BY: CN	COMPLETION DEPTH: 1.05 m
REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
PROJECT ENGINEER: Barry Fedorak	

LOG OF TESTHOLE 60304883-RES ISLAND-2013-10-11.GPJ UMA_COC.GDT PRINT: 1/23/14 By:

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-04**
LOCATION: Lower Airstrip Borrow Area 1	COORDINATES: N 6830433 E 411651	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◪ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	CB		COBBLES - some silt, some gravel, moist, dark brown, subangular rock			SURFICIAL CONDITIONS - 50% vegetation, tundra shrubs and grasses - 40-50% exposed boulder/cobble (sizes >1 m)	
	SW		SAND - gravelly, trace silt, well-graded, moist, dark brown, some cobbles, rounded to subangular rock	☰	1	SAMPLE MC = 5.7%	
			- Wet at 0.6 mBGS			PROCTOR RESULTS: - 2130 kg/m3 max density at 8% optimum moisture	
1						OVERALL OVERSIZE CONTENT - >75 mm ~ 30% by mass - >15 mm ~ 10% by mass	1
			- Saturated at 1.2 mBGS				
			END OF TESTPIT at 1.4 mBGS - Trace seepage upon completion at 1.2 mBGS. - Little or no sloughing below 0.8 mBGS. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.40 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-05**
LOCATION: Lower Airstrip Borrow Area 1	COORDINATES: N 6830399 E 411604	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - gravelly, some silt, some cobbles, moist, dark brown, rounded to subangular rock			OVERALL OVERSIZE CONTENT - cobbles >75mm ~ 20% by mass - rock >150 mm ~ 10% by mass	
			- Moist to wet at 0.9 mBGS				
1							1
			END OF TESTPIT at 1.2 mBGS - Trace seepage at 1.1 mBGS. - End of testpit due to refusal at large boulder.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.20 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-06**
LOCATION: Lower Airstrip Borrow Area 4	COORDINATES: N 6830505 E 411558	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ⧄ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0			SAND and GRAVEL - some cobbles, some silt, well-graded, dark brown, moist to wet, subangular rock			SURFICIAL CONDITIONS - 20-30% vegetation, tundra shrubs, grasses, moss - 20-30% boulder cover - 40-60% sand, gravel, cobbles	
	SW					OVERALL OVERSIZE CONTENT - >75 mm ~ 20% by mass - > 150 mm ~ 10% by mass	
			- Wet at 0.75 mBGS				
			- Saturated, sloughing from 0.5 mBGS				
1							1
			END OF TESTPIT at 1.3 mBGS - Seepage from 0.8 to 0.9 mBGS. - Testpit sidewall collapsed; major sloughing throughout testpitting. - End of testpit due to sloughing.				
2							2
3							

LOGGED BY: CN	COMPLETION DEPTH: 1.30 m
REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-07**
LOCATION: Lower Airstrip Borrow Area 3	COORDINATES: N 6830419 E 411520	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◺ NO RECOVERY ◨ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - gravelly, some silt, some cobbles, gap-graded, moist, brown, angular to subangular rock			SURFICIAL CONDITIONS - 70% boulders - 10% vegetation, tundra shrubs, grasses, and moss - 10% exposed gravelly sand OVERALL OVERSIZE CONTENT - Rootlets noted from 0-0.3 mBGS - Rock >75 mm ~ 20% - Rock >150 mm ~ 10%	
1							1
			END OF TESTPIT at 1.2 mBGS - No seepage upon completion. - Minimal sloughing. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.20 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-08**
LOCATION: Lower Airstrip Borrow Area 3	COORDINATES: N 6830412 E 411580	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ▮ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - silty, some gravel to gravelly, some cobbles, gap-graded, moist, brown, subangular rock			OVERALL OVERSIZE CONTENT - >75 mm ~ 25% - >150 mm ~ 10%	
	SW		SAND - gravelly, some silt, well-graded, occasional cobble, occasional boulder, moist, brown, rounded to subangular rock				
1							1
			END OF TESTPIT at 1.2 mBGS - No seepage upon completion. - Minimal sloughing. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.20 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-09**
LOCATION: Lower Airstrip Borrow Area 5	COORDINATES: N 6830298 E 411556	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ◨ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND and GRAVEL - some cobbles, some silt, occasional boulder, well-graded, wet, brown - Saturated, side walls sloughing at 0.2 mBGS			SURFICIAL CONDITIONS - 80% rocks/boulders - 10% vegetation, mostly moss OVERALL OVERSIZE CONTENT - cobbles >75 mm ~ 20%	
	ML		SILT - sandy, some gravel, trace clay, trace cobbles, low plastic, saturated, dark grey				
1			END OF TESTPIT at 1.0 mBGS - Seepage noted from 0.2 mBGS. - End of testpit due to sloughing of sidewalls.				1
2							2
3							

AECOM

LOGGED BY: CN	COMPLETION DEPTH: 1.00 m
REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-10**
LOCATION: Lower Airstrip Borrow Area 5	COORDINATES: N 6830403 E 411523	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◪ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW	▨	SAND - some gravel, some silt, some cobbles, well-graded, moist, brown, subangular rock	☰	2	SURFICIAL CONDITIONS - ~ 50% tundra - ~ 30% rock >150 mm - some areas of boulders SAMPLE MC = 6.4% PROCTOR RESULTS - 2170 kg/m3 max density at 8.0% optimum moisture	
1			END OF TESTPIT at 1.0 mBGS - No seepage upon completion. - Minimal sloughing. - End of testpit due to refusal on a boulder.			OVERALL OVERSIZE CONTENT - cobbles >75 mm ~ 20% - rock > 150 mm ~ 10%)	1
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.00 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

LOG OF TESTHOLE 60304883-RES ISLAND-2013-10-11.GPJ UMA_COC.GDT PRINT: 1/23/14 By:

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-11**
LOCATION: Lower Airstrip Borrow Area 5	COORDINATES: N 6830127 E 411550	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ◨ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SP		SAND - gravelly, some silt, some cobbles, gap-graded, saturated, subangular rock			OVERALL OVERSIZE CONTENT - >75 mm ~ 20% by mass - >150mm ~ 10% by mass	
			END OF TESTPIT at 0.6 mBGS - Groundwater at surface. - End of testpit due to sloughing.				
1							1
2							2
3							

	LOGGED BY: CN	COMPLETION DEPTH: 0.60 m
	REVIEWED BY: BF	COMPLETION DATE: 8/20/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

LOG OF TESTHOLE 60304883-RES ISLAND-2013-10-11.GPJ UMA_COC.GDT PRINT: 1/23/14 By:

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-12**
LOCATION: Lower Airstrip Borrow Area 4	COORDINATES: N 6830032 E 411561	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ◿ NO RECOVERY ▮ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND - gravelly, some silt, some cobbles, well-graded, moist, brown, subangular rock (>75 mm ~20%, > 150 mm ~10%) - Wet, sloughing at 0.8 mBGS - Saturated at 1.0 mBGS	▤	3	SURFICIAL CONDITIONS - 40% vegetation, tundra shrubs, grasses, moss - 40% boulder cover OVERALL OVERSIZE CONTENT - >75 mm ~ 20% - >150 mm ~ 10% SAMPLE MC = 11.1% PROCTOR RESULTS - 2190 kg/m3 max density at 8.0% moisture	
1							1
			END OF TESTPIT at 1.3 mBGS - Trace seepage at 1.0 mBGS. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM

LOGGED BY: CN	COMPLETION DEPTH: 1.00 m
REVIEWED BY: BF	COMPLETION DATE: 8/21/2013
PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-13**
LOCATION: Lower Airstrip Borrow Area 4	COORDINATES: N 6829983 E 411516	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ⧄ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND and GRAVEL - some cobbles, occasional boulder, well-graded, moist, dark brown			SURFICIAL CONDITIONS - 40% vegetation, tundra shrubs, grasses, moss - 40% boulder cover	
			End of testpit at 0.8 mBGS due to refusal on a boulder; re-dug 2.0 m away				
1	SW		Second Testpit upper horizon similar to previous; SAND and GRAVEL - some cobbles, occasional boulder, well-graded, moist, dark brown				1
			END OF TESTPIT at 1.1 mBGS - No seepage upon completion. - End of testpit due to refusal at bedrock.				
2							2
3							

LOGGED BY: CN	COMPLETION DEPTH: 1.00 m
REVIEWED BY: BF	COMPLETION DATE: 8/21/2013
PROJECT ENGINEER: Barry Fedorak	

LOG OF TESTHOLE 60304883-RES ISLAND-2013-10-11.GPJ UMA_COC.GDT PRINT: 1/23/14 By:

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-14**
LOCATION: Lower Airstrip Borrow Area 4	COORDINATES: N 6829917 E 411543	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◿ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	OR		ORGANICS - thin layer of organic soil (2-3 cm thick)			SURFICIAL CONDITIONS - 40% vegetation, tundra shrubs, grasses, moss - 40% boulder cover	
	SW		SAND and GRAVEL - some cobbles, trace silt, well-graded, moist, subangular rock	☰	4	OVERALL OVERSIZE CONTENT - >75 mm ~ 30% - >150 mm ~ 20%	
			- Wet, sloughing at 0.8 mBGS				
1			- Saturated at 1.0 mBGS				1
			END OF TESTPIT at 1.3 mBGS - Trace seepage at 1.0 mBGS. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM

LOGGED BY: CN	COMPLETION DEPTH: 1.30 m
REVIEWED BY: BF	COMPLETION DATE: 8/21/2013
PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-15**
LOCATION: Freshwater Lake Borrow Area 3	COORDINATES:	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Hand Dug	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◺ NO RECOVERY ▐ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND - gravelly, some cobbles, trace silt, well-graded, moist, brown, subangular rock	☰	5	SAMPLE MC = 4.7% OVERALL OVERSIZE CONTENT - >75 mm ~ 15% - > 150 mm ~ 5%	
			END OF TESTPIT at 0.7 mBGS - No seepage upon completion. - Minimal sloughing.			PROCTOR RESULTS - 2149 kg/m3 max density at 8.2% optimum moisture	
1							1
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 0.70 m
	REVIEWED BY: BF	COMPLETION DATE: 8/21/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-16**
LOCATION: Upper Beach Borrow Area	COORDINATES: N 6828720 E 412135	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◪ NO RECOVERY ◧ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND and GRAVEL - some cobbles, some silt, well-graded, moist, brown, angular to subangular rock				
			END OF TESTPIT at 0.6 mBGS				
1							1
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 0.60 m
	REVIEWED BY: BF	COMPLETION DATE: 8/21/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-17**
LOCATION: Lower Airstrip Borrow Area 5	COORDINATES: N 6830258 E 411633	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ◺ NO RECOVERY ▮ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND - gravelly, some cobbles, some silt, occassional boulder, moist, brown, sub-angular	☰	6	OVERALL OVERSIZE CONTENT - >75 mm ~ 15% - >150 mm ~ 5%	
1							1
			END OF TESTPIT at 1.2 mBGS - No seepage upon completion. - Some sloughing upon completion. - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.20 m
	REVIEWED BY: BF	COMPLETION DATE: 8/22/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

PROJECT: Resolution Island Maintenance Assessment	CLIENT: PWGSC	TESTHOLE NO.: **TP13-18**
LOCATION: Lower Airstrip Borrow Area 5	COORDINATES: N 6830260 E 411600	PROJECT NO.: 60304883
CONTRACTOR:	METHOD: Mini-Excavator	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ☰ BULK ⧄ NO RECOVERY ◨ CORE

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH (m)
0	SW		SAND - gravelly, some cobbles, some silt, occassional boulder, well graded, brown, moist, sub-angular to angular rock			OVERALL OVERSIZE CONTENT - >75 mm ~ 15% - >150 mm ~ 5-10%	
1							1
			END OF TESTPIT at 1.2 mBGS - End of testpit due to excavator maximum depth.				
2							2
3							

AECOM	LOGGED BY: CN	COMPLETION DEPTH: 1.20 m
	REVIEWED BY: BF	COMPLETION DATE: 8/22/2013
	PROJECT ENGINEER: Barry Fedorak	Page 1 of 1

Appendix G

Geotechnical Borrow Summary

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - LOWER AIRSTRIP BORROW AREA 1

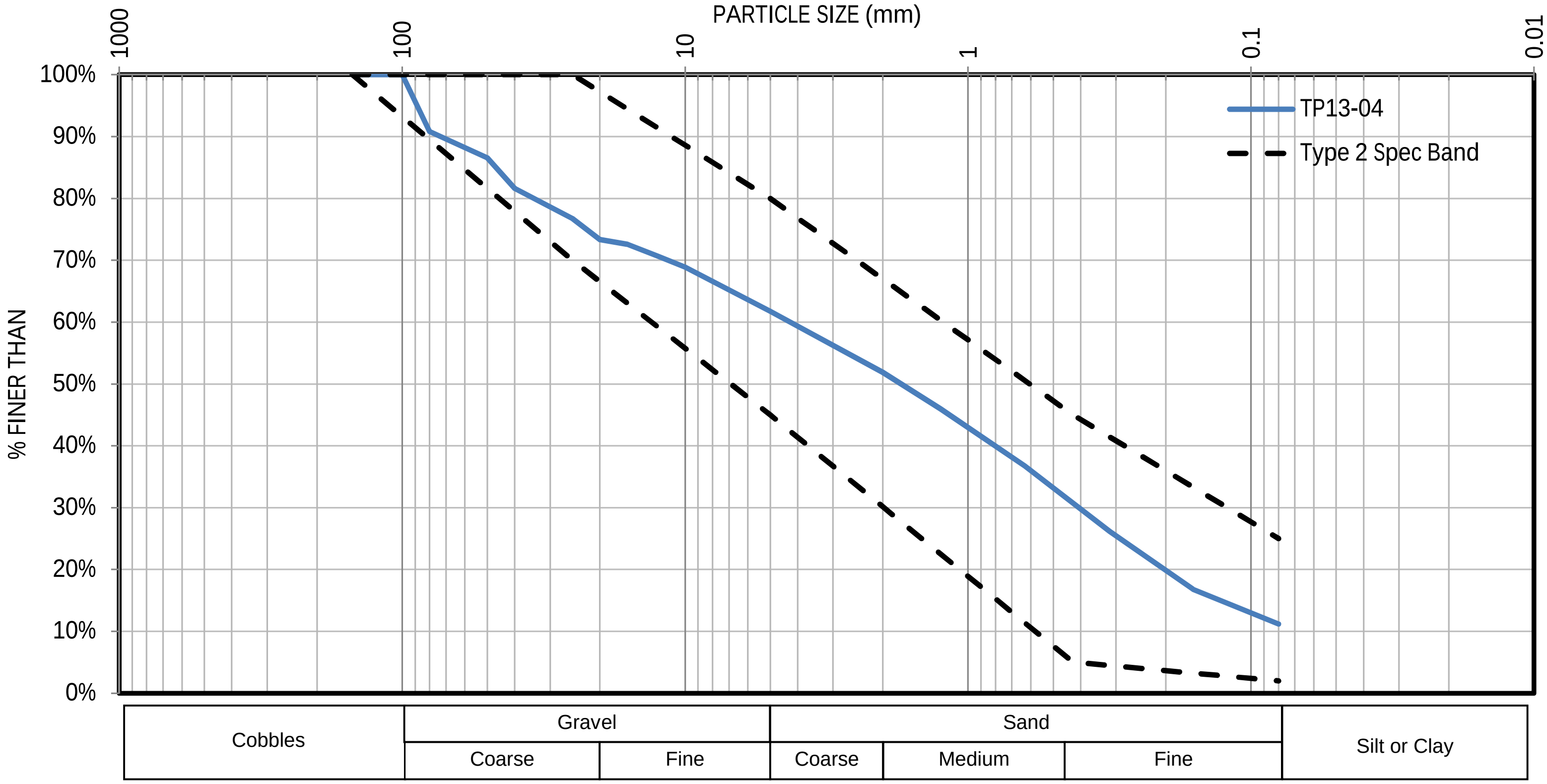

Figure 1

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - LOWER AIRSTRIP BORROW AREA 5

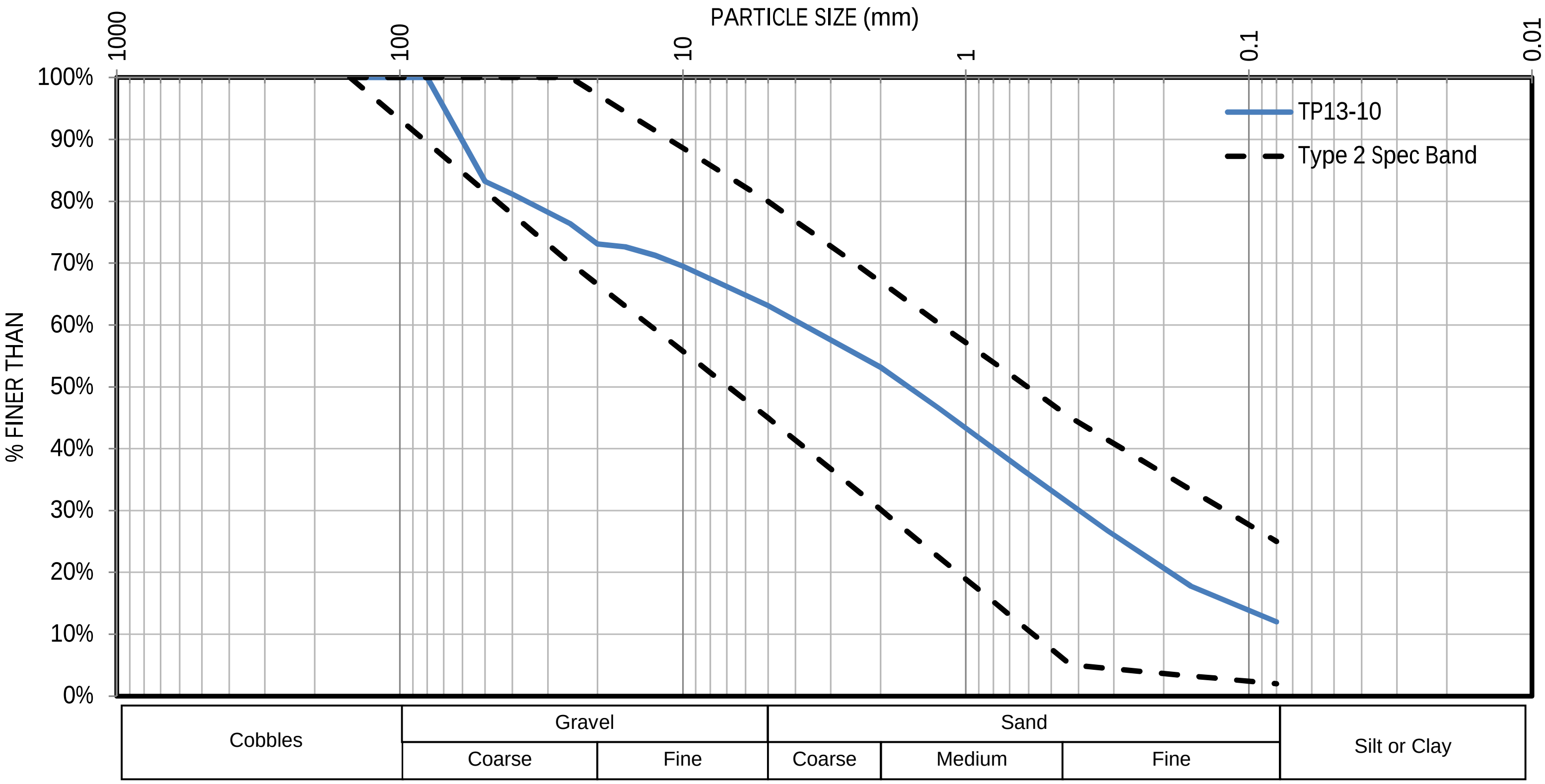

Figure 2

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - LOWER AIRSTRIP BORROW AREA 4

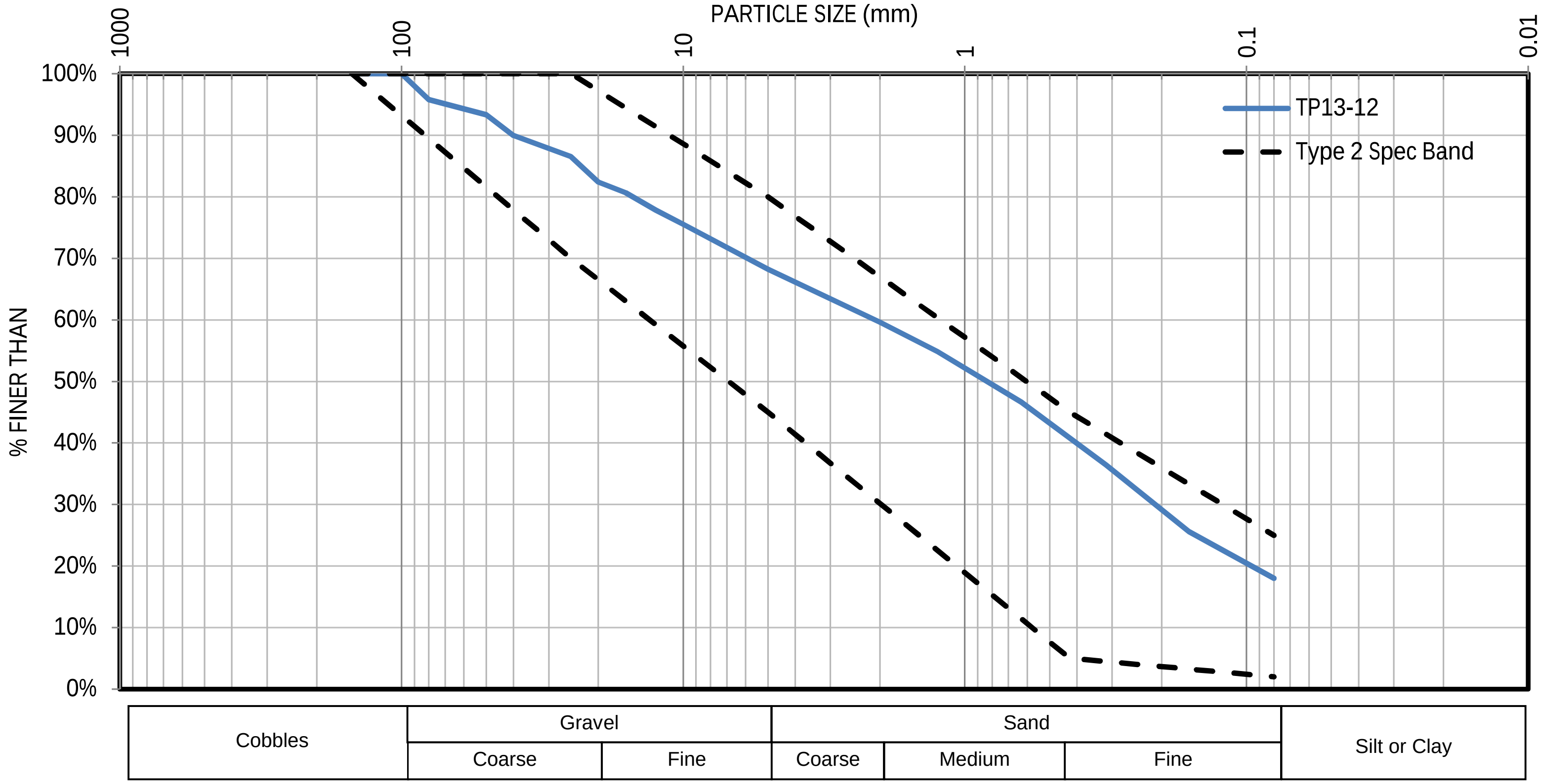

Figure 3

AECOM

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - LOWER AIRSTRIP BORROW AREA 4

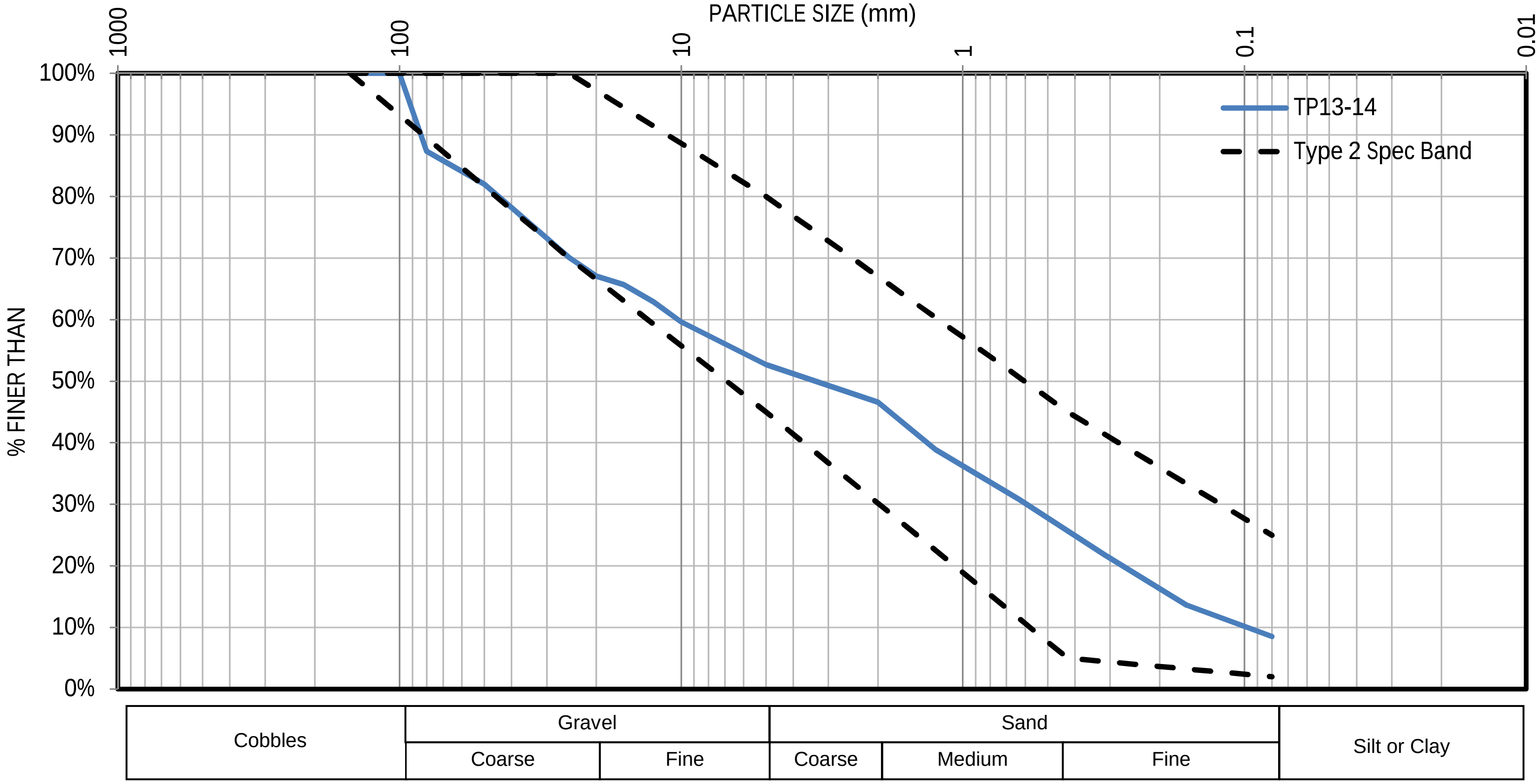

Figure 4

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - FRESHWATER LAKE BORROW AREA 3

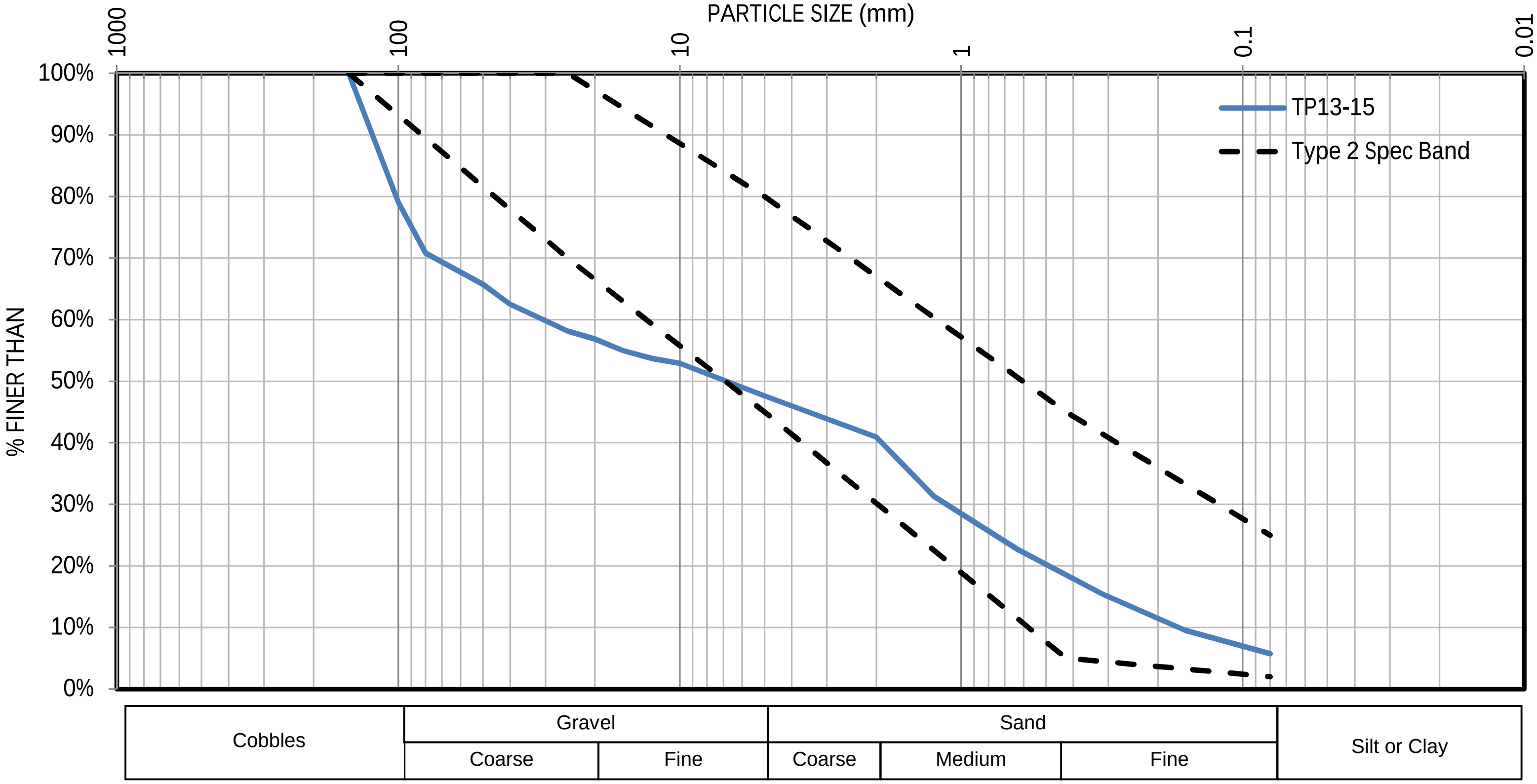

Figure 5

AECOM

BAF-5 RESOLUTION ISLAND MAINTENANCE ASSESSMENT

GRAIN SIZE DISTRIBUTION CURVES - LOWER AIRSTRIP BORROW AREA 5

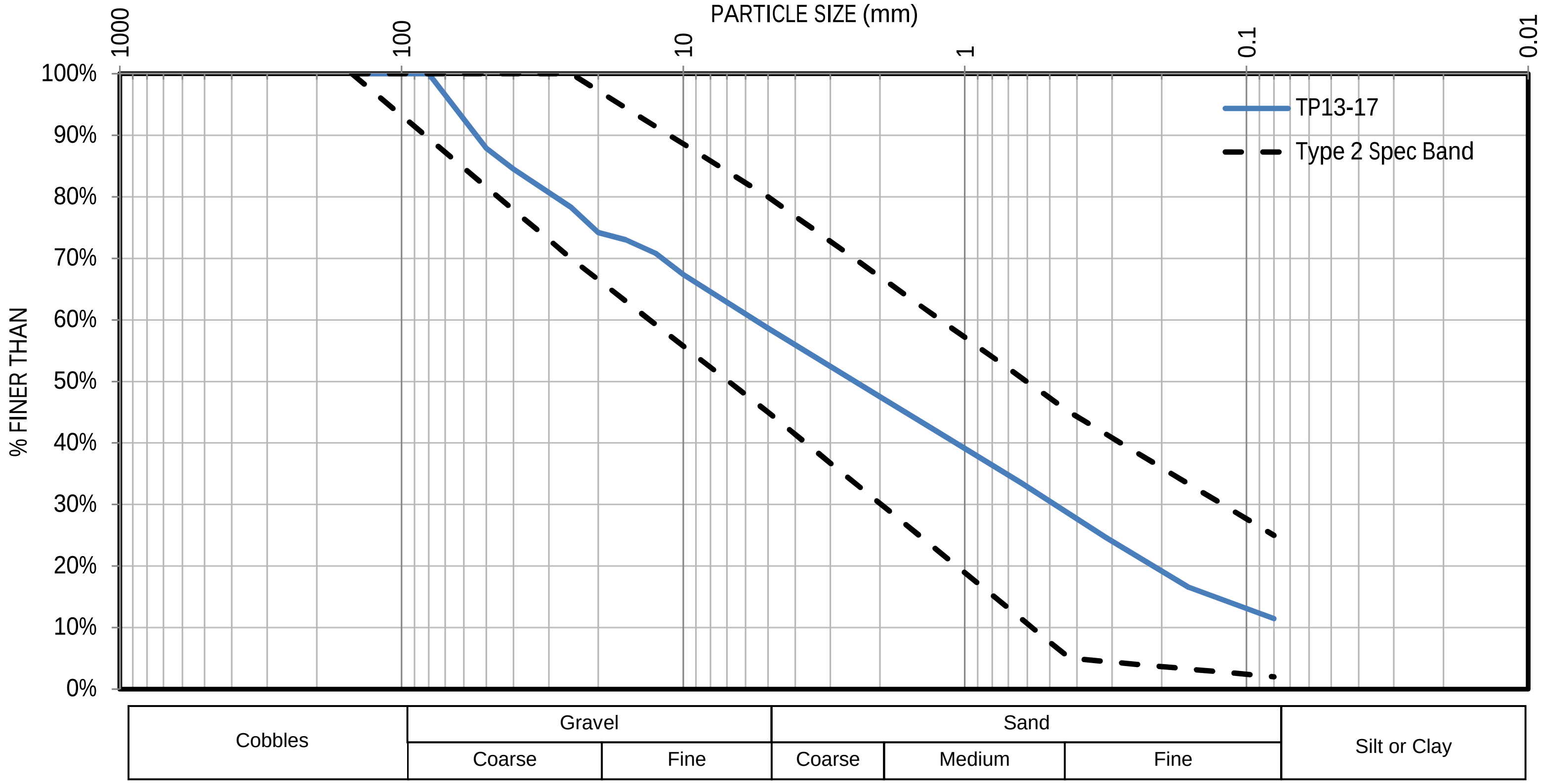

Figure 6

Appendix H

Geophysical Survey Report

Resolution Island
Overhauser Magnetometer Survey

Prepared For:
AECOM

Prepared By:
DMT Geosciences Ltd.
Calgary, Canada
(APEGA Permit P-09454)

Date: September, 2013

DMT Geosciences

DMT Geosciences Ltd.
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General: +1.403.264.9496
Fax: +1.403.263.7641

www.dmtgeosciences.ca

File: 2013-CGAA.221

September 20th, 2013

AECOM
17007 – 107th Avenue
Edmonton, Alberta
T5S 1G3

Attention: Greg Wright

Dear; Greg,

DMT Geosciences Ltd. (DMT) is pleased to submit the following report entitled:

Resolution Island - Overhauser Magnetometer Survey

We would like to express our thanks to AECOM for the opportunity to provide our services in relation to this project.

If you have any questions, or require any additional information, please do not hesitate to contact our office.

Yours sincerely,

DMT GEOSCIENCES LTD. PERMIT No. P9454

Jim Henderson, Ph.D., P.Geoph., FEC(H)
Director, Geophysics & Consulting

Adam Peake, B.Sc., Geoph. I.T.
Junior Geophysicist

1.0 INTRODUCTION

In accordance with DMT Geosciences Ltd. proposal AMP902 to AECOM, a geophysical investigation was completed by DMT Geosciences Ltd. at Resolution Island, Nunavut, August 12th to 19th, 2013. This survey formed one component of environmental assessments being conducted onsite during the same time frame. The objective of the survey was to delineate the extents of buried landfills within the site.

1.1 Site Description

The site was located approximately 312km southeast of Iqaluit, at 413035mE 6830350mN on the eastern point of Resolution Island. It consisted of a decommissioned DEW line station with infrastructure as well as a currently utilized modern radar station. Many decommissioned structures still existed and had to be avoided during the survey to avoid unwanted noise.

The station itself was located on a topographically high plateau relative to the surrounding land. Support facilities existed on the beach area to the south and at the airstrip to the west.

Seven known landfills were identified and surveyed (see Figure 1). The landscape consisted of mostly exposed bedrock with little overburden in some places. The terrain was rocky and steep in some places.

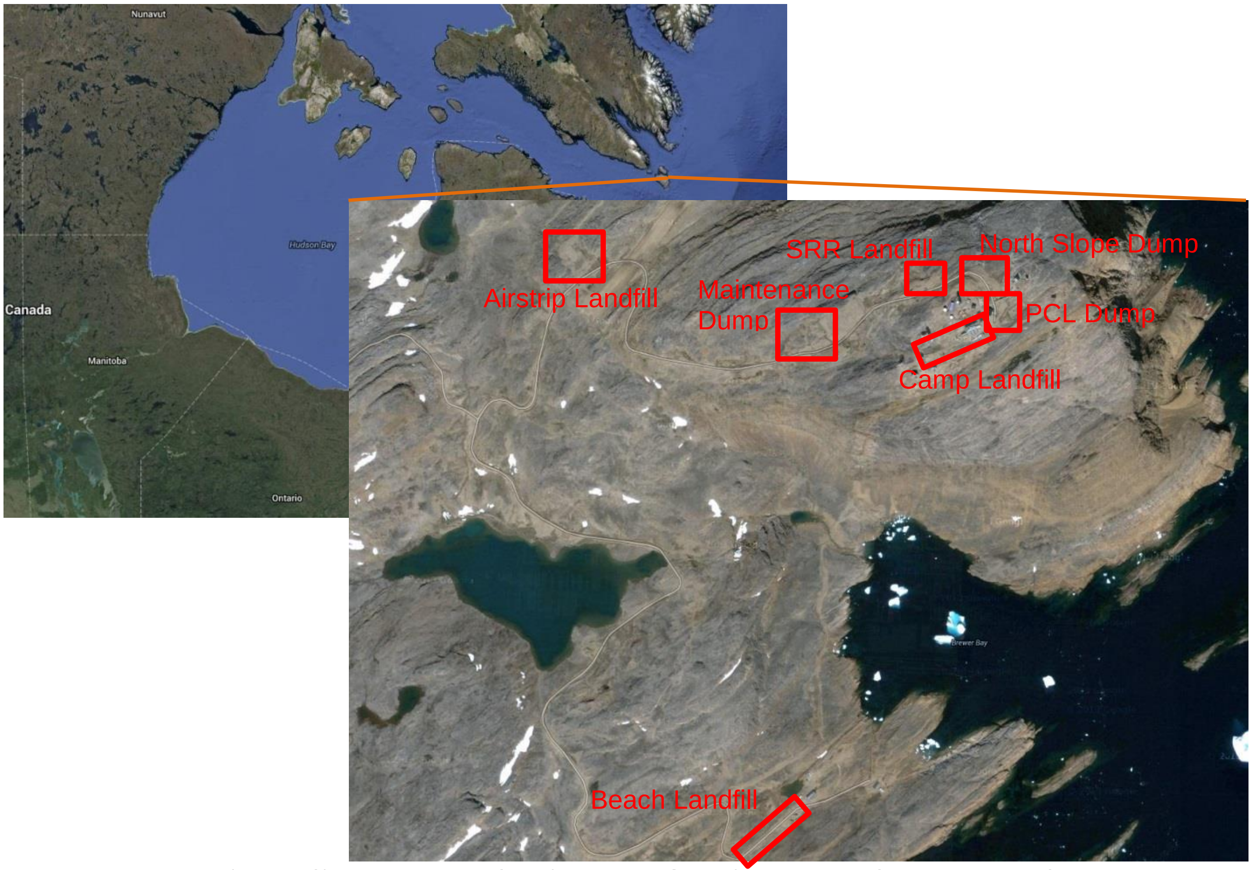


Figure 1: Map location (upper left), satellite image of site (lower right, Google). Approx. landfill locations identified by red.

2.0 METHODS

2.1 Overhauser Magnetometer

Total field magnetic intensity is a scalar measurement of the Earth's magnetic field. Anomalies within this field are due to two types of magnetism: induced and remnant. Induced magnetism results in the enhancement of the ambient field causing it to act as a magnet. Resulting magnetism is directly proportional to the intensity of the ambient field, and the ability of the material to enhance the local field (magnetic susceptibility). Remnant magnetism is a permanent magnetism of the material that depends on the metallurgical properties, and the thermal, mechanical and magnetic history of the material. It is independent of the field in which it is measured.

In an Overhauser effect magnetometer, the hydrogen-rich fluid in the magnetometer sensor is mixed with an electron-bearing fluid and is subjected to a strong radio-frequency current that polarizes the protons. Protons are then deflected into their plane of precession by a short duration pulse. After a brief pause to allow transient currents to subside, the slowly decaying proton precession signal remains. The precession frequency is measured and transformed to magnetic field units, nanoTeslas (nT). For each measurement, the time, position and magnetic field values are digitally stored. The Overhauser effect results in a greater polarization of the proton-rich fluid, translating to stronger signals with less power consumption than proton precession instruments.

Variations in the Earth's total magnetic field were measured using the GSM-19 Overhauser Effect Gradiometer with integrated GPS. The internal GPS receiver utilized Canadian Differential GPS (CDGPS) corrections to provide sub-meter accuracy.

The total field survey data were collected at 0.5 second intervals as the operator walked over areas suspected of containing buried metallic debris. These areas were either deemed suspicious ahead of time, or deemed suspicious by their appearance or by the presence of debris sticking out of the ground. Within these areas, only disturbed ground was surveyed, and ground with no grading, piling, or vegetation disturbance was assumed to be free of landfills. In areas where magnetic anomalies were identified, the operator surveyed their extents and subsequently flagged their boundaries so that soil sampling could be done.

Figure 2: Overhauser Magnetometer setup.

3.0 RESULTS

In many cases, the potential landfill zones exhibited surface debris which affected the apparent lobes in the data. The boundaries of most identified zones were flagged and surveyed by AECOM immediately after they were surveyed with the magnetometer.

In general, small amounts of surface debris did not induce a large response relative to the maximums which in general did not hinder the identification of landfill boundaries. For example, piles of cans on the surface did not register a notable difference.

Individual areas are presented in Figures 3 through 9. Colour scales and data ranges remain the same throughout all figures for comparison. All anomalies are presented in Tables 1 through 7 with approximate locations and comments.

3.1 Camp Landfill

The results for the survey of the Camp Landfill are displayed in Figure 3. See Table 1 for anomaly locations and suspected sources. Infrastructure was still present on the northeastern side including buildings and 3 metre diameter tank, as well as crates containing pieces of radar equipment in the middle of the survey area. The infrastructure could have contributed to large magnitude anomalies identified by CL-C, CL-D, CL-I and possibly CL-E and CL-J. Anomalies CL-E and CL-J could also be partially due to buried debris. The possibility exists that debris was buried under the crates and also contributed to the anomalous response.

Table 1: Anomaly locations for Figure 3 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
CL-A	See Figure 3	See Figure 3	Buried pipe and/or debris
CL-B	413051	6830248	Buried debris
CL-C	413123	6830276	Buried vertical pipe
CL-D	413132	6830272	Metal tank on surface
CL-E	413145	6830260	Metal tank / buried debris
CL-F	413148	6830248	Buried debris
CL-G	413122	6830241	Buried debris
CL-H	413065	6830227	Buried debris
CL-I	See Figure 3	See Figure 3	Crates / buried debris
CL-J	413027	6830218	Crates / buried debris
CL-K	413008	6830196	Buried debris
CL-L	412989	6830203	Buried debris
CL-M	412960	6830184	Buried culvert

3.2 PCL Dump

The results of the survey of the PCL Dump are displayed in Figure 4. See Table 2 for anomaly locations and suspected sources. This site consisted of a slope landfill where debris was pushed over a slope and buried. PCL-F's source is unknown. It was far away from the debris slopes and almost on bare bedrock so not much opportunity remained to bury items. There were however piles of rocks that could conceal metallic material.

Table 2: Anomaly locations for Figure 4 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
PCL-A	413177	6830290	Buried debris
PCL-B	413178	6830304	Buried debris
PCL-C	413195	6830301	Buried debris
PCL-D	413188	6830333	Buried debris
PCL-E	413167	6830328	Buried debris
PCL-F	413230	6830356	Possible debris under boulders

3.3 North Slope Dump

The results of the survey of the North Slope Dump are displayed in Figure 5. See Table 3 for anomaly locations and suspected sources. This site consisted of a slope landfill where debris was pushed over a slope and buried. Relatively large anomalies exist labeled as NSD-A. The exposed debris at the toe seemed to be part of a tower structure which could be entirely buried there, providing the large magnitude responses. Other isolated responses existed to the northwest identified by NSD-B as well as NSD-C and NSD-D to the southeast which did not have surficial debris.

Table 3: Anomaly locations for Figure 5 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
NSD-A	See Figure 5	See Figure 5	Buried debris
NSD-B	See Figure 5	See Figure 5	Buried debris
NSD-C	413175	6830367	Buried debris
NSD-D	413185	6830361	Buried debris

3.4 Maintenance Dump

The results of the survey of the Maintenance Dump are displayed in Figure 6. See Table 4 for anomaly locations and suspected sources. Two relatively large magnitude anomalies existed in this site (MD-Upper and MD-Lower). Surficial debris was present at both locations.

Table 4: Anomaly locations for Figure 6 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
MD-Upper	412489	6830229	Buried debris
MD-Lower	412564	6830281	Buried debris

3.5 Airstrip Landfill

The results of the survey of the Airstrip Landfill are displayed in Figure 7. See Table 5 for anomaly locations and suspected sources. The bulk of buried debris was within Anomaly AL-A with isolated anomalies to the southeast labeled as AL-B. This landfill had a large steep slope on the north and west sides. The magnitude and lateral extent suggests a large amount of debris could be buried.

Table 5: Anomaly locations for Figure 7 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
AL-A	See Figure 7	See Figure 7	Buried debris. Steep slope
AL-B	See Figure 7	See Figure 7	Buried debris

3.6 Beach Landfill

The results of the survey of the Beach Landfill are displayed in Figure 8. See Table 6 for anomaly locations and suspected sources. This landfill was long and narrow and was situated between a dipping rock face and the access road. The landfill is relatively consistent (BL-A) and has an isolated anomaly to the southwest (BL-B). Holes were present scattered around the surface of the landfill, which were likely from soil percolating down through the buried debris. The lateral extent and magnitude suggests a large amount of debris could be buried.

Table 6: Anomaly locations for Figure 8 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
BL-A	See Figure 8	See Figure 8	Buried debris. Holes present
BL-B	412256	6828536	Buried debris

3.7 SRR Landfill

The results of the survey of the SRR Landfill are displayed in Figure 9. See Table 7 for anomaly locations and suspected sources. The landfill was located under a steep rocky slope made of large boulders. The magnitude of the response labeled SSR-A is very large relative to the other landfills on the island. The source is unknown since there was no surficial debris or other indications. Other anomalies (SSR-F and SSR-G) did have surficial debris present. Anomaly SSR-B is likely due to a large tank present at the base of the rock slope.

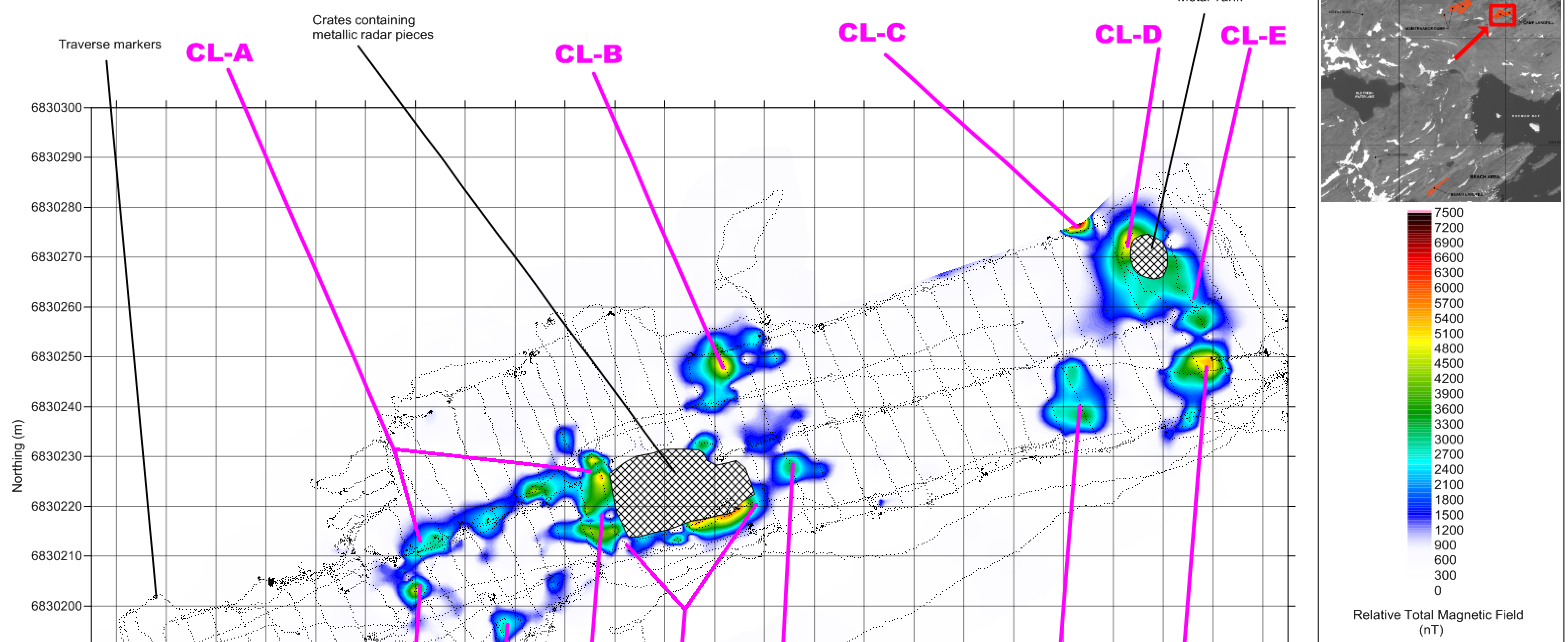
Table 7: Anomaly locations for Figure 9 (approximate centre).

Anomaly	Easting (m)	Northing (m)	Suspected Source / Notes
SSR-A	See Figure 9	See Figure 9	Buried debris. Relatively large magnitude
SSR -B	412882	6830427	Metal tank at base of slope
SSR -C	412894	6830440	Buried debris
SSR -D	412924	6830442	Buried debris
SSR -E	412931	6830431	Buried debris
SSR -F	412921	6830398	Buried debris
SSR -G	412908	6830394	Buried debris

4.0 CONCLUSION

The Overhauser magnetometer survey conducted on Resolution Island, Nunavut, successfully delineated several landfills containing ferrous metals. Throughout the site, seven major landfill locations were detected and their boundaries were delineated, which allowed AECOM to survey and sample the soil surrounding them.

Camp Landfill



Location:
Resolution Island, NU

Scale:
1:750

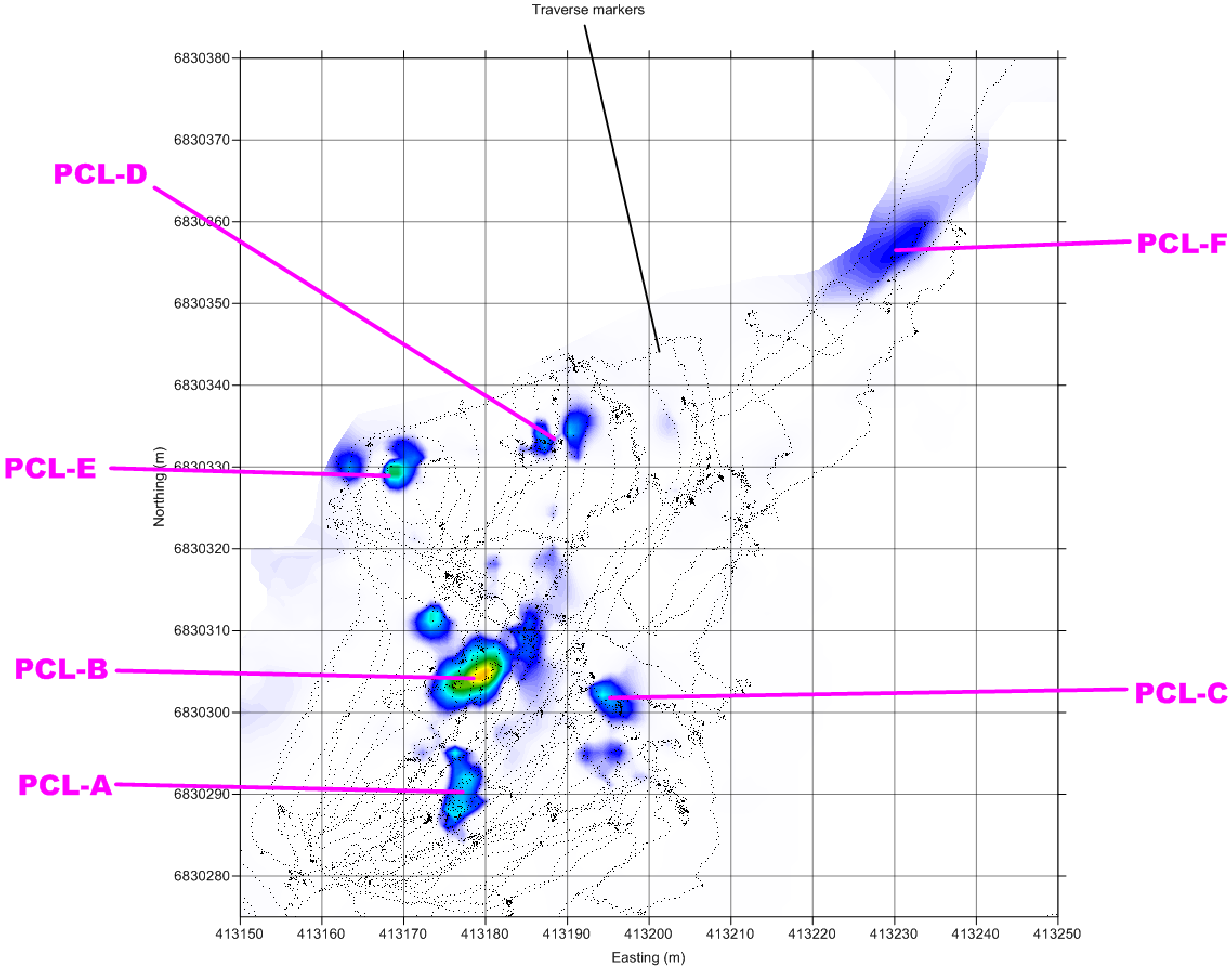
Zone:
UTM Zone 20 North (NAD 83)

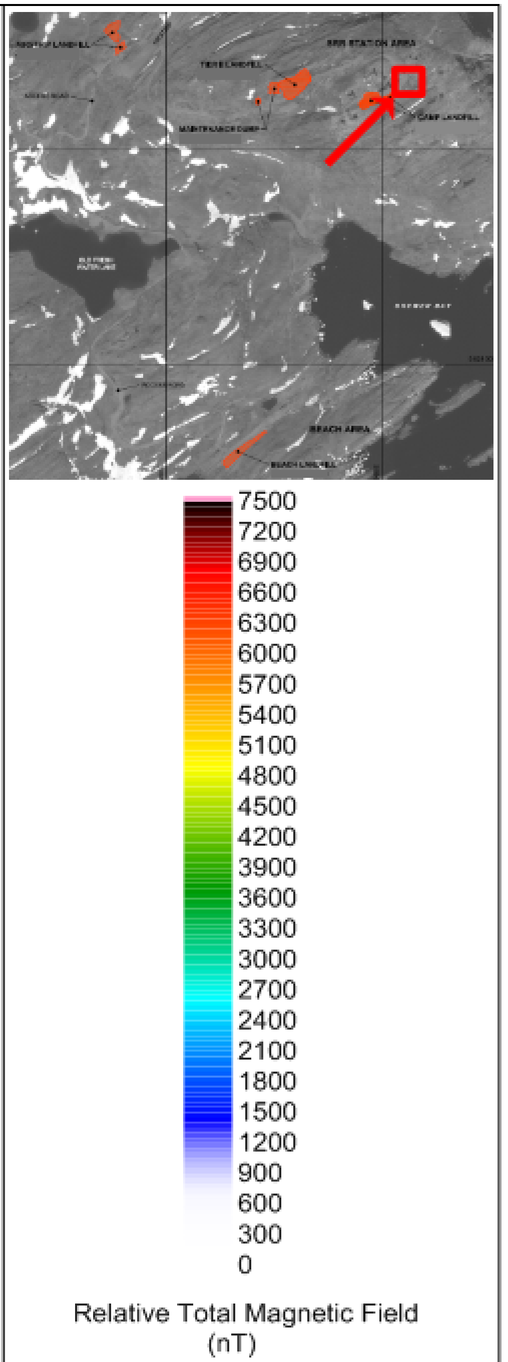
Figure #:
3

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

AECOM DMT

PCL Dump





Relative Total Magnetic Field (nT)

Location:
Resolution Island, NU

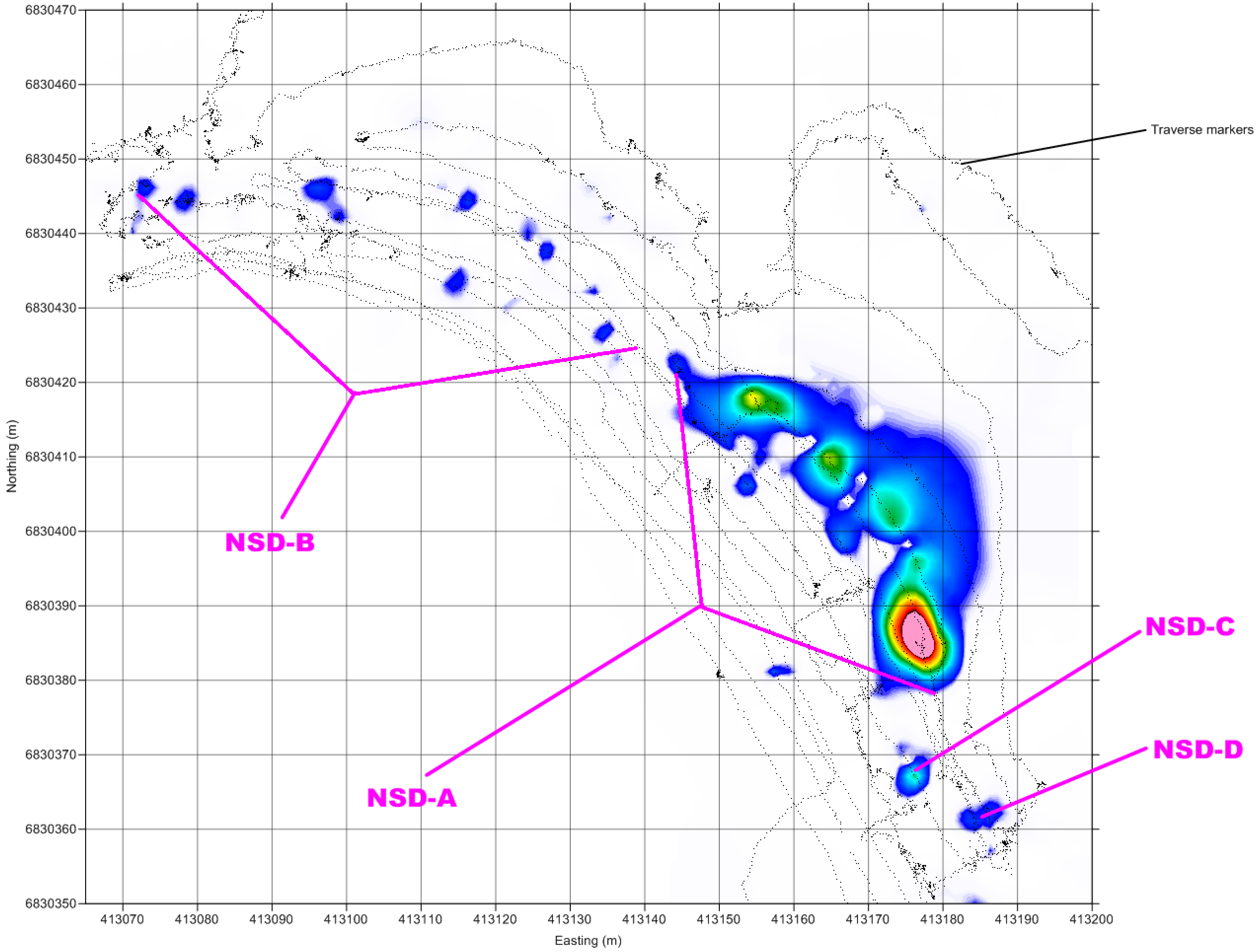
Scale:
1:500

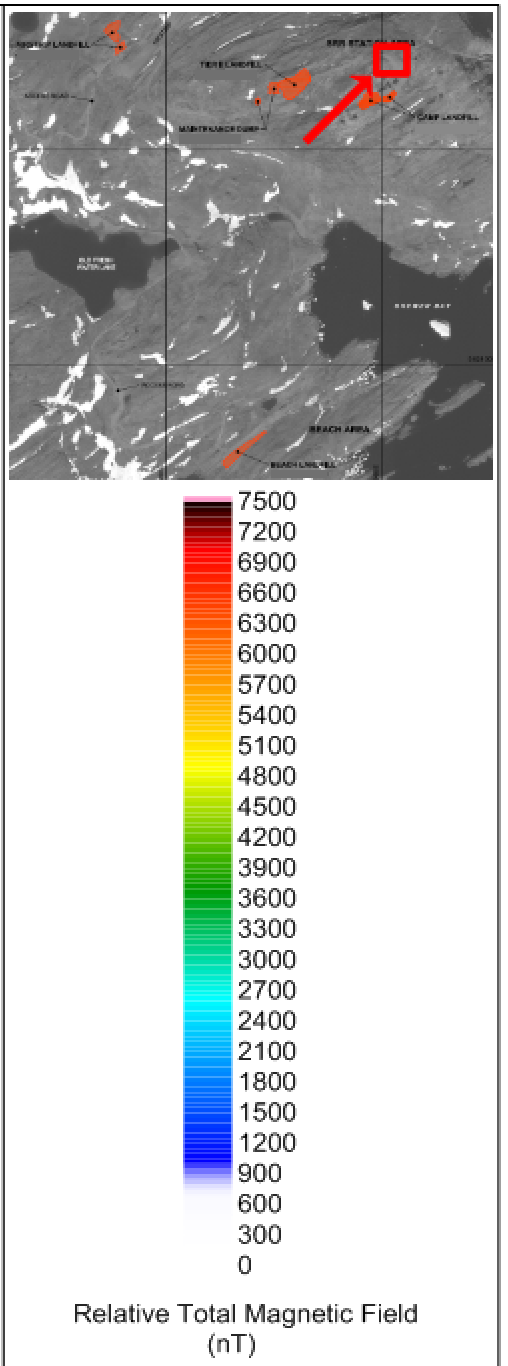
Zone:
UTM Zone 20 North (NAD 83)

Figure #:
4

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

North Slope Dump





Location:
Resolution Island, NU

Scale:
1:500

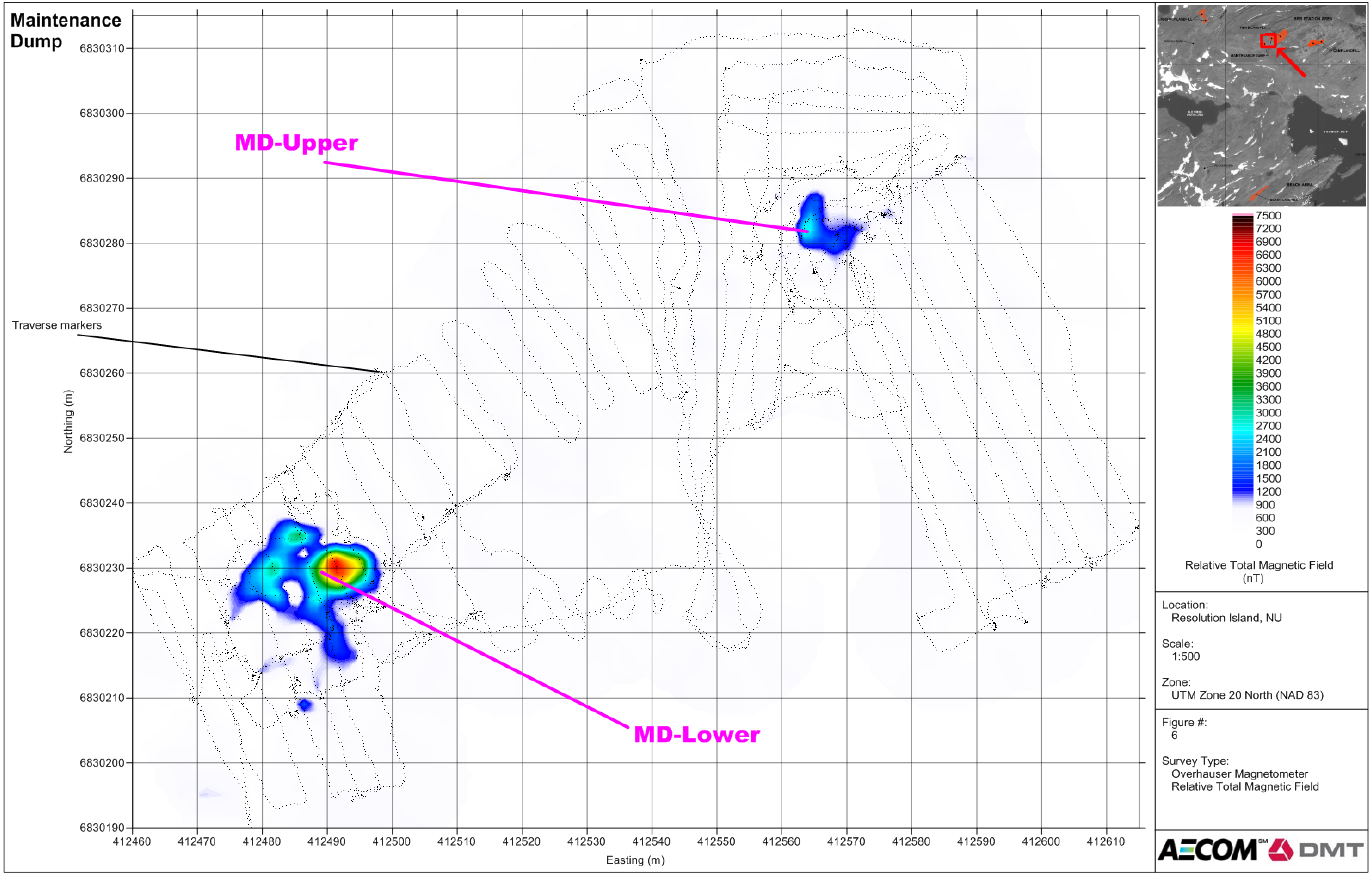
Zone:
UTM Zone 20 North (NAD 83)

Figure #:
5

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

AECOM DMT

Maintenance Dump



Location:
Resolution Island, NU

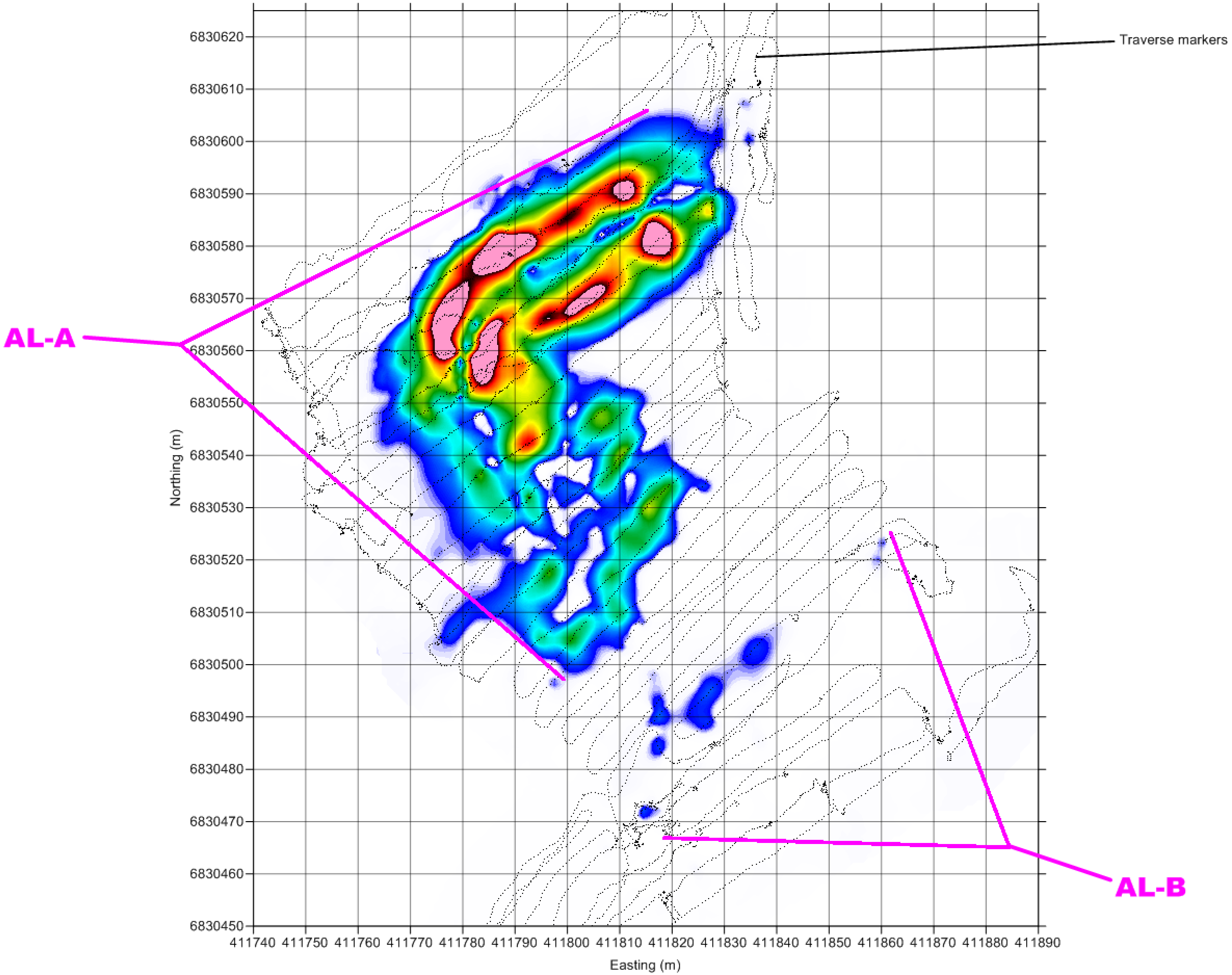
Scale:
1:500

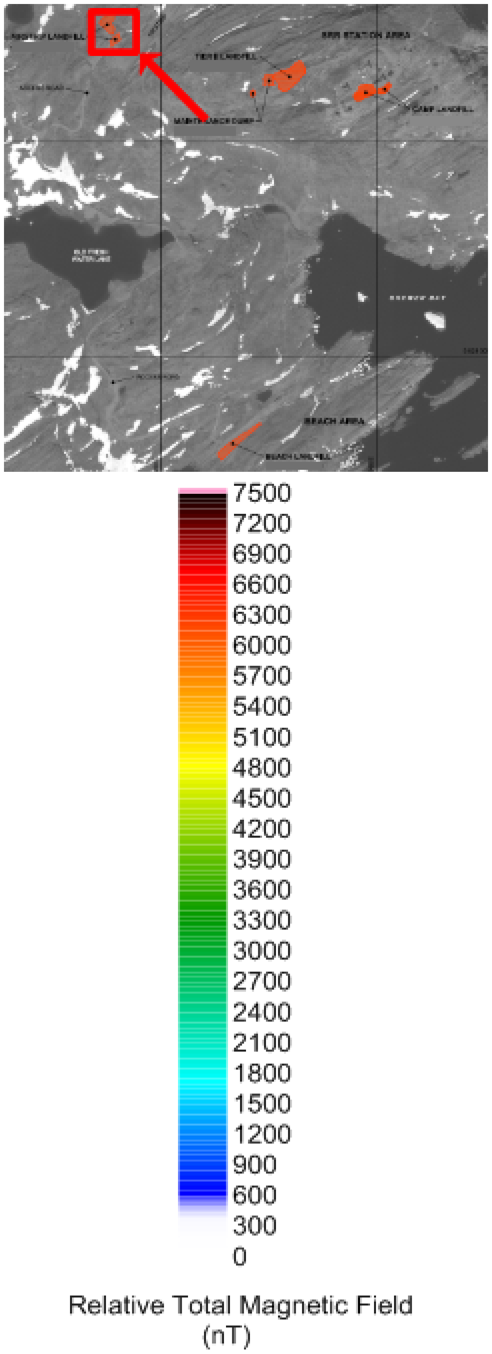
Zone:
UTM Zone 20 North (NAD 83)

Figure #:
6

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

Airstrip Landfill





Location:
Resolution Island, NU

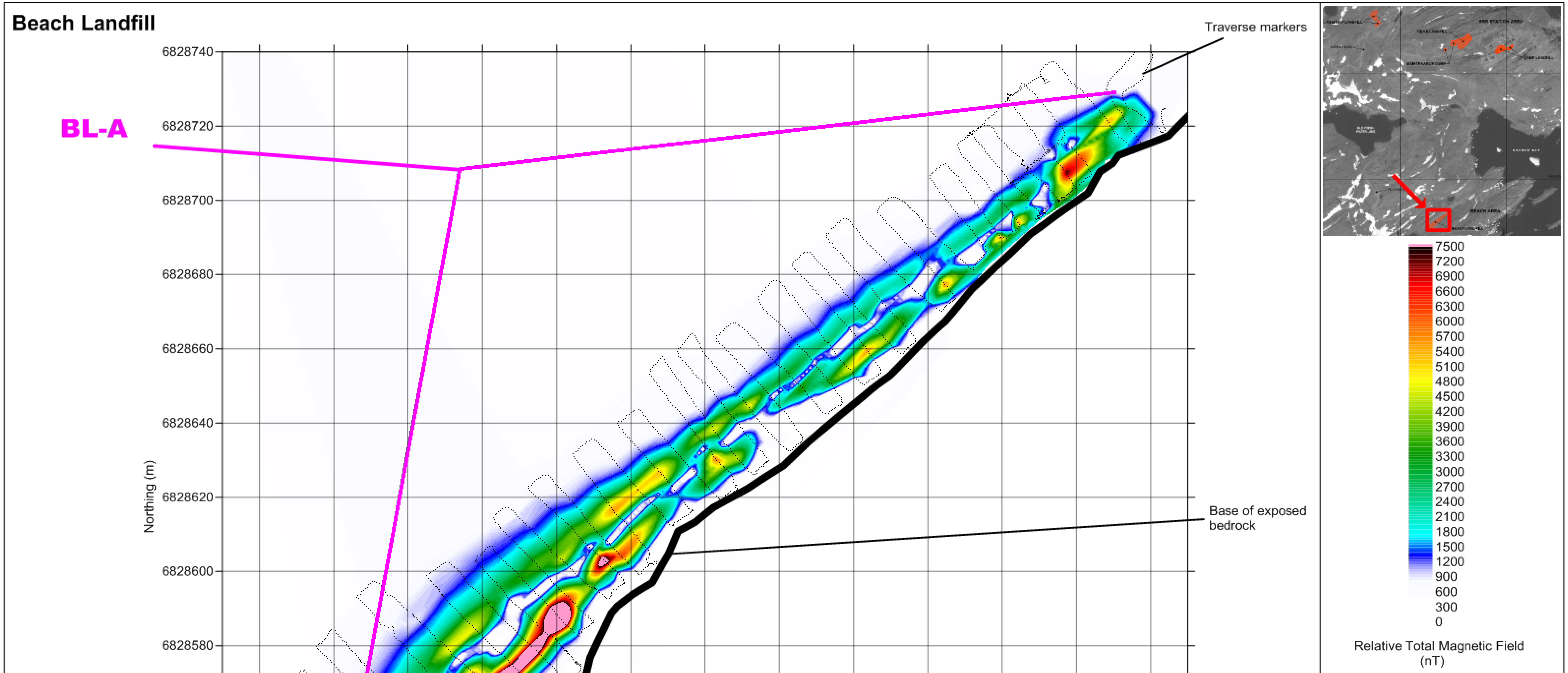
Scale:
1:750

Zone:
UTM Zone 20 North (NAD 83)

Figure #:
7

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

AECOM DMT



Location:
Resolution Island, NU

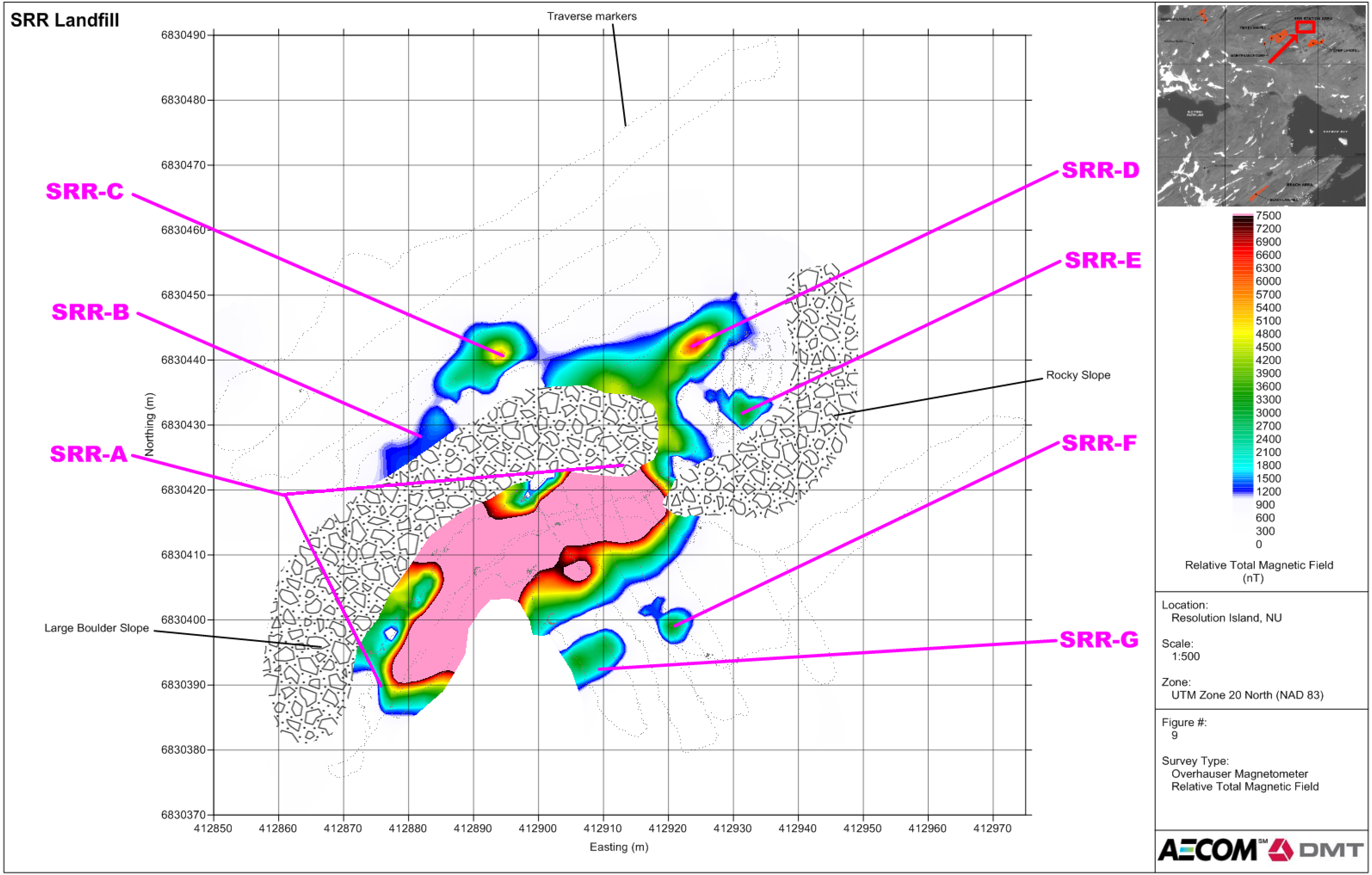
Scale:
1:1000

Zone:
UTM Zone 20 North (NAD 83)

Figure #:
8

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

SRR Landfill



Location:
Resolution Island, NU

Scale:
1:500

Zone:
UTM Zone 20 North (NAD 83)

Figure #:
9

Survey Type:
Overhauser Magnetometer
Relative Total Magnetic Field

AECOM DMT