Hope Bay Project
Boston Camp Revised Interim Closure Plan

Prepared for

TMAC Resources Inc.

Prepared by

SRK Consulting (Canada) Inc.
1CT022.001.710
May 2014

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1 Introduction

The Boston Advanced Exploration Camp (hereafter Boston Camp) was part of the Hope Bay Regional Exploration Project. Boston Camp is located on Inuit Owned Land in the west Kitikmeot region of Nunavut (Figure 1), the camp is authorized under Nunavut Water Board (NWB) Type B Water Licence 2BB-BOS1217. In January 2013, the Hope Bay Regional Exploration Project was acquired by TMAC Resources Inc. (TMAC) from the previous owner Hope Bay Mining Limited (HBML) a wholly owned subsidiary of Newmont Mining Corporation (NMC).

This document presents the closure obligations, the plan for closing the camp and demonstrates how the closure obligations will be met. This closure plan serves as an update to the 2012 Closure Plan according to the provisions set forth in the NWB Water Licence. The water and ore/waste rock management plan developed for the Boston Site (SRK 2009) is incorporated into this plan.

1.1 Background

Boston Camp is located approximately 170 km southwest of Cambridge Bay, above the high water mark on a peninsula in Aimaokatalok Lake. The camp provides support services for exploration activities in and around the Boston mineral resource located at the south end of the Hope Bay Greenstone Belt (Figure 1). The Boston Camp is currently under care and maintenance. It is considered critical infrastructure for restarting exploration in the Hope Bay Greenstone Belt in the future.

Boston Camp was not modified from its original form until June 2010 when a new sewage treatment plant and a new core processing facility were installed. In 2010 the tents were rearranged and attached to a central corridor leading to the main camp building. This closure plan is consistent with the objectives set forth in the 2012 Closure Plan because site modifications have been limited.

1.2 Closure Objective

The overall closure objective for the Boston Camp is to establish chemical and physical stability to protect human health and the environment. Post-closure care and maintenance, including environmental monitoring will be undertaken to ensure that these conditions are met.

1.3 Permits and Leases

Activities at the Boston Camp were completed in accordance with NWB Licence No. 2BB-BOS1217, and a Land Use Licence with the KIA. Final closure of the site will be completed to satisfy the objectives specified in the Water Licence. Land use requirements in the KIA Land Use Licence have been reviewed and taken into account in preparing this plan. Table 1 provides a Table of Concordance indicating how the conditions specified in the licence are satisfied by this closure plan.

Table 1 Table of Concordance

Licence Reference	Licence Condition (2BB-BOS1217)	Closure Plan Reference	Closure Plan Response/Specification
Part I. 1	Submit revised Abandonment and Reclamation Plan consistent with Mine Site Reclamation Guidelines for the Northwest Territories (INAC 2007), and consistent with the INAC Mine Site Reclamation Policy for Nunavut, 2002.	N/A	Requirements satisfied by submission of this updated Revised Interim Closure Plan
Part I. 2	Licencee shall complete all restoration work prior to the expiry of this Licence (July 31, 2017).	5.2	The works will not be completed by this date. TMAC will be applying for a licence extension. Infrastructure at Boston is critical to future exploration when the Hope Bay Greenstone Belt is brought out of care and maintenance.
Part I. 3	Complete progressive reclamation of components no longer in use.	3	Entire site will be reclaimed.
Part I. 4	Backfill and restore all sumps to the pre-existing natural contours to the satisfaction of an Inspector.	3.4 -3.7, 3.10 – 3.12	Areas of site disturbance will be filled and recontoured to be consistent with natural contours, provide geotechnical stability, and minimize erosion and sedimentation.
Part I. 5	Remove site infrastructure and materials prior to expiry of Licence.	3.4, 3.5, 3.8	All facilities and materials will be removed. The rock fill pad and airstrip will be left in place.
Part I. 6	Regrade all roads and airstrip to match natural contours and reduce erosion	3.2, 3.4, 3.7, 3.9 - 3.11	Airstrip, roads, and rock pads will be left in place and regraded to prevent ponding.
Part I. 7	Remove culverts and re-establish drainage path of natural channel. Measures to minimize erosion and sedimentation shall be implemented	3.7	Culvert from the Core Storage Road will be removed and the natural flow path restored.
Part I. 8	All disturbed areas will be ripped, graded or scarified to conform to natural topography and promote growth of vegetation	3.7, 3.9 - 3.11	Areas of disturbance will be ripped where necessary and regraded to ensure positive drainage, conform to natural topography and to encourage revegetation.
Part I. 9	Remediation of hydrocarbon contaminated soils to the satisfaction of an Inspector	3.10	Hydrocarbon contaminated soils will either be remediated by landfarming to achieve specified remediation criteria or removed from the site to a licensed disposal facility.
Part I. 10	Restore drill holes and disturbed areas to natural conditions upon completion of drilling, must include removal of drill casing materials and the permanent capping of holes	3.12	All drill steel will be cut at grade, holes will be capped, thermokarst areas backfilled, and soils around the drill sites scarified and revegetated.
Part I. 11	Store drill cores at least thirty (30) metres above ordinary high water mark of any adjacent water body, where any direct flow into a water body is not possible, and no additional impacts are created.	3.3	All drill core boxes will be consolidated in one area on the existing Boston Camp pad
Part I. 12	Contour and stabilize all disturbed areas upon completion of work and restore to a pre-disturbed state	3.11	Areas of disturbance will be regraded to ensure positive drainage, and to be consistent with natural topography.

2 Closure Scope of Work

The layout of the Boston Camp is shown on Figures 2 and 3. Closure and reclamation activities for Boston Camp include:

- Demolishing and removing remaining site structures,
- Decommissioning and demolition of containment structures,
- Decommissioning the existing portal to underground workings,
- Consolidating and covering ore stockpiles,
- Reclaiming drill sites,
- Collecting and disposing of hazardous wastes,
- Collecting and disposing of non-hazardous wastes,
- Stabilizing permafrost degradation areas,
- Remediating hydrocarbon contaminated soils, and
- Drainage control and revegetation, where appropriate.

Post-closure environmental monitoring will be implemented to confirm conformance with the closure objectives.

3 Closure Activities

3.1 Decommissioning of Camp Structures and Ancillary Facilities

All utilities to structures and facilities will be dismantled and the structures emptied prior to demolition. Non-hazardous and hazardous waste will be segregated as discussed in Section 3.8. Tanks used for heating fuel storage will be drained, removed, and temporarily placed within the lined area of the primary tank farm. If possible and/or if a need is demonstrated, furniture, utilities or structures, will be salvaged. Where possible salvageable structures will be moved intact, or alternatively they will be carefully dismantled and catalogued to facilitate efficient reassembly. Unusable or unwanted buildings will be demolished and the waste material segregated into burnable and non-burnable waste and disposed of as described in Section 3.8.1. Salvage value is not included in the cost estimate. The following structures and facilities will be demolished:

- Accommodation and Office Complex,
- Core Processing Facility,
- Maintenance Shop,
- Power Generator Complex,
- Crusher Enclosure,
- Water Supply Structure,
- Sewage Treatment Plant,
- Helipads and Docks,
- Incinerator,
- Vent Raise,
- Communications Tower, and
- Small Sheds.

3.2 Airstrip Decommissioning

Following removal of all buildings and structures the airstrip will be decommissioned. Crushed ore used for surfacing material and for repairing the airstrip will be removed and consolidated into the ore stockpile. The main airstrip rock fill will be left in place, and the airstrip will be regraded to ensure positive drainage. Large white X’s will be painted on the ends of the airstrip.

Adjacent to the airstrip are two areas where drill cuttings have been stored. A geotextile underlies the drill cuttings. Drill cuttings will be removed and stockpiled for backfilling depressions during reclamation. The geotextile will be removed, cut into manageable pieces, and disposed of as described in Section 3.8.1. The area will be regraded to ensure positive drainage and prevent ponding. Areas of permafrost degradation will be covered with a 1 m thick thermal blanket of waste rock and graded to promote positive drainage.

3.3 Drill Core Storage

Drill core will be consolidated on the Boston Camp pad. Drill core boxes will be placed on pallets and strapped, inventoried, and labelled. This area is outside of the 31 m wide fish habitat buffer zone from the shoreline of Aimaokatalok Lake.

3.4 Decommissioning and Demolition of Containment Structures

3.4.1 Tank Farms

Tank Farms at Boston Camp include the primary bulk fuel storage to the north of the airstrip, the power plant fuel containment system and the jet fuel containment system all contained within secondary containment structures. There are also Tidy Tanks for heating fuel located within small secondary containment berms. The bedding, containment berm, and protective granular cover for the liners, of all containment structures on this site were constructed using crushed ore.

All tanks will be decommissioned, drained, and transported to the Doris North Waste Management Yard. Any remaining fuel will be consolidated and hauled to a designated fuel storage area at Doris Camp. At Doris Camp empty drums will be cleaned, crushed and disposed of as non-hazardous waste (see Section 3.8.1). Rinse water from the washing process will be routed through an oil/water separator and not discharged to the environment until treated water meets water quality standards specified in the Water Licence. Tanks will shipped off-site for resale or disposal.

The granular cover layer above the liner will be tested for petroleum hydrocarbons and other contaminants. Depending on the test results, the material will either be consolidated within the ore pile or handled as contaminated soil and treated as described in Section 3.10. Once exposed, the tank farm liner will be cleaned to remove any hydrocarbon contamination, and then cut into manageable pieces for disposal. The underlying bedding soil and containment berm will be tested for the presence of petroleum hydrocarbons. If contaminated, the ore will be remediated as described in Section 3.10, while the uncontaminated ore will be consolidated within the ore stockpile.

The portable pollution control berms situated in the jet fuel containment system will be cleaned, dismantled, and loaded into containers for off-site disposal as non-hazardous waste.

All areas will be regraded for positive drainage after the containment structures are removed. The area will not be revegetated because it was built on a rock pad or bedrock.

3.4.2 Sedimentation Ponds

Two sedimentation ponds were constructed at the Boston Camp (Figures 2 and 3). A high density polyethylene (HDPE) lined pond (Sedimentation Pond 1) and an unlined pond (Sedimentation Pond 2) are located on the east edge of the camp.

Sedimentation Pond 1 was used to settle drilling mud from regional exploration drilling. Any water contained in the pond will be tested and discharged to the tundra or treated to meet the site-specific discharge criteria. Settled sediments will be allowed to dry, then removed from the

pond and temporarily stockpiled to allow for the removal of the liner. Liner will be cleaned, cut into manageable pieces, and disposed of as non-hazardous waste. The pond sediments will be tested for contaminants, and depending on the results will be shipped to a licensed off-site disposal facility or covered in place by pushing the containment berm inwards. The area will be subsequently regraded to ensure positive drainage.

Sedimentation Pond 2 was initially used to settle drilling fluids during underground development but was converted to a Burn Pit to burn all wood waste after the bulk sample was completed. Sediment in the pond will be tested for contaminants, and depending on the test results will be either shipped off-site for disposal in a licensed facility or covered in place with by pushing the containment berm inward. The area will be regraded to ensure positive drainage. All solid waste other than fine sediments will be collected and disposed of as described in Section 3.8.1.

For cost estimating purposes, it was assumed the sediments within the sedimentation ponds can be disposed of on site without special treatment.

3.4.3 Landfarm

The soils within the Land Farm will be tested for petroleum hydrocarbons. Soil hydrocarbon concentrations will be compared to the Nunavut Tier 1 Environmental Guidelines for Contaminated Site Remediation for industrial land use and coarse grained soils (EBA 2012a, EBA 2012b). Soils that meet these remediation criteria may be used for reclamation. Soils not meeting these criteria will continue to be remediated in the Land Farm. Drums containing hydrocarbon impacted soil will be emptied onto the Land Farm pad as space becomes available or will be shipped off-site for disposal. Landfarming will continue until soils meet remediation objectives or an alternate remediation method is employed.

When remediation is complete, the liner will be cut into manageable pieces for disposal. The containment area will be regraded to ensure positive drainage. These materials will be processed as non-hazardous waste.

3.5 Decommission Mine Workings

3.5.1 Underground Portal

The underground portal will be closed in accordance with regulations. A 15 m thick rockfill plug will be installed in the underground portal. The portal opening will be backfilled with geochemically suitable rock. This may include waste rock that has been tested and confirmed to be suitable for general construction, or clean quarry rock suitable for general construction. The backfilled area will be contoured to prevent surface water ponding. The entire area will be regraded to promote positive drainage and to conform to the site topography.

3.5.2 Vent Raise

The wooden headframe raise and the ventilation fan will be removed and disposed of as non-hazardous waste. The raise will be capped with reinforced concrete with gas vent in accordance with the appropriate mining regulations.

3.6 Ore Stockpile Closure

The ore stockpile will be consolidated and managed to reduce metal loading to the receiving environment. Ore which has been used as surface dressing, repairs, or for construction of the various containment facilities around site will be collected and consolidated within the existing ore stockpile

The ore piles will be consolidated in an area approximately two-thirds of the original footprint, regraded to prevent ponding, and covered with an HDPE liner. A protective cover of 0.3 m of waste rock would be placed over the geomembrane.

3.7 Decommission Camp Rock Fill Pad

All rock pads on site were built using rock from underground development. The waste rock is non-acid generating and has a significant acid neutralisation potential (SRK 2009). Some of the waste rock from the camp pad may be excavated and used as backfill material where required, but the pad will always have a minimum thickness of 1 m. The rock fill pad will be left in place, regraded to promote positive drainage and prevent the ponding of surface water. The culvert from the Core Storage Road will be removed and a swale created to restore the natural flow path.

3.8 Collection and Disposal of Waste

3.8.1 Non-Hazardous Waste

Following dismantling, demolition, and removal of all structures, a general site wide cleanup will be conducted to gather all waste on site.

The demolition debris from camp structures and other facilities will be collected and segregated for proper disposal. Wood debris will be separated into burnable and non-burnable based on the appropriate guidelines for burning and incineration and/or landfilling (GN 2012, GNWT 2004, particularly Schedules III and IV). Wood waste will either be chipped or burned. Wood waste suitable for burning will be transported to an approved burn pan. Prior to on-site burning appropriate approvals and permissions will be attained.

Ashes from the incinerator will be managed according to existing management plans.

Non-burnable non-hazardous waste will be loaded into containers, hauled to Roberts Bay, and transported for off-site disposal. All materials shipped off site will be disposed of in a licensed facility at Hay River, NT, (or another designated location) in accordance with appropriate Federal, Provincial, Territorial or Municipal non-hazardous waste regulations.

Prior to demolition, all water supply and sewage pipelines are to be flushed and the sludge and waste water will be collected and loaded into 55 gallon drums. The drums will be transported to the Doris North camp treatment facility for processing.

3.8.2 Hazardous Waste

Hazardous wastes and chemicals will be collected and stored in appropriately sealed and labelled containers and/or empty drums. This includes any remaining fuel, hydraulic oil, antifreeze, lubricants, paint, paint thinners, cleaning supplies, degreasing agents and any other chemicals that cannot be used for their intended purpose. The containers will be hauled to Doris North and consolidated with other hazardous waste for transport and disposal off-site. Materials shipped off site will be disposed of in a licensed facility in accordance with appropriate Federal, Territorial, Provincial or Municipal hazardous waste regulations.

3.9 Stabilization of Permafrost Degradation

A few areas were previously identified as permafrost degradation areas which require stabilization. These areas of permafrost degradation are as follows:

- Airstrip (permafrost degradation ponds can be found at different locations along the east and west shoulders of the airstrip due to historic drilling activities) (SRK 2013),
- Drill Road,
- Drill sites,
- Core Storage Road,
- Diamond Drill Cuttings and Sedimentation Pond,
- Road to Dock (possible small pockets of permafrost degradation) (SRK 2013),
- Road to airstrip (SRK 2013), and
- Sewage Treatment Plant discharge.

Areas of depression should be filled in with and/or covered with a 1 m thick thermal blanket consisting of rock, overburden, drill cuttings, wood chips or a mixture of these during the winter season. The surface of the areas will be regraded to ensure positive drainage.

3.10 Remediation of Hydrocarbon Impacted Soils

A Phase 3 Environmental Site Assessment (Appendix A) was conducted in 2012. Soil hydrocarbon concentrations were compared to the Nunavut Tier 1 Environmental Guidelines for Contaminated Site Remediation for industrial land use and Coarse grained soils (EBA 2012a, EBA 2012b). Soils that meet these remediation criteria may be used for reclamation. Soils not meeting these criteria will be remediated.

A field investigation will be completed after demolition and debris removal to define the nature and extent of hydrocarbon contamination. Remediation options will be assessed after the field investigation. Selection of the type of remediation used to address each of these areas is dependent on the following site-specific factors:

- Size of the impacted area and volume of impacted soils,
- Type of hydrocarbons present, and
- Ground conditions of the impacted area (i.e., solifluction and/or potential for permafrost degradation).

Remediation alternatives will be the same as proposed for Windy Camp and the Patch Lake Facility (SRK 2012). Off-site disposal and in situ bioremediation/landfarming are the preferred alternatives.

Impacted soils will be excavated and either relocated to the existing Land Farm for treatment or placed in megabags and hauled to Roberts Bay for disposal at a licensed facility near Hay River (or other location). Smaller isolated areas of hydrocarbon impact will be remediated in situ using bioremediation.

The bioremediation method consists of aerobic treatment whereby a proprietary oxygen-releasing compound (EHC-O manufactured by Adventus Americas) will be applied to the affected area at an application rate of about 2.5 g EHC-O per kg of soil. This compound will be tilled into the active zone of the soil (done in the summer season). At least one season after the compound has been added the impacted soil will be tested to determine if microbial activity has resulted in a reduced hydrocarbon contamination. If the soils still exceed compliance criteria, the treatment may be repeated or the soils will be excavated and removed as described below.

Excavated soils or soils previously land farmed which meet the remediation criteria will be used for reclamation or stockpiled.

The open excavations will then be backfilled with suitable backfill to prevent surface water ponding and permafrost degradation. Backfilled excavations will be covered with a minimum 1 m thick layer of waste rock to prevent permafrost degradation and erosion.

The option to encapsulate impacted soils in place is also preserved should it be demonstrated that hydrocarbon risk is minimal and/or other remediation methods are ineffective or inappropriate for a given area. Written approval by the NWB will be sought prior to implementation of encapsulation method.

3.11 Drainage Control and Revegetation

Once all surface infrastructure has been removed and the area has been cleared of debris, the areas will be regraded to ensure no ponding of water. In the summer prior to regrading, the areas should be staked in the field to be easily identified during the winter reclamation work.

Additional areas will not be disturbed during regrading. Any remaining depressions which cannot be regraded will be backfilled with suitable backfill to prevent surface water ponding and permafrost degradation. All roads and trails associated with the existing Boston Camp will be ripped and scarified to promote natural revegetation, reduce erosion potential, and ensure the

restoration of natural drainage pathways in a low maintenance fashion. Where there is sufficient soil substrate to support vegetation, appropriate revegetation technology will be implemented.

Vegetation has been damaged in the following areas:

- Sewage Treatment Plant Discharge,
- Drill sites, where appropriate,
- Area South of the Core Storage Road, and
- Area between the Drill Road and the Airstrip.

Areas with only minor vegetation damage and no evidence of ponding will be appropriately revegetated. Areas of complete vegetation dieback and ponding will be backfilled with suitable backfill to prevent surface water ponding and permafrost degradation. The areas will be regraded to ensure positive drainage and revegetation where appropriate. A study will be commissioned to determine the most appropriate revegetation techniques for each site.

3.12 Drill Site Reclamation

A total of 545 drill holes are within an area of 0.81 km^2 in the vicinity of Boston Camp. Drill holes will be inventoried and the extent of remediation work required for each location will be assessed. For drill hole reclamation, above ground casing will be cut at grade, and a cap will be hammered in place to seal the hole. Areas of permafrost degradation around boreholes, if present, will be covered with a 1 m thick thermal blanket and graded to ensure positive ponding. Erosion control measures will be installed where required and vegetation growth will be encouraged where possible by scarifying the soils and seeding. Cost estimates assume that an average area of 10 m^2 will be covered, and that backfilling will be done in the winter using low ground pressure vehicles. Scarifying and seeding will be done in the summer..

The drill holes will not be grouted and the steel casing will not be backfilled. The holes drilled into the lake bottom (over the ice) as well as any holes encountering artesian conditions were grouted and sealed as part of the drilling procedure. The drill holes located on dry land intersect cold permafrost to a depth of approximately 500 m and as such water flow through these holes is unlikely.

An adaptive management approach will be used to reclaim areas where saline drilling fluid spills have affected vegetation. This first phase of this adaptive management approach will be to revegetate these areas with salt tolerant species. The success of these efforts will be monitored by an Arctic vegetation specialist. Based on the results, management alternatives will be developed and implemented.

4 Post–Closure Monitoring

Monitoring to confirm that the closure plan and associated remediation techniques have achieved the stated closure objectives will be carried out as follows:

- Once closure activities have been completed, the site should be visually inspected by a qualified Professional Geotechnical Engineer annually for three consecutive years to ensure that erosion and/or permafrost degradation areas have stabilized and that remediation objectives for hydrocarbon contaminated soils have been achieved.
- The site should be inspected by an Arctic vegetation specialist to confirm suitability of the revegetation efforts. Inspections should be completed at the following intervals, unless otherwise recommended by the vegetation expert: Year 1, Year 3, Year 7 and Year 10 post-closure.
- The annual seep sampling program should be continued to detect any changes in the waste rock or ore stockpile leachate chemistry during post-closure monitoring.
- Soil quality in the Land Farm and/or the hydrocarbon impacted areas where in situ bioremediation has been implemented will be monitored every two years until site soil remediation objectives have been met.

5 Cost Estimate and Scheduling

5.1 Closure Cost Estimate

Appendix B provides details of the estimated closure costs for the Boston Camp site.
The estimated closure cost for Boston Camp site is $5,988,000 in undiscounted 2012 Canadian dollars. These costs assume that in addition to remediation of hydrocarbon contaminated soils that all salvageable equipment and infrastructure will be relocated to the Doris Camp site.

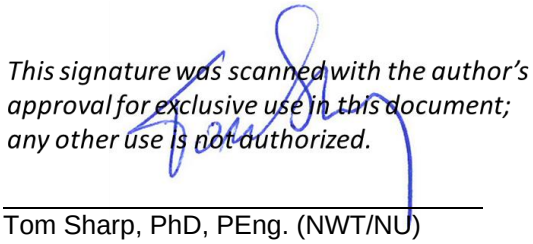
A contingency of 20% of the direct costs is also included. The purpose of the contingency is to account for costs that are uncertain given the current level of information. These items include hydrocarbon impacted soil remediation, drill hole reclamation, and material quantity estimates.

These costs were developed based on equipment and labor rates provided by a contractor, using an NWB approved spreadsheet based cost estimating process that is consistent with the principles of RECLAIM. A detailed comparison between the SRK model and RECLAIM is provided in Appendix C.

5.2 Scheduling

Inventory of drill sites and determination of required remediation work was started in 2012. Closure of the Boston Camp will occur upon closure of the entire Hope Bay Project. Removal of waste from site, and equipment demobilization will be completed after decommissioning. In situ bioremediation and/or landfarming of hydrocarbon impacted soil may take several years.

This report, **"Hope Bay Project, Boston Camp Revised Interim Closure Plan"**, was prepared by



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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Disclaimer

"This report and the opinions and conclusions contained herein ("Report") contains the expression of the professional opinion of SRK Consulting (Canada) Inc. ("SRK") as to the matters set out herein, subject to the terms and conditions of the agreement dated [HBML.BOC-CM.PSA.003, September 30, 2008] (the "Agreement") between Consultant and Hope Bay Mining Ltd., as assigned to TMAC Resources Inc. ("TMAC"), the methodology, procedures and sampling techniques used, SRK's assumptions, and the circumstances and constraints under which Services under the Agreement were performed by SRK. This Report is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of TMAC, whose remedies are limited to those set out in the Agreement. This Report is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context. In addition, this report is based in part on information not within the control of SRK. Accordingly, use of such report shall be at the user's sole risk. Such use by users other than TMAC and its corporate affiliates shall constitute a release and agreement to defend and indemnify SRK from and against any liability (including but not limited to liability for special, indirect or consequential damages) in connection with such use. Such release from and indemnification against liability shall apply in contract, tort (including negligence of SRK whether active, passive, joint or concurrent), strict liability, or other theory of legal liability; provided, however, such release, limitation and indemnity provisions shall be effective to, and only to, the maximum extent, scope or amount allowable by law."

6 References

EBA Engineering Consultants Ltd. 2012a. Phase 3 ESA & Biotreatability Study, Former Windy Camp, Hope Bay Gold Project, Nunavut. Prepared for Newmont Mining Corporation. IFR version issued in February.

EBA Engineering Consultants Ltd. 2012b. Phase 3 Environmental Site Assessment and Soil Biotreatability Study Former Patch Workshop, Hope Bay Project, NU. Issued for review. Technical Report prepared for Hope Bay Mining Limited, EBA File: Y22101187.001, February 2012.

DIAND 2002. Indian Affairs and Northern Development. Mine Site Reclamation Policy for Nunavut. ISBN 0-662-32073-5.

INAC 2007. Indian and Northern Affairs Canada. Mine Site Reclamation Guidelines for the Northwest Territories, NWT

GN 2012. Environmental Guidelines for the Burning and Incineration of Solid Waste. Department of Environment Government of Nunavut. Revised January 2012.

GN 2010.Environemental Guideline for the General Management of Hazardous Waste. Department of Environment Government of Nunavut. Revised October 2010.

GNWT 2004. Guideline for Industrial Waste Discharges in the Northwest Territories. Government of Northwest Territories Department of Resources, Wildlife and Economic Development Environmental Protection Service. April 2004.

SRK 2009. Water and Ore/Waste Rock Management Plan for the Boston Site. Hope Bay Project, Nunavut. Technical report prepared for Hope Bay Mining Ltd., SRK Consulting (Canada) Inc. Project#1CH008.022 July 2009.

SRK 2013.2013 Annual Geotechnical Inspection, Boston Advanced Exploration Project. Technical Report prepared for TMAC Resources Inc. SRK Consulting (Canada) Inc. Project #1CT022.000 February 2011.

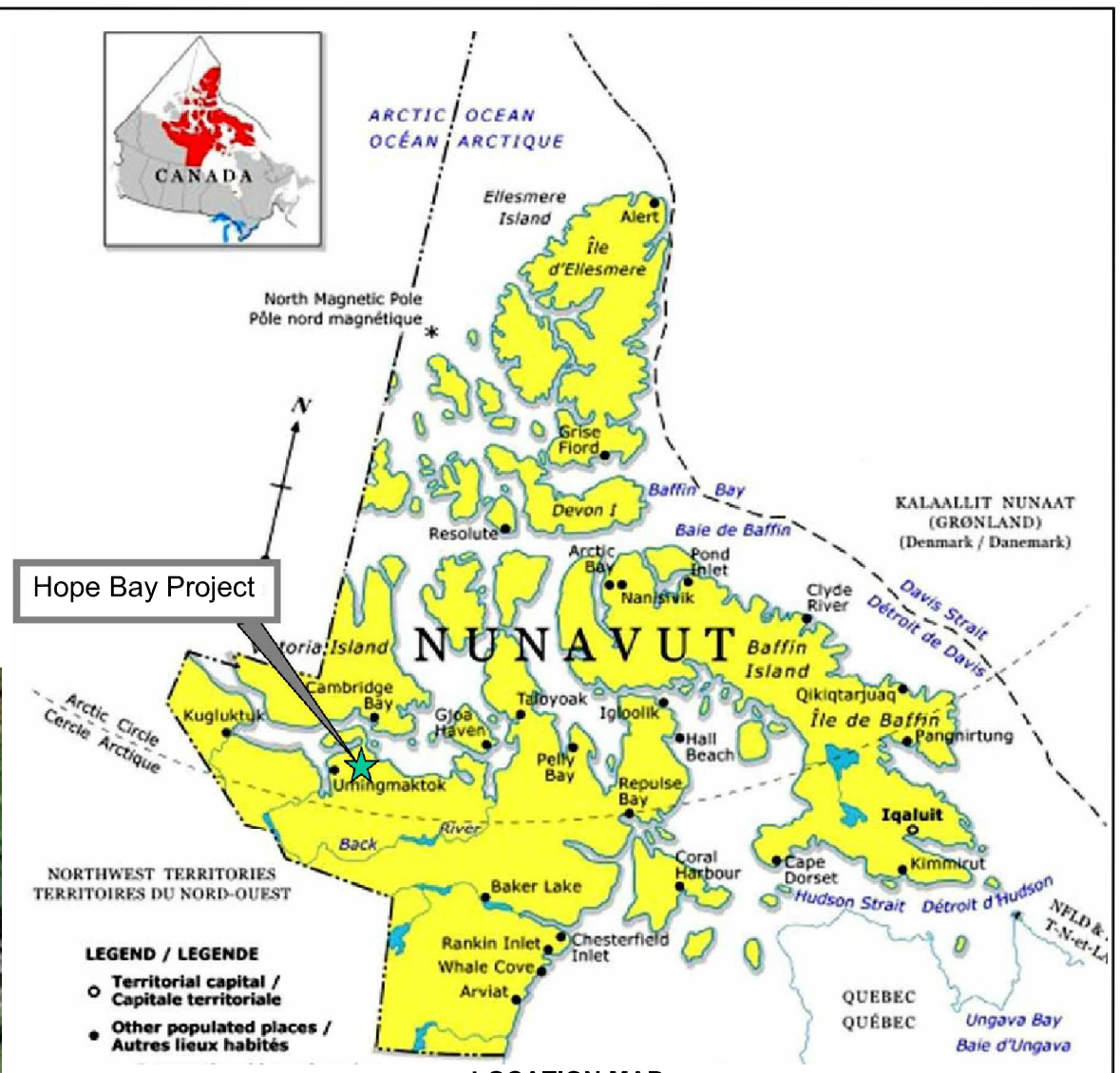
SRK 2012. Hope Bay Project Boston Camp Revised Interim Closure Plan. Hope Bay, Nunavut. Report prepared for Hope Bay Mining Ltd., SRK Consulting (Canada) Inc. Project #1CH008.065 June 2012.

Figures

REGIONAL SATELLITE PHOTOGRAPH

0 5 10 15 20 25

Scale in Kilometers



LOCATION MAP

Not To Scale

DETAIL A

Not To Scale

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Photo Taken July 2011

srk consulting

SRK JOB NO.: 1CT022.001.Task 700

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TMAC RESOURCES

TMAC Resources Inc.

Boston Camp Revised Interim Closure Plan

Boston Site Layout Looking South-West

DATE:	APPROVED:	FIGURE:
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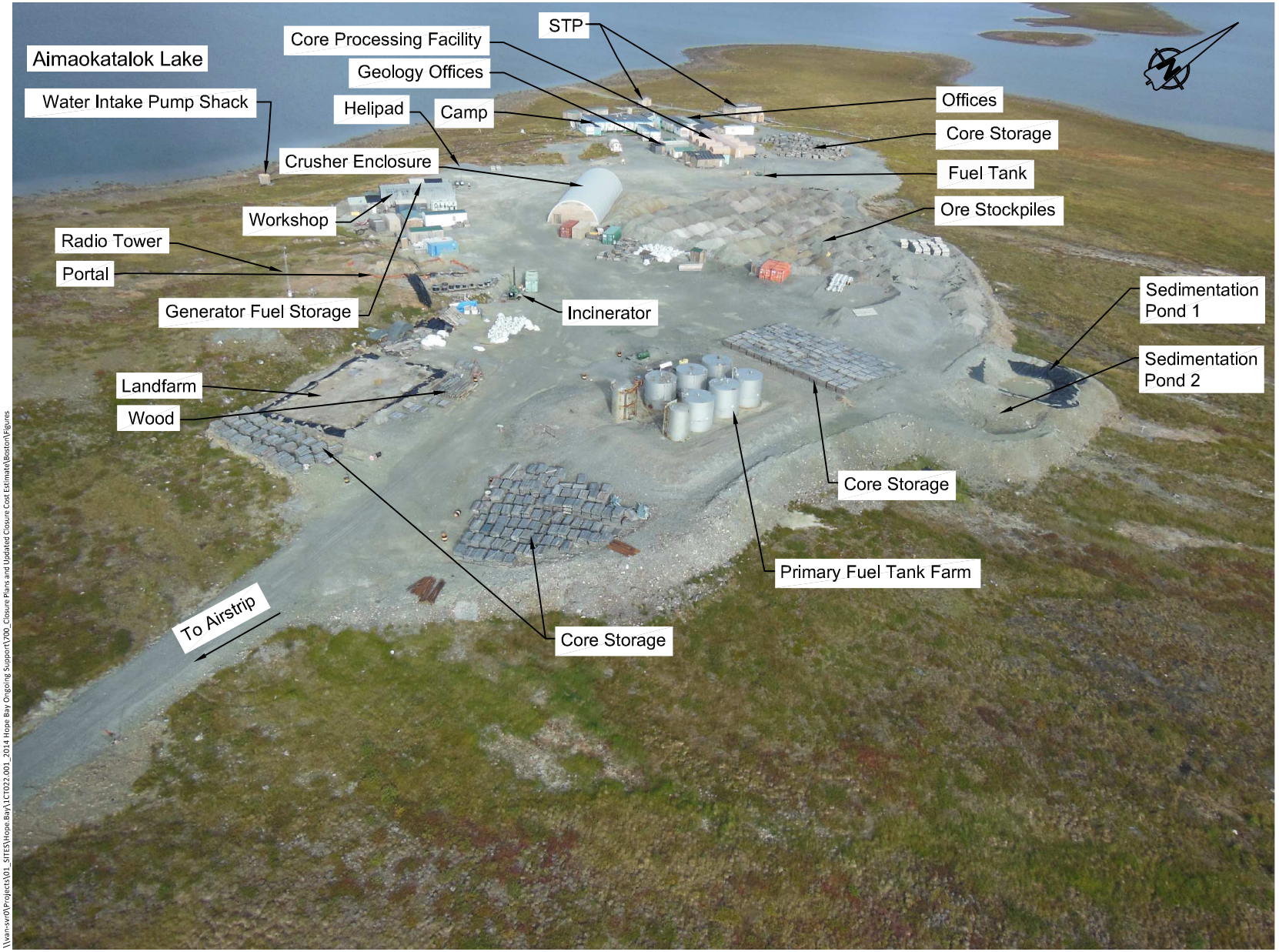

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TMAC RESOURCES

TMAC Resources Inc.

Boston Camp Revised Interim Closure Plan

Boston Site Layout Looking West

DATE:	APPROVED:	FIGURE:
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Appendix A: Phase 3 Environmental Site Assessment Report

HOPE BAY MINING LIMITED

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY PROJECT, NU

REPORT

DECEMBER 2012
ISSUED FOR USE
EBA FILE: E14101223

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EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA), is pleased to provide this report to Newmont Affiliate Hope Bay Mining Ltd. (HBML) on the Phase III Environmental Site Assessment (ESA) conducted at the Boston Advanced Exploration Project (Boston Camp, hereafter referred to as the Site) located within the Hope Bay project area. The Site is approximately 65 km east of Umingmaktok and 170 km southwest of Cambridge Bay, Nunavut (Figure 1). The Phase III ESA report is a part of the submissions related to the Final Abandonment and Restoration Plan for the Site, as per Licence No. 2BB-BOS1217 Type "B" issued to HBML by the Nunavut Water Board.

The objectives of the Phase III ESA for the Site were to:

- Delineate the identified constituents of concern [petroleum hydrocarbons (PHCs)] in soil, sediment, and groundwater;
- Install and collect water samples from groundwater wells surrounding the Site for PHCs, dissolved CCME metals and routine water;
- Calculate the volume of hydrocarbon-impacted soil; and
- Determine pathways of movement or migration of contaminants through soil and groundwater to refine the site conceptual model as well as the fate and transport and risk assessment models.

Based on the known history of the Site, previous Site documents, and a walk-through of the Site upon arrival, the Site was divided into five areas of environmental concern (AEC) and two areas of potential environmental concern (APEC). The five AEC were:

- AEC 1 - Generator Shed;
- AEC 2 - Generator near the camp;
- AEC 3 - Tank Farm Perimeter;
- AEC 6 – Incinerator; and
- AEC 7 - Water Pump Building.

The two APEC sites were:

- APEC 1 - the Land Farm Perimeter; and
- APEC 5 - the Retention Pond.

Prior to the Phase III ESA, HBML asked EBA to also collect samples from inside the landfarm. For simplicity, the area inside the landfarm is referred to in the Phase III ESA as part of APEC 1. Figure 4 shows the AECs and APECs that were sampled during the Phase III ESA.

Test pits were dug by either a power auger, hand auger or a combination of both, logged, and samples were bagged for field soil screening (hydrocarbon vapours) at approximate intervals of 25 cm. Shallow holes were dug with a hand auger near AEC 7, but no visible indications of PHC impacts were detected. No permafrost was encountered in the test pits, even though the deepest pit was 1.75 m. Soil sampling, groundwater and surface water sampling were completed on August 11 and 12, 2012.

A summary of the Phase III ESA results with areas and estimated in-situ volumes of soils having concentrations of PHC concentrations higher than the Nunavut/ Canadian Council of Ministers of the Environment (CCME) guidelines for industrial, coarse grained soils is provided below.

Site PHC Soils Exceeding Nunavut and CCME Industrial Soil Guidelines (coarse grained)

Area	Location	Parameter	CCME Guidelines	Nunavut Guidelines	Maximum PHC Concentrations (mg/kg)	Area (m^2)	Estimated Depth (m)	Estimated In-Situ Volume (m^3)
AEC 2	Generator	Benzene	0.03	0.03	0.13	124	2	250
		Tolunene	0.37	0.37	4.3			
		Ethylbenzene	0.082	0.082	9.1			
		Xylene	11	11	100			
		F1	320	240	5800			
		F2	260	260	11000			
APEC 1	Inside the Landfarm	Benzene	0.03	0.03	0.33	358	0.28	100
		Tolunene	0.37	0.37	25			
		Ethylbenzene	0.082	0.082	17			
		Xylene	11	11	140			
		F1	320	240	5300			
		F2	260	260	47000			
		F3	1700	1700	9600			

Most groundwater and surface water samples exceeded applicable guidelines for chloride, nitrate, nitrite and iron. The remaining groundwater and surface seep sample parameters were below guidelines or laboratory detection limits.

Approximately 348 m^3 of soils impacted with benzene, ethylbenzene, toluene, and xylenes (BTEX), and hydrocarbon fraction F1 to F3 concentrations were identified. About 100 m^3 of this impacted soil was already in a landfarm. The estimated volume of soils had greater concentrations of BTEX and fractions F1 to F3 than the Nunavut PHC guidelines for industrial land use.

Based on the evaluation of the impacted areas (AEC 2 and APEC 1), the remediation options provided, and the outcome of the soil analysis for PHC, the preferred remedial approach for the Site would be in-situ bioremediation. The SiREM study, conducted in 2011 on soil from the Windy and Patch Camps, suggests that the bioremediation of fraction F2 impacted soils by undisturbed, aerobic techniques would be effective. Landfarming of AEC 2 could cause additional issues, since the area would likely need to be excavated to at least 2 m below grade and would expose free water at 1 m. APEC 1 would be left in the landfarm, turned periodically and have the same fertilizer amendment as AEC 2.

The probable range of remedial cost for the in-situ bio remediation is estimated to range between $170,000 and $260,000, with a remedial timeframe of two to three treatment seasons. This estimate was based on the report written by EBA (2010), but it does not include permitting costs, engineering costs, and periodic engineering effort to monitor and sample the water and soils at the facility.

Based on the outcomes of this Phase III ESA, the following recommendations apply to the Site for closure:

- AEC 2 (248 m^3 of impacted soil) should be remediated using land farming with fertilizers and tilling. The SiREM study suggests that the bioremediation of fraction F2 impacted soils by undisturbed, aerobic techniques would be effective.
- APEC 1 (100 m^3 of impacted soil) can be remediated in-situ, as it is already in a land farm. This area should be turned periodically with a nutrient amendment to increase biodegradation of PHC.
- Further investigation underneath the pad at AEC 1, AEC 3 and APEC 5 are still required.
- Any fuel remaining in aboveground storage tanks on the Site should be collected and disposed of, in accordance with Nunavut regulations, in order to prevent any possible further hydrocarbon soil impacts.
- Further investigation into the high salinity values in the groundwater monitoring wells and surface water.
- Water quality in the groundwater monitoring wells should be continued to be monitored yearly.

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1.0 INTRODUCTION

1.1 General

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- Calculate the volume of hydrocarbon-impacted soil; and
- Determine pathways of movement or migration of contaminants through soil and groundwater to refine the site conceptual model as well as the fate and transport and risk assessment models.

1.2 Authorization

Ms. Angela Holzapfel, Environmental Compliance Manager at HBML authorized EBA to proceed with the work on March 31, 2012. The Professional Services Agreement number is PSA-HB-10-KE-001 and the Work Order Number is CR-0329-2.

1.3 Scope of Work

EBA developed the work plan based on previous reports related to historic spills at the Site facility and an evaluation of current and historic site operations. The scope of work for the Phase III ESA, as outlined in the proposal (EBA File: PY2210173, dated February 3, 2012) and adjusted during the work, was as follows:

- Prepared a health and safety plan for the field program using EBA's in house Safe Work Form (SWF). A safety meeting, including a field level risk assessment was conducted on-site prior to the start of the field program. All workers on-site agreed to the conditions of the SWF before work commenced. In addition, EBA staff completed HMBL's in-house site orientation and site-specific training.
- Conducted a Phase III ESA to delineate PHC and lead impacts only, with a sufficient data density to estimate weighted-average soil volume estimates for the PHC fractions F1 to F4 and to evaluate areas where the soils are affected by diesel, waste oil, other types of hydrocarbons, or combinations of spills.

- Assessed the following Areas of Environmental Concern (AECs) and Areas of Potential Environmental Concern (APECs) (Figure 4):
  - AEC 1 – Generator Shed/ Maintenance Building;
  - AEC 2 – Generator;
  - AEC 3 – Tank Farm Perimeter;
  - AEC 6 – Incinerator;
  - AEC 7 – Water Pump Building;
  - APEC 1 – Landfarm; and
  - APEC 5 – Retention Pond Perimeter.
- Obtained soil samples at regular intervals from all boreholes. Examined soil samples for staining and obvious odour. Measured the photoionization potential on samples using a photoionization detector (PID). Site delineation was achieved using a combination of laboratory sampling, supplemented with the use of a PID. Boreholes were logged and sample locations were recorded by GPS measurement.
- Submitted 38 soil samples to Maxxam Analytics Inc. of Edmonton for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), and PHC fractions F1 to F4. Submitted select samples for sieve analysis.
- Conducted groundwater monitoring of five wells at the Site, including purging the wells in accordance with EBA procedures and sampling for laboratory analysis of one or more routine water, dissolved regulated metals, BTEX, and PHC fractions F1 and F2. Submitted two surface water samples for analysis of routine water, dissolved regulated metals, BTEX, and PHC fractions F1 and F2 to assess the surface water condition at the Site.
- Prepared this Phase III ESA report discussing field observations and analytical results.

2.0 BACKGROUND INFORMATION

2.1 Location, Ownership and Current Land Use

The Hope Bay Project is on Inuit-owned land administered by the Kitikmeot Inuit Association (KIA), with minerals development authority vested within Nunavut Tunngavik Inc. (NTI). Depending on the location of land within the Hope Bay project area, three entities administer surface and subsurface mine leases on behalf of the Inuit; the KIA (surface rights), the NTI (subsurface rights), and Aboriginal Affairs and Northern Development Canada (both surface and subsurface rights).

HBML has secured access and mineral rights to the Hope Bay Project through land use and commercial land leases negotiated with these stakeholders.

The current land use is classified as Industrial, but the Site is currently under care and maintenance. There is no current or future anticipated groundwater use at the Site.

The Site is a mining exploration support facility operated by HBML. The Site is on leased Inuit-owned land within the West Kitikmeot region of Nunavut, located at approximately 67°39'N, 106°22'W. The Site is currently authorized under Nunavut Water Board Type B Water License 2BB-BOS1217.

2.2 Site History and General Description of Site

The Site was established in 1995, with the original Water Licence N7L2-1652 Type B issued to BHP Minerals Canada Ltd. by the Northwest Territories Water Board on August 1, 1995. Currently, the Site consists of two maintenance shops, generator sheds with generators, two helipads, laydown areas, an incinerator, six 80,000 L fuel storage tanks, two 50,000 L fuel storage tanks contained within an HDPE lined containment area, a fresh water pump house, aboveground grey water and potable pipelines, wastewater treatment plant, and tents and trailers for accommodations, offices and cooking (SRK 2012). All structures are constructed on a crushed rock pad that varies in size of material from coarse gravel to boulders, with a thickness from approximately 0.6 m to 3 m, and slopes north at about a 1% gradient (SRK 2009).

The Site has a short airstrip that was used to transport employees by smaller aircrafts such as a Twin Otter. There are no all-weather roads on-site for exploration; therefore exploration was conducted using tracked vehicles in the winter or helicopters in the summer (SRK 2012). The camp can house approximately 65 people.

Supplies are transported to Roberts Bay via barges in the summer before freeze up and stored at Roberts Bay, which is just north of Doris Camp (Figure 2). Once adequate snow and ice cover is available, a winter road is constructed from Roberts Bay to the Site to transport the supplies to the Site and backhaul wastes to Roberts Bay (SRK, 2012).

2.3 Site Details

In June 2012, the Site underwent modifications by installing a new wastewater treatment facility, rearranging tents and constructing a central corridor that lead to the main camp building. The Site is currently uninhabited and is under care and maintenance with regular inspections conducted by HBML Project personnel.

The primary contaminant of concern is PHC, which originated from historic spills and storage of fuel. Previous ESAs at the Site were conducted in 2003 (EBA 2004) and 2009 (WESA 2009). A Phase II ESA Report (WESA 2009) evaluated soils in the landfarm (Figure 3) and reported F2 and F3 hydrocarbon fractions higher than the generic Canadian Council of Ministers of the Environment (CCME) environmental guidelines.

The Hydrocarbon Spill Assessment and Remediation report (EBA, 2004) indicated that soil hydrocarbon impacts mainly resulted from three diesel spills in 2003. These spills occurred on the southwest corner of the maintenance shop, on the southwest corner of the generators and near the Site helipad. An estimated 4,000 litres of diesel fuel were spilled near the southwest corner of the maintenance shop (Spill Report # 03-452), 150 litres of diesel fuel near the southwest corner of the generators near the camp (Spill Report # 03-541) and an unknown amount of fuel near the Site helipad. There was also another spill near the maintenance shop of 2000 litres of diesel (Spill Report # 03-457).

A collection system for the treatment of hydrocarbon-impacted water was constructed southwest of the maintenance building and east of helipad (Figure 4). Approximately 350 litres of water were treated before being conveyed to a lined pond for later discharge to a location east of the pond. Another 82,000 L of hydrocarbon-impacted water was treated and discharged on the tundra east of the storage pond.

Twenty-seven test pits were dug on-site in August 2003 and 22 groundwater monitoring wells were installed. Eight of these wells contained free phase product. Two interception trenches with catch basins, liners and pumps were constructed: one by the Site helipad and one by the maintenance shop.

Most of the soil hydrocarbon impacts were located between the Site generators and the maintenance shop. The estimated hydrocarbon-impacted soil volume for this area was 8,000 cubic metres in 2003. About 30 cubic metres was excavated from an area near the generators and placed in the landfarm (referred to by WESA as the soil treatment facility) located southwest of the tank farm. According to the report, toluene, xylene, and fractions F2 and F3 hydrocarbon impacts remained on the west wall, north wall, and base of the excavated area.

Other potential historic fuel-impacted areas include the helipad closest to the maintenance shop. Suspected hydrocarbon impacts in this area were based on visual observations. Another area potentially impacted with fuel included an area between the shop and a location approximately 10 m southwest of the shop. These potential impacts were based on MultiRae multi-gas monitor readings of the soil in this location.

2.4 Climate

Based on meteorological data from weather stations at Cambridge Bay, approximately 170 km northeast of the Site and Contwoyto Lake, approximately 300 km southwest of the Site, the mean annual temperature is -15°C and -12°C, respectively. Based on 68 months of data at the Hope Bay project, the mean monthly air temperatures for Doris Station ranged from -33.2°C in February 2008 to 13.2°C in July 2007. The annual average temperatures for 2002 to 2009, using only complete years of available data, were -11.7°C and -11.1°C at Boston and Doris Stations, respectively (Rescan, 2009).

Total annual rainfall from 2002 to 2009 (based on available complete years) averaged 30 mm and 85 mm at Boston and Doris Stations, respectively (Rescan, 2009). The 1971 to 2000 climate normal annual precipitation at Cambridge Bay regional station is 139 mm, comprised of 70 mm of rainfall and 69 mm of snow water equivalent.

2.5 Site Topography and Vegetation

The Hope Bay Project generally has a low to moderate surface relief, and the Site has approximately 13 m of differential elevation between the low point (shore of Aimaokatalok Lake) and the high point (ridge by portal). The surficial deposits that overlie the bedrock consist of glacial till, glaciofluvial deposits, lacustrine deposits, and alluvial deposits.

The Site is situated on a ridge, which comprises a peninsula extending northwards into Aimaokatalok Lake. Aimaokatalok Lake is located approximately 100 m west and 185 m north and Stickleback Lake is about 115 m east of the Site. The Site is approximately 325 m long by 150 m wide, covering an area of about 48,750 m^2.

Areas of felsenmeer are common and swampy areas are also present. Tundra and moss cover the ground even at higher elevations. Vegetation consists primarily of lichen, moss, dwarf willows, and birches.

2.6 Regional Quaternary Geology

The region was subjected to multiple glaciations during the Quaternary period. During each glaciation, the area was overridden by the northwestern sector of the Laurentide Ice Sheet. Evidence of only the most recent (Late Wisconsin) glaciation is preserved in the present-day landscape. Striations, orientation of eskers, grooves, and drumlins indicate that the predominant glacial ice movement was north-northwest.

The project area became ice-free about 8,800 years ago, as the southwest to northeast trending ice sheet melted back toward the southeast (Dyke and Prest, 1986) leaving a blanket of basal till as the ice retreated. Immediately following deglaciations, the sea level was about 200 m higher than at present (Dyke and Dredge, 1989). The entire project area was submerged and the edge of the ice sheet abutted the open sea. Meltwater streams from the ice carried fine grained sediments toward the sea, resulting in the accumulation of marine sediments on top of the till with the greatest accumulated thickness in the deeper water zones, which now form the valley bottoms.

Following glaciation, isostatic rebound caused a relative decline in sea level. During emergence, the land surface was washed by waves. Easily erodible surfaces such as marine sediments, till, and glaciofluvial sands and gravels were reworked and redistributed by waves, currents, and sea ice. Some present-day rock outcrops were exposed as the thin soil washed off the uplands and accumulated in the valley bottoms. Current outcrop cover varies from 35% to 80% in the region. Outcrops tend to form relatively continuous, north-northwest trending ridges throughout the area with broad tundra-covered flat valleys. Lakes are also elongated in a north-northwest direction. Since emergence, natural slope processes, frost action, and permafrost have contributed to the present day landscape.

2.7 Regional Bedrock Geology

Regional bedrock geology consists of sedimentary and volcanic rocks of the Arctic Platform (NRCAN, 1957). The Hope Bay project region is underlain by the late Archean Hope Bay Greenstone Belt, which is approximately 42 km and consists of mostly mafic volcanic rocks.

2.7.1 Regional and Local Surficial Soils

The Geological Survey of Canada indicates that glacial till deposits are predominant regionally. Pleistocene deposits are buried beneath marine sediments consisting of clay, silt, and sand. Marine sediments represent the dominant surficial material and the material may be saline. The overburden soil pore water can also have high salinity concentrations, often exceeding that of seawater (HBML, 2011). Soils developed on marine sediments are generally fine textured with textures ranging from clay to silty clay with traces of sand (EBA 1996). The overburden soils are normally consolidated, typically have low structural integrity, and are subject to compaction when wet.

According to HBML Phase III Project Proposal (HBML, 2011), marine silts and clays in the local area can contain significant (up to 50% by volume) ground ice, while the till contains low to moderate ice contents (5 to 25%). Solifluction and other slope movement features related to the thawing of poorly-drained and weak saturated soils on slopes can result in thaw flow slides known as earthflows and mudflows.

The bedrock contact zone generally consists of a small rubble zone ranging from a few centimeters to up to 2 m in thickness.

The majority of the soils encountered at the Site were fine to coarse grained sands with silt and a trace of clay. Where vegetation was present in undisturbed areas, the organic horizon ranged from 3 to 45 cm, with an average of about 9 cm.

2.7.2 Hydrogeology

The project area is coastal lowland with numerous lakes and ponds, separated by glacial landforms and parallel geological intrusions, including diabase dykes and sills. The drainage basins are generally long and narrow and predominantly oriented along the north-south axis. The predominant drainage in the area is north into Hope Bay.

Permafrost generally extends to -560 m (Heginbottom et. al., 1995). Ground temperature measurements in the project area indicate an active zone thickness ranging between 1.5 to 2.6 m (WESA 2009) and the depth of zero annual amplitude varying between 11 and 17 m (EBA 1996).

Groundwater in the continuous permafrost zone is confined to this shallow active layer. Based on the regional geology and the presence of permafrost, the groundwater flow is likely complex and controlled by topography, surface waterbodies, and bedrock structure. Vertical groundwater flow is limited by the shallow permafrost. The period of groundwater flow is highly influenced by climatic conditions and flow is also likely limited to the short summer season when the active layer thaws, thus allowing water to flow in this horizon. It is expected that the surface water bodies are expressions of the water table.

Water flow in the active layer is expected to follow surface topography, which appears to be from the high bedrock ridge to the west, into Aimaokatalok Lake.

3.0 ENVIRONMENTAL CRITERIA

The following subsections outline the rationale for the selection of applicable generic risk management guidelines for soil and surface water.

3.1 Land Use Assessment

CCME land use guidelines and Government of Nunavut land use guidelines currently recognize four different types of land use:

- Agricultural land use: lands used for growing crops or producing livestock, and that are agricultural in nature. These also include lands that provide habitat for resident and transitory wildlife and native flora.
- Residential/Parkland land use: lands where the primary activity is occupation for residency and recreational purposes. These include lands used as buffer zones between areas of residence, but do not include wild lands, such as national and provincial parks, other than campground areas.

- Commercial land use: lands where the primary activity is related to commercial operations, such as the provision of goods and services (e.g., shopping mall) and occupancy is not for residential or manufacturing purposes. These do not include operations where the growing of food is the primary activity (i.e., agricultural).
- Industrial land use: lands where the primary activity involved the production, manufacture, construction, and/or assembly of goods.

Canadian soil quality guidelines are derived for the protection of receptors under these four different land uses. The site use is currently classified as industrial. The industrial land use will be applicable during exploration phases and through the life of the mine until closure. On industrial lands, the primary land use activities are not directly dependent on the need to sustain a high level of ecological processes.

3.2 Particle Size Designation

A coarse-grained soil is defined as having a median grain size (D_{50}) of 75 µm or greater, whereas a fine-grained soil has a D_{50} of less than 75 µm. A review of the particle size analyses results for this Phase III ESA and the previous Phase II ESA study indicates that the soils are predominantly coarse-grained. These results corroborate soil textural observations in the field and additional particle size analyses conducted for this study. There was one area (APEC 5) where fine textured soils were observed and verified through laboratory analysis.

3.3 Applicable Exposure Pathways

3.3.1 Human Pathways

The Site is covered with sand, gravel, boulders, grassy areas, and sub-arctic tundra vegetation. The majority of the Site consists of short grass with sparse vegetation. Soil and water direct contact (dermal contact and ingestion) pathways are considered applicable at the Site during remedial activities.

Soil and water direct contact (dermal contact and ingestion) pathways are considered applicable pathways. There are no buildings in use, and given the future anticipated use of the Site, the vapour inhalation pathway can be excluded.

The drinking water pathway will be applicable if the Site opens again, since drinking water will come from Aimaokatalok Lake.

3.3.2 Ecological Pathways

Under this current land use, the eco-soil contact pathway is applicable. Given the proximity of Aimaokatalok Lake, the protection of groundwater for aquatic life (freshwater) is applicable.

3.4 Applicable Guidelines

Various regulatory guideline documents were consulted and are summarized in the sections below.

Canadian Soil Quality Guidelines consider both human health and ecological receptors, and are intended as general guidance for the protection, maintenance, and improvement of specific uses of land and water. Based on the existing site usage, the Nunavut/CCME industrial guidelines for soil are applicable.

SOIL CRITERIA

General Soil Criteria and PHCs

- CCME Soil Quality Guideline for the Protection of Environmental and Human Health – Industrial Land Use (coarse-grained soils);
- CCME Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil; and
- Environmental Protection Division, Department of Environment, Government of Nunavut, Environmental Guideline for Contaminated Site Remediation (March 2009 Revised) – Industrial Land Use (coarse-grained soils).

The Canada-Wide Standard (CWS) for PHCs in Soil is a specialized case of CCME Soil Quality Guidelines (CCME, 2008). Hydrocarbons are subdivided into four broad physicochemical fractions as defined by the US Total Petroleum Hydrocarbons Criteria Working Group. The fractions are defined in equivalent carbon numbers as follows:

- F1: C6 to C10
- F2: >C10 to C16
- F3: >C16 to C34
- F4: C34+

The primary focus in PHC CWS standard development is prevention of toxic effects from F1 to F4 on the receptors, in certain situations these pathways may be of little immediate concern and PHC management is governed by other factors including:

- Ignition hazard
- Odour and appearance
- Effects on buried infrastructure
- Formation of non-aqueous phase liquids (NAPLs)
- Socio-economics and technological capabilities

Soil Quality Guidelines can be used as benchmarks to evaluate the need for further investigation or remediation with respect to a specified land use. Guidelines are applied to identify and classify sites, to assess the general degree of contamination at a site and to determine the need for further action, and as a basis for remediation objectives.

In the present study, soil PHC analyses were compared to the Government of Nunavut Tier 1 Environmental Guideline for Contaminated Site Remediation for Nunavut (industrial land use and coarse-grained soils). These criteria are similar to the Tier 1 CCME Canada-Wide Standards (CWS) for PHCs in soil. These criteria are:

Tier 1 Environmental Guidelines for Contaminated Site Remediation of Surface Soils – Coarse-Grained

Parameter	Environmental Guideline for Contaminated Site Remediation – Nunavut- Industrial (mg/kg)	CCME Soil Quality Guideline for the Protection of Environmental and Human Health- Industrial (mg/kg)
F1	240*	320
F2	260	260
F3	1,700	1,700
F4	3,300	3,300

* For protection against contaminated groundwater discharge to an adjacent surface waterbody or for potable water

WATER CRITERIA

General Criteria

For the purpose of this assessment, water quality parameters were compared to:

- CCME Canadian Water Quality Guidelines for Protection of Fresh/ Marine Water Aquatic Life.

As in the case of soils, the geochemical cycling of CCME regulated metals naturally present in the environment, especially in mining areas enriched in metals, may cause ambient water quality parameters to exceed the Tier 1 environmental guidelines. Mining activities that cause site disturbance and changes in pH and soil salinity are factors that may result in above-background metals concentrations in water.

The CCME does not have established water quality guidelines for the protection of aquatic life for total dissolved solids (TDS) or calcium (CCME, 2007).

Chlorides

In 2011, the CCME released a water guideline for chloride for the protection of aquatic life, including a long-term exposure guideline of 120 mg/L chloride and a short-term benchmark concentration of 640 mg/L chloride. The long-term exposure guideline is intended to protect all forms of aquatic life for an indefinite exposure period, whereas the short-term benchmark concentration is a concentration at which severe effects are likely to be observed over the longer-term, but which is deemed protective under short exposure terms (CCME, 2011).

Water Licence

As per Water Licence No. 2BB-BOS1217, the following water criteria apply to the still-active water monitoring program stations.

Water Licence Water Discharge Requirements for Station BOS-5 (Bulk Fuel Storage Facility) and BOS-6 (Landfarm)

Parameter	Maximum Average Concentration (mg/L)
Oil and Grease	15
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090
Lead	0.001

4.0 PHASE III SITE WORK AND RESULTS

4.1 Site Safety

In accordance with HBML's policies, EBA staff including Mr. Tyrel Hemsley and Mr. Michel Hebert, participated in a one-day site orientation and safety training, in addition to a bear awareness course, a hands-on training for the use of bear deterrents, and a briefing on both types of helicopters available on-site for proper loading and unloading of equipment. EBA completed its in-house Safe Work Form, which was updated and signed daily. Pre-job hazard assessments were completed prior to going in the field, and were updated with a field-level assessment once on-site. EBA participated in the staff safety meetings each morning, and prepared a trip planner each field day prior to going to the Site.

4.2 Soil Sampling Methods

Based on the known history of the Site, and previous Site documents, the Site was originally divided into seven areas of environmental concern (AECs) and ten areas of potential environmental concern (APECs). However, after a walk-through of the Site upon arrival, assessment of the pad thickness and length of time to dig through the pad, only five AECs and two APECs were investigated in this assessment. A summary key of the areas is provided on Figure 4, and detailed features of the areas are provided on Figures 4Ai to 4G. The areas are as follows:

Areas of Environmental Concern (AEC) at Boston Camp

Area	Location Description	Quantity and Spill #	Contaminants of Concern	Number of Test Pits
AEC 1	Generator Shed/Maintenance Building	6,000 L total Spill #: 2003452 and 2003457	Diesel	21
AEC 2	Generator near the Camp	150 L Spill #: 2003541	Diesel	8
AEC 3	Tank Farm (perimeter)	250 L Spill #: 2000147 and 2001143	Drilling oil and diesel	5
AEC 6	Incinerator (near the portal)	4x4 m area Spill #: 2000118	Diesel	4
AEC 7	Water Pump Building	1 L	Diesel	3
Note: These are only AEC areas assessed in this assessment.				

Areas of Potential Environmental Concern (APEC) at Boston Camp

Area	Location Description	Contaminants of Concern	Number of Test Pits
APEC 1	Landfarm Area	PHC	15
APEC 5	Retention Pond (perimeter)	PHC	3
Note: These are only the APEC areas assessed in this assessment.			

Test pits were dug by either a power auger or hand auger. Soils were visually logged and bagged for field soils screening (hydrocarbon vapours) at approximate intervals of 25 cm (Appendix B). Soil sampling was completed on August 11, 2012.

A total of 47 logged test pits (Appendix A) were dug, of which 21 were completed with the power auger or combination, while the remainder of the 26 test pits were dug with a hand auger. Shallow holes were dug with a hand auger near AEC 7, but no visible indications of PHC impacts were detected. Test pit depths were to the free water surface or to auger refusal. The maximum test pit depth was 1.75 m below surface (including the pad), which was in the AEC2 area. No permafrost was encountered in the test pits.

The organic layer in the vegetated areas ranged from 3 to 45 cm, with an average of 9 cm. Soils in nearly all locations consisted of yellowish brown to brown sand or silty sand to about 0.5 m below grade. Sand ranged in size from fine to coarse, depending on the test pit. Fine to coarse gravel was encountered, along with a few boulders and fine to coarse cobbles in test pits. Soil moisture ranged from moist to wet, with some saturated soils encountered at APEC5.

Soils underlying the Site pad were difficult to assess, due to pad thickness. The Site pad consists of crushed rock that varies in size of material from coarse gravel to boulders with a thickness ranging from 0.6 m to 3 m. Some areas were unable to be examined, due to the difficulty of digging through the rock pad.

Soil samples were field screened using the ambient temperature headspace method. Soil samples were placed in plastic bags and allowed to adjust to outdoor air temperature, before the airspace within the bag was analyzed for combustible gases using a PID Drager Multi-PID 2+ instrument. PID screening results and depths of screened samples are shown next to the sample location on the boring logs in Appendix A.

Based on the PID screening and field observations, soil samples were selected for laboratory analysis. Soil samples were collected directly from the select test pits and packed with zero headspace in laboratory supplied jars, and stored in an insulated cooler with ice for transport to Maxxam Analytics International Corporation in Edmonton, Alberta. Field protocols and QA/QC procedures during sampling were in accordance with standard industry protocols. Holding times for all soil samples were within acceptable limits. All coolers still had ice present upon receipt at the laboratory, and the temperature was 5°C within the various coolers. No samples were broken or lost during transport.

A total of 38 samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), PHC fractions F1 to F4; and 5 samples were analyzed for particle size analysis (PSA).

4.3 Ground Water Sampling Methods

There were five shallow groundwater wells installed around the Site on August 10, 2012. Two were installed on the east side of the Site near AEC 7 and three were installed on the west side of the pad, all in undisturbed areas. Each well was purged dry before sampling. Field screening of the water samples was not completed, due to the limited availability of water in the wells. Ground water samples were collected in designated laboratory provided bottles and preserved as required for routine water, dissolved regulated metals, BTEX, and PHC fractions F1 to F2. There were some wells that had very limited amounts of water available, so only BTEX, and PHC fractions F1 to F2 were analysed (Table 8). Field protocols and QA/QC procedures during sampling were in accordance with standard industry protocols. Holding times for all water samples were within acceptable limits, except for dissolved nitrite (N) and nitrate (N). All coolers still had ice present upon receipt at the laboratory, and the temperature was 5°C within the various coolers. No samples were broken or lost during transport.

Ground water sample locations are shown on Figure 5, along with analytical results.

4.4 Surface Water Sampling Methods

Two surface water samples were collected for this Phase III ESA:

- The ponded water 5 m North of GW-3, and
- The ponded water 2 m East of GW-4,

Surface water samples were collected in designated laboratory provided bottles and preserved as required for routine water, dissolved regulated metals, BTEX, and PHC fractions F1 to F2. Field protocols and QA/QC procedures during sampling were in accordance with standard industry protocols. Holding times for all water samples were within acceptable limits, except dissolved nitrite (N) and nitrate (N). All coolers still had ice present upon receipt at the laboratory, and the temperature was 5°C within the various coolers. No samples were broken or lost during transport.

Surface water sample locations are shown on Figure 5, along with analytical results.

4.5 Soils Sampling Results

PHC sample analytical results for soils are shown on Figures 4Ai to 4G and on Tables 1 through 7 in the Tables section of the report, and complete laboratory reports are provided in Appendix B. A summary of the Phase III ESA results with areas and estimated in-situ volumes of soils having concentrations of PHC concentrations higher than the Nunavut/CCME guidelines for industrial, coarse grained soils is provided below, followed by a summary of observations for each of the seven (7) areas.

Site PHC Soils Exceeding Nunavut and CCME Industrial Soil Guidelines (Coarse Grained)

Area	Location	Parameter	CCME Guidelines	Nunavut Guidelines	Maximum PHC Concentrations (mg/kg)	Area (m^2)	Estimated Depth (m)	Estimated In-Situ Volume (m^3)
AEC 2	Generator	Benzene	0.03	0.03	0.13	124	2	250
		Tolunene	0.37	0.37	4.3			
		Ethylbenzene	0.082	0.082	9.1			
		Xylene	11	11	100			
		F1	320	240	5800			
		F2	260	260	11000			
APEC 1	Inside the Landfarm	Benzene	0.03	0.03	0.33	358	0.28	100
		Tolunene	0.37	0.37	25			
		Ethylbenzene	0.082	0.082	17			
		Xylene	11	11	140			
		F1	320	240	5300			
		F2	260	260	47000			
		F3	1700	1700	9600			

AEC 1 – Generator Shed/Maintenance Building

In 2003, there were approximately 6,000 litres of diesel fuel spilled near the southwest corner of the maintenance shop. The pad ranged in depth from 0.6 m to 2 m and was constructed with medium to coarse gravel, with cobbles and an occasional boulder. During the Phase III ESA, EBA was unable to drill through the thicker portions of the pad (>0.6 m) with the power auger, therefore test pits were dug around the edge of the pad and near the two interception trenches (Figure 4Ai and 4Aii).

Test pits located near the north interceptor trench (Figure 4Aii) had a diesel odour. In addition, two of the test pits had a sheen on the water (AEC1-16 and AEC1-17), but soil sample analysis from these pits were below the applicable guidelines for hydrocarbons. All other test pit samples were likewise below the applicable guidelines for hydrocarbons. Further investigation under the pad is required to identify potentially impacted soils where drilling did not occur, to confirm potentially impacted soils.

Soil analytical results are provided on Figure 4Ai and 4Aii, and in Table 1.

AEC 2 – Generator Spill

In 2003, approximately 150 litres of diesel fuel spill occurred in the area of the generator near the camp. This area is covered with a dense medium to coarse gravel fill, approximately 0.6 m deep, with cobbles and an occasional boulder. Analytical results (Figure 4B) and PID screening samples (Appendix B) from the Phase III ESA identified an area around the generator from the diesel spill in 2003 expanding northwards from the generator. The highest concentration of BTEX and hydrocarbon fractions F1 to F4 were at AEC 2-1 at 0.75 to 1.00 m depth, which were above applicable guidelines for hydrocarbons. Vertical delineation was not achieved at this location, although it is anticipated that the total depth of impacted soils is 2 m below grade.

Areas under the generator shack and the camp buildings were not assessed because the buildings are still present. It is likely that hydrocarbons may be present below these areas. As confirmed by analytical testing in conjunction with PID readings, hydrocarbon impacts exceeding regulatory guidelines were confined to an area of approximately 124 m^2 with a volume of 248 m^3. It is important to note that at AEC 2-1, free water was found in the borehole at a depth of 1 m.

Soil analytical results are provided on Figure 4B and in Table 2.

AEC 3 – Tank Farm Perimeter

This area had two spills occur, one in 2000 (Spill report # 00-147) and another in 2001 (Spill report # 01-143) for a total of 230 litres of diesel fuel. During the Phase III ESA, EBA personnel were only able to assess the east side of the tank perimeter off the pad, due to the thickness of the pad (up to 3 m thick). Further investigation around the tank farm on the pad is required to confirm potentially impacted soils. All soil samples submitted to the laboratory were below the applicable guidelines for hydrocarbons.

Soil analytical results are provided on Figure 4C and in Table 3.

AEC 6 – Incinerator

In 2000, a 4 m x 4 m area was impacted by diesel fuel near the incinerator. During the Phase III ESA, a total of 4 test pits were dug surrounding the incinerator, with a maximum depth of 1.2 m. Analytical testing in conjunction with PID readings confirmed that soils were below applicable guidelines for hydrocarbons.

Soil analytical results are provided on Figure 4D and in Table 4.

AEC 7 – Water Pump Building

A one litre diesel spill occurred around the water pump house, but no previous soil assessment was completed, due to high water levels from Aimaokatalok Lake submerging the pump house. During the Phase III ESA, soil samples were collected using a hand auger and visually inspected, but no signs of impacted soils were observed. Therefore, no soil samples were collected around this area.

APEC 1 – Landfarm

The landfarm was constructed in 2003 by EBA (EBA, 2004), to store approximately 50 barrels of impacted soils from two hydrocarbon spills in 2003. During this Phase III ESA, an assessment was conducted around the landfarm on undisturbed soils and within the landfarm. Investigation of the landfarm was not part of EBA's original scope of work, but was requested by HBML. Soils were not investigated on the north and east side of the landfarm, due to the pad, but the west and south end of the pad were investigated using a hand auger (Figure 4E). Analytical testing in conjunction with PID readings confirmed that soils were below applicable guidelines for hydrocarbons.

In the landfarm (Figure 4F), soils varied in depths to the liner ranging from 7 cm to 56 cm, with an average of 28 cm. The highest concentration of BTEX and hydrocarbons F1 to F4 were at AEPC 2-1 at 0.3 to 0.5 m depth, which were all above applicable guidelines for hydrocarbons. The landfarm is 358 m^2 with a volume of approximately 100 m^3 (0.28 m thickness was used for the volume calculation) of impacted soil.

Soil analytical results are provided on Figures 4E and 4F and in Table 5 and 6.

APEC 5 – Settling Pond

The settling pond was partially filled with water during the time of the investigation. Soil samples on the pad were not collected, as the pad was too thick for the power auger. However; samples adjacent to the settling pond on undisturbed soils were collected (Figure 4G). Soils in this area were classified as fine textured. Analytical testing in conjunction with PID readings confirmed that soils were below applicable guidelines for hydrocarbons.

Soil analytical results are provided on Figure 4G in Table 7.

Laboratory analytical results generally correlated with PID field screening and field observations.

4.6 Groundwater and Surface Water Sampling Results

Three of the five groundwater wells installed in 2012 (Wells GW-1, GW-3 and GW-5) had enough water to collect samples for the analysis of BTEX, PHC F1 and F2, routine water and dissolved CCME regulated metals:

- Well GW-1 (south of the Water Pump) had a total length of 2.06 m with 1.16 m below grade. Water level was 0.38 m below grade at this location.
- Well GW-3 (east of Settling Pond) had a total length of 1.72 m with 0.83 m below grade. Water level was 0.14 m below grade at this location.
- Well GW-5 (east of GW-3) had a total length of 1.69 m with 1.00 m below grade. Water level was 0.19 m below grade at this location.

Two groundwater wells installed in 2012 (wells GW-2 and GW-4) only had enough water to collect samples for the analysis of routine water and dissolved CCME regulated metals:

- Well GW-2 (north of the Water Pump) had a total length of 1.83 m, of which 0.93 m was below grade. The water level was 0.68 m below grade.

- Well GW-4 (east of Tank Farm) had a total length of 1.67 m, of which 0.80 m was below grade. The water level was 0.07 m below grade.

All wells had caps installed, and were purged dry. Each of the five wells contained brown turbid water. Field screening of water samples was not completed on samples before sending to the laboratory, as there was not enough water.

Two surface water samples were collected on the east side of the tank farm/settling pond area. One sample was 5 m north of GW-3 and the other 2 m east of GW-4. All samples were submitted for the analysis of BTEX, PHC fractions F1 and F2, routine water and dissolved CCME regulated metals.

Water analytical results and well locations are provided on Figure 5. Water analytical results are also provided in Table 9, and complete laboratory reports are provided in Appendix B.

A summary of the number of groundwater sample parameters that exceed guidelines is provided below:

Groundwater and Surface Water Exceedance Summary Table

Parameter	CCME Guideline for the protection of Freshwater Aquatic Life (mg/L)[1]	Number Samples Analyzed	Number of Exceedances	Range of Exceedances (mg/L)
Nitrate (NO_3)	13	5	2	83-160
Nitrite (NO_2)	0.06	5	2	0.099-0.18
Chloride	120	5	5	560 - 3600
Iron	0.3	5	3	0.45-0.71

Specific exceedances are described as follows and are presented in Figure 5 and Table 9.

- Monitoring well GW-1 exceeded the applicable guidelines for chloride (1100 mg/L);
- Monitoring well GW-3 exceeded the applicable guidelines for nitrate (83 mg/L), nitrite (0.18 mg/L), chloride (1,200 mg/L), and iron (0.53 mg/L);
- Monitoring well GW-5 exceeded the applicable guidelines for nitrite (0.099 mg/L), chloride (3,600 mg/L), and iron (0.71 mg/L);
- Surface seep sample 1 exceeded the applicable guidelines for nitrate (160 mg/L), and chloride (560 mg/L)and;
- Surface seep sample 2 exceeded the applicable guidelines for chloride (580 mg/L), and iron (0.45 mg/L);

[1] CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life

The remaining groundwater and surface seep sample parameters were below guidelines or laboratory detection limits.

Water quality values in the Water and Ore/Waste Rock Management Plan (SRK 2009) report that background runoff concentrations from undisturbed catchments do not exceed CCME guidelines for the protection of freshwater and aquatic life for the following parameters: chloride, nitrate, and nitrite. This may suggest that the chloride, nitrite and nitrate values observed in this study are above background values. Background runoff concentrations for iron observed in the Ore/Waste Rock Management Plan report were at 0.36 mg/L which is above CCME guidelines for the protection of freshwater and aquatic life. The values in this study ranged from 0.45 to 0.71, which may suggest that these values are natural observed in this area.

5.0 REMEDIAL OPTIONS

In 2010, EBA prepared a cold climate bioremediation literature review and ranked potential remediation options for Windy Lake Camp and Patch Lake Facility (EBA, 2010). A summary of remediation options with Arctic/Antarctic case studies was provided along with a listing of the advantages and disadvantages of each. Proposed remedial options for the Site were ranked using an approach based on the life cycle framework assessment for remediation options developed by Diamond et al. (1999).

Established soil treatment options that were evaluated for this report, from most rapid to the most protracted, included physical treatments, such as excavation and landfilling (encapsulation), incineration, thermal desorption, landfarming, or biopile remediation, surfactant addition, soil washing, and monitored natural attenuation.

Information to support bioremediation of soils via soil microorganisms in this region was obtained from a study conducted in 2011, by SiREM laboratories in Guelph Ontario for EBA and HBML. In this study, SiREM utilized five different treatments from soils collected from Windy Camp and Patch Lake Facility. Each microcosm was incubated at 50% water holding capacity at 10°C for 147 days. Below is a summary table of the results from this study:

Summary of Percent Removal of PHCs in Microcosm Study from SiREM

Treatment	F2 (C10-C16)			F3 (C16-C34)			F4 (C34-C50)		
	% Removal	Initial [ ] (ug/g)	Final [ ] (ug/g)	% Removal	Initial [ ] (ug/g)	Final [ ] (ug/g)	% Removal	Initial [ ] (ug/g)	Final [ ] (ug/g)
Aerobic Active Control-Patch	65	4400	1550	-	3450	4600	-	570	645
Aerobic Treatment EHC-O (oxygen releasing compound) Amended-Patch	59	4400	1800	-	3450	4250	8	655	605
Aerobic Nutrient Amended-Patch	90	4400	455	29	3450	2450	33	680	455
Aerobic Nutrient and EHC-O Amended-Patch	80	4400	875	17	3450	2850	24	680	515
Aerobic Active Control-Windy	30	2800	1950	-	410	450	92	25	2
Aerobic Treatment EHC-O Amended-Windy	75	2800	700	-	410	495	13	24	21
Anaerobic Nitrate Amended-Windy	-	2800	2950	-	410	510	65	23	8
Anaerobic Sulfate and EHC-O Amended-Windy	-	2800	2800	-	410	510	-	14	23

A summary of the remedial alternatives for the PHC impacted areas is provided below:

Summary of Remediation Options for Boston Camp Soils

Areas	Predominant Hydrocarbon Fraction Requiring Treatment	Remedial Alternative
AEC 2 - Generators APEC 1 - Inside Landfarm	PHC: F1 to F3 fraction Source: historic diesel fuel spills Concentrations: up to 47,000 mg/kg	**Excavation and Off-Site Disposal** Advantages: ▪ Quick remedial timeframe. Disadvantages: ▪ Requires importation of clean backfill, which could be obtained on or near the Site. ▪ Backfilling should be done as soon as possible after excavation in order to mitigate possible permafrost damage. ▪ Generally most expensive option.
		Landfarming: Hydrocarbon affected soils are spread out in a layer about 0.3 m to 0.5 m thick, nutrients are added, and periodically the soils are mixed (i.e., by tilling). Soil moisture may also be adjusted. Other amendments including proprietary oxygen releasing compounds may be added. Advantages: ▪ Proven technology in the arctic. ▪ Cost effective for coarse-grained soils requiring treatment for diesel fuel contamination (F2, F3) ▪ Treated soils can be used as backfill where appropriate. Disadvantages: ▪ Treatment season in the arctic is short (generally three months). ▪ Excavations in arctic generally require rapid importation of clean backfill in order to prevent permafrost damage. ▪ Requires monitoring and periodic tilling effort. ▪ Requires the addition of amendments (nitrogen and phosphorous sources). ▪ Facility requires permitting and periodic inspections. ▪ May be difficult to achieve most stringent remedial guidelines (Tier 1 remedial objectives for wildland land use). ▪ Facility collects precipitation and snowmelt that may require treatment prior to disposal.
		Biopiles: A bioremediation technique whereby the soil is piled over an air distribution system and aerated. The air distribution system can also be used to provide heat to the soil. Advantages: ▪ For a given volume of soils requiring treatment, biopiles require less area than a landfarm. ▪ Stockpiling soil reduces the rate of heat loss by increasing the volume/surface ratio, effectively extending the length of the treatment season. Disadvantages: ▪ Require significant engineering and entail higher construction/operation costs than a landfarm.

Summary of Remediation Options for Boston Camp Soils

Areas	Predominant Hydrocarbon Fraction Requiring Treatment	Remedial Alternative
		▪ Excavations generally require importation of clean backfill in order to prevent permafrost damage. ▪ Forced air generally reduces remedial timeframes but there is a requirement for a power supply. Wind-powered systems may not be effective to achieve remedial goals. ▪ Construction materials (i.e., PVC pipe) must be disposed of at the end of remediation.
		Enhanced Anaerobic Biodegradation: Solutions of electron acceptors (nitrates and or sulphates) are applied to soils in-situ to enhance natural anaerobic biodegradation processes. Advantages: ▪ Less site disturbance and damage to permafrost compared to excavating soils. Disadvantages: ▪ Anaerobic degradation of hydrocarbons by microbes in polar climates is not well understood and there is little published research to establish this as a viable remedial alternative in the arctic. ▪ Requires chemical inputs that must be controlled to avoid adverse effects on nearby water bodies (introduction of nitrates and sulphates into the environment). ▪ The five month bench-scale study concluded that this option would not be successful for the Old Windy Camp soils, which has a location and soils similar to the Site.
		Aerobic In-situ Biodegradation: Solutions of nitrogen (20:20:20 fertilizer) are applied to soils in-situ to enhance natural aerobic biodegradation processes. Advantages: ▪ Less site disturbance and damage to permafrost compared to excavating soils. ▪ The microcosm study suggests the greatest removal of PHC fraction F2 and F3. Disadvantages: ▪ Requires chemical inputs that must be controlled to avoid adverse effects on nearby water bodies (introduction of ammonium, phosphates and potential increase of nitrates into the environment). ▪ May take longer to remediate due to short growing season and cool soil temperature. ▪ May have issues getting nutrients deep enough into the soil
		Surfactant Soil Washing: On-site set-up to agitate soils in a surfactant solution (or water) to remove PHCs. Advantages: ▪ Can be less time-consuming than bioremediation and natural treatment systems. ▪ Best suited for coarse-grained soils, like those at Old Windy Camp. Disadvantages: ▪ Chemical inputs can disrupt soil properties and nutrient cycling. ▪ Technology produces a liquid stream that that must be treated separately. ▪ Resulting treated soil typically requires dewatering prior to backfilling, as it has little to no bearing strength post-treatment.

Summary of Remediation Options for Boston Camp Soils

Areas	Predominant Hydrocarbon Fraction Requiring Treatment	Remedial Alternative
		▪ Large manpower and energy requirements
		Monitored Natural Attenuation: In-situ a remediation approach including variety of physical, chemical, or biological processes that can act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil. Advantages: ▪ Minimizes or avoids air and land emissions, tundra damage, and non-renewable resource depletion. ▪ Good alternative for areas that are difficult to access (soils under buildings or wetlands). ▪ Allows cleanup workers to avoid contact with contaminated soils. ▪ Less equipment and labor than most methods. ▪ Less expensive. ▪ Sampling and testing over years can be costly, but it may still cost less than other methods. Disadvantages: ▪ Remedial timeframe may be protracted. ▪ Difficult to demonstrate in advance that approach will work. For this reason, approach may not be acceptable to stakeholders.

One potential issue while remediating AEC 2 may be the free water at 1 m. The dominant underlying soil is sand ranging from fine to coarse sand, which may have a hydraulic conductivity ranging from 10^{-5} to 10^{-3} m/s. This may influence the type of remediation undertaken due to the movement of impacted water and amendments used in remediation. The direction of this water may be north (Aimaokatalok Lake approximately 185 m) to north east (Stickleback Lake approximately 115 m).

Approximately, 348 m^3 of soils with BTEX, F1 to F3 hydrocarbon fraction concentrations were identified, of which 100 m^3 of the impacted soil is already in a landfarm. This is the estimated volume of soils that was greater than the Nunavut PHC guidelines for industrial land use.

Based on the evaluation of the impacted areas (AEC 2 and APEC 1), the remediation options above, and the outcome of the soil analysis for PHC, the preferred remedial approach for the Site would be landfarming. The SiREM study of the Patch and Windy Camps suggests that the aerobic bioremediation of fraction F2 impacted soils would be effective. The impacted material would need to be turned periodically for aeration of the soil and have fertilizer amendments, such as urea (46-0-0) and monoammonium phosphate (11-52-0). Both nitrogen and phosphorus have been shown to increase microbial degradation of PHC (Braddock et al. 1997; Thomassin-Lacroix et al. 2002). Landfarming AEC 2 could cause additional issues, since the area would likely need to be excavated to at least 2 m below grade and would expose the free water.

The probable range of remedial cost for the landfarming is estimated to range between $140,000 and $210,000, with a remedial timeframe of two to three treatment seasons. This estimate was based on the costs provided in EBA (2010), but it does not include permitting costs, engineering costs, and periodic engineering effort to monitor and sample the water and soils at the facility.

6.0 RECOMMENDATIONS

Based on the outcomes of this Phase III ESA, the following recommendations apply to the Site:

- AEC 2 (248 m^3 of impacted soil) should be remediated using land farming with fertilizers and tilling. The SiREM study suggests that the bioremediation of fraction F2 impacted soils by undisturbed, aerobic techniques would be effective.
- APEC 1 (100 m^3 of impacted soil) can be remediated in-situ as it is already in a landfarm. This area should be turned periodically with a nutrient amendment to increase biodegradation of PHC.
- Further investigation underneath the pad at AEC 1, AEC 3 and APEC 5 are still required.
- Any fuel remaining in aboveground storage tanks on the Site should be collected and disposed of, in accordance with Nunavut regulations, in order to prevent any possible further hydrocarbon soil impacts.
- Further investigation into the high salinity values in the groundwater monitoring wells and surface water.
- Water quality in the groundwater monitoring wells should be continued to be monitored yearly.

7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

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Attachments: Tables (8)
Figures
Appendix A: Borehole Logs
Appendix B: Laboratory Analytical Results
Appendix C: General Conditions

REFERENCES

Braddock F. Joan, Marian L. Ruth and Peter H. Catterall. 1997. Enhancement and inhibition of microbial activity in hydrocarbon-contaminated arctic soils: implications for nutrient-amended bioremediation. Environmental science and Technology 31:7, 2078-2084

CCME, September 2007, Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health.

CCME (2008a) Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil, Endorsed by CCME Council of Ministers in 2001, Table 1 Revised January 2008. http://www.ccme.ca/assets/pdf/phc_standard_1.0_e.pdf

CCME (2008b) Canada-Wide Standard for Petroleum Hydrocarbons (PHC) in Soil: Scientific Rationale Supporting Technical Document. PN 1399. http://www.ccme.ca/assets/pdf/pn_1399_phc_sr_std_1.2_e.pdf

CCME (Canadian Council of Ministers of the Environment). 2007. Canadian water quality guidelines for the protection of aquatic life: summary table. Update 7.1, December 2007. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg, MB.

CCME (Canadian Council of Ministers of the Environment). 2011. Canadian water quality guidelines for the protection of aquatic life: Chloride. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Dyke, A.S., and Dredge, L.A. 1989. Quaternary geology of the northwestern Canadian Shield. In Quaternary geology of Canada and Greenland. Edited by R.J. Fulton. Geological Survey of Canada, Ottawa.

Dyke, A.S. and Prest, V.K. 1986. Late Wisconsin and Holocene retreat of the Laurentide Ice Sheet. Geological Survey of Canada, Map 1702A.

Diamond, M.L., Page, C.A., Campbell, M., McKenna, S., and Lall, R. 1999. Life-cycle framework for assessment of site remediation options: method and generic survey. Environ. Toxicol. Chem. 18, 788–800.

EBA, 1996. Boston Gold Project, Surficial Geology and Permafrost Features.

EBA, 2004. Hydrocarbon Spill Assessment and Remediation Boston Camp, Nunavut. Submitted to Miramar Mining Corporation.

EBA, 2010 Evaluation Of Risk And Remedial Options for Petroleum Hydrocarbon Impacted Soils at Patch Lake Facility and Windy Lake Camp, Hope Bay Gold Project, Nunavut. Issued for Review.

Geological Survey of Canada. 2003. Geology of the Doris North Gold Deposits, Northern Hope Bay Volcanic Belt, Slave Structural Province, Nunavut; Carpenter, R. L.; Sherlock, R. L.; Quang, C.; Kleespies, P.; McLeod, R.; Geological Survey of Canada, Current Research 2003-C6, 2003.

Government of Nunavut. 2009. Environmental Guideline for Contaminated Site Remediation. Department of Sustainable Development Environmental Protection Service.

Heginbottom, J.A., Dubreuil, M.A. and Harker, P.A., 1995. Canada – Permafrost, In: National Atlas of Canada, 5th Edition, National Atlas Information Service, Natural Resources Canada, MCR 4177

Hope Bay Mining Limited Phase 2 Hope Bay Belt Project. December 2011.

Rescan Environmental Services Ltd. 2009. Meteorology Baseline Report, Hope Bay Belt Project, Proj#1009-002-02/Rev C.1, December 2009.

SRK Consulting (Canada) Inc. 2009. Hope Bay Mining Ltd.-Water and Ore/Waste Rock Management Plan for the Boston Site, Hope Bay Project Nunavut, Prepared for Hope Bay Mining Ltd.

SRK Consulting (Canada) Inc. 2012. Hope Bay Project-Boston Camp Revised Interm Closure Plan, Prepared for Hope Bay Mining Ltd.

SiREM. 2012. Laboratory Biotreatability Study To Assess Aerobic and Anaerobic Biodegradation of Petroleum Hydrocarbons at Two Sites in Nunavut, Northern Canadian Site. Ref# TL00307B. Prepared for EBA Engineering.

Thomassin-Lacroix E.J.M, M. Eriksson, K.J. Reimer and W.W Mohn. 2002. Biostimulation and bioaugmentation for on-site treatment of weathered diesel fuel in Arctic soil. Applied Microbiology and Biotechnology 59, 551-556

WESA, 2009, Hope Bay Gold Project: Phase II Environmental Site Assessment of Patch Lake Workshop, Windy Camp, and Boston Soil Treatment Area.

TABLES

Table 1	Soil Analytical Results for Hydrocarbons at AEC 1 (Old Spill Area)
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Table 1: Soil Analytical Results For Hydrocarbons at AEC 1 (Old Spill Area)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)								Soil Texture
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	Grain Size (% >75 µm)
AEC 1 - 2	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	15	<10	-
AEC 1 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	88	38	<10	-
AEC 1 - 3	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	16	<10	<10	64
AEC 1 - 5	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10	-
AEC 1 - 7	0.20 to 0.40	<0.005	<0.02	<0.01	<0.04	<12	<10	17	<10	-
AEC 1 - 13	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	48	13	-
AEC 1 - 14	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	83	23	-
AEC 1 - 15	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	67	46	-
AEC 1 - 16	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	16	<10	<10	-
AEC 1 - 17	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10	-
AEC 1 - 18	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	31	<10	-
AEC 1 - 19	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	74	11	-
AEC 1 - 20	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	22	<10	-
AEC 1 - 21	0.75 to 1.00	<0.005	0.35	<0.01	<0.04	<12	<10	78	23	-
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	**-**	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**	**-**
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	**-**	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**	**-**

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 2: Soil Analytical Results For Hydrocarbons at AEC 2 (Generator Spill)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)								Soil Texture
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	Grain Size (% >75 µm)
AEC 2 - 1	0.75 to 1.00	**0.034**	**2.00**	**7.300**	**100**	**5,800**	**11,000**	1,700	14	-
AEC 2 - 1	1.50 to 1.75	**0.087**	**1.8**	**9.1**	**55**	**3,100**	**6,000**	680	<10	-
AEC 2 - 2	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10	-
AEC 2 - 3	1.25 to 1.50	**0.077**	**0.59**	**2.8**	**35**	**530**	**4,100**	800	28	-
AEC 2 - 4	0.50 to 0.70	<0.005	<0.02	<0.012	<0.04	150	**1,800**	600	<10	-
AEC 2 - 5	0.75 to 1.00	0.009	0.11	0.032	0.16	<12	<10	<10	<10	-
AEC 2 - 6	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	17	61
AEC 2 - 7	0.75 to 1.00	<0.005	<0.02	0.013	0.079	<12	41	<10	<10	-
AEC 2 - 8	0.75 to 1.00	**0.13**	**4.3**	**3.9**	**34**	**670**	**7,600**	1,500	50	-
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	-	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**	-
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	-	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**	-

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 3: Soil Analytical Results For Hydrocarbons at AEC 3 (Tank Farm Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)								Soil Texture
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	Grain Size (% >75 µm)
AEC 3 - 1	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	65	16	-
AEC 3 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	74	28	75
AEC 3 - 5	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	18	<10	-
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	-	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**	-
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	-	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**	-

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 4: Soil Analytical Results For Hydrocarbons at AEC 6 (Incinerator)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 6 - 2	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	27	<10
AEC 6 - 4	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	190	60
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	**-**	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	**-**	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 5: Soil Analytical Results For Hydrocarbons at APEC 1 (Land Farm Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)								Soil Texture
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	Grain Size (% >75 µm)
APEC 1 - 1	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	280	150	-
APEC 1 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10	-
APEC 1 - 4	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	10	<10	61
APEC 1 - 6	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<20	-
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	**-**	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**	**-**
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	**-**	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**	**-**

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 6: Soil Analytical Results For Hydrocarbons at APEC 1 (Inside Land Farm)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
Inside Land Farm 1	0.30 to 0.50	**0.33**	**25**	**17**	**140**	**5,300**	**47,000**	**9,600**	230
Inside Land Farm 3	0.30 to 0.50	<0.005	<0.02	<0.01	<0.04	76	**2,700**	1,400	27
Inside Land Farm 5	0 to 0.15	<0.005	0.045	0.014	<0.04	<12	**2,700**	**2,100**	76
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	-	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	-	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 7: Soil Analytical Results For Hydrocarbons at APEC 5 (Retention Pond Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)								Soil Texture
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)	Grain Size (% >75 µm)
APEC 5 - 1	0.25 to 0.50	<0.005	<0.01	<0.02	<0.04	<12	<10	28	<10	-
APEC 5 - 2	0.50 to 0.75	<0.005	<0.01	<0.02	<0.04	<12	<10	120	33	44
APEC 5 - 3	0.25 to 0.50	<0.005	<0.01	<0.02	<0.04	<12	<10	180	52	-
Environmental Guideline for Contaminated Site Remediation - Nunavut (Coarse-Grain)[1]	**-**	**0.03**	**0.37**	**0.082**	**11**	**240**	**260**	**1,700**	**3,300**	**-**
CCME Soil Quality Guideline for the Protection of Environmental and Human Health[2]	**-**	**0.03**	**0.37**	**0.082**	**11**	**320**	**260**	**1,700**	**3,300**	**-**

Notes:

[1] Environmental Guidelines for Contaminated Site Remediation, Nunavut, for Industrial, coarse-grained soil

[2] CCME Soil Quality Guideline for the Protection of Environmental and Human Health, for Industrial, coarse-grained soil

[3] All soil samples were collected on August 9, 2011

- = Not detected/not analyzed/no unit/no guidelines

Bold = Greater than the referenced guideline

Table 8: Groundwater and Surface Water Analytical Results for Hydrocarbons and Routine Water at Boston Camp

Test Parameter	Unit	CCME[1]	Licence No. 2BB-BOS1217	GW-1 Boston	GW-2 Boston	GW-3 Boston	GW-4 Boston	GW-5 Boston	Seep Sample 1	Seep Sample 2
BTEX and Hydrocarbon Fractions F1 to F2										
Benzene	mg/L	0.370	0.370	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Toluene	mg/L	0.002	0.002	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Ethylbenzene	mg/L	0.090	0.090	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Xylenes	mg/L	-	-	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
F1 (C6 - C10)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (>C10 - C16)	mg/L	-	-	<0.30 (1)	<0.80 (1)	<0.80 (1)	<0.80 (1)	<0.30 (1)	<0.30 (1)	<0.30 (1)
Routine Water and Diss. Regulated Metals Misc. Inorganics										
Conductivity	uS/cm	-	-	3800	-	3000	-	11000	3000	2400
pH	-	6.5 to 9	6.0-9.5	7.46	-	7.21	-	6.76	7.19	7.11
Routine Water and Diss. Regulated Metals Calculated Parameters										
Anion Sum	meq/L	-	-	36	-	29	-	110	29	22
Cation Sum	meq/L	-	-	36	-	28	-	95	30	24
Hardness ($CaCO_3$)	mg/L	-	-	1500	-	1200	-	2900	1300	1000
Ion Balance	-	-	-	0.99	-	0.97	-	0.86	1.1	1.1
Dissolved Nitrate (N)	mg/L	-	-	0.47	-	19 (4)	-	0.11 (3)	36 (4)	0.008 (5)
Dissolved Nitrate (NO_3)	mg/L	13	-	2.1	-	**83**	-	0.49	**160**	0.035
Nitrate plus Nitrite (N)	mg/L	-	-	0.47 (2)	-	19	-	0.11	36	0.008
Dissolved Nitrite (N)	mg/L	-	-	<0.015 (2)	-	0.054 (3)	-	<0.030 (2)	0.012 (5)	<0.0030 (5)
Dissolved Nitrite (NO_2)	mg/L	0.06	-	<0.049	-	**0.18**	-	**<0.099**	0.039	<0.0099
Total Dissolved Solids	mg/L	-	-	2000	-	1700	-	5700	1800	1300
Routine Water and Diss. Regulated Metals Anions										
Alkalinity (PP as $CaCO_3$)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Alkalinity (Total as $CaCO_3$)	mg/L	-	-	54	-	24	-	180	24	17
Bicarbonate (HCO_3)	mg/L	-	-	66	-	29	-	220	29	21
Carbonate (CO_3)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Hydroxide (OH)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Dissolved Sulphate (SO_4)	mg/L	-	-	200	-	510 (1)	-	310 (1)	470 (1)	260 (1)
Dissolved Chloride (Cl)	mg/L	120	-	**1100 (1)**	-	**590 (1)**	-	**3600 (1)**	**560 (1)**	**580 (1)**
Routine Water and Diss. Regulated Metals Elements										
Dissolved Aluminum (Al)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Antimony (Sb)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Arsenic (As)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Barium (Ba)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Beryllium (Be)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Boron (B)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Cadmium (Cd)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Calcium (Ca)	mg/L	-	-	400	-	340	-	390	380	280
Dissolved Chromium (Cr), Trivalent	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Cobalt (Co)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Copper (Cu)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Iron (Fe)	mg/L	0.3	-	0.22	-	**0.53**	-	**0.71**	0.17	**0.45**
Dissolved Lead (Pb)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Lithium (Li)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Magnesium (Mg)	mg/L	-	-	120	-	76	-	480 (1)	83	80
Dissolved Manganese (Mn)	mg/L	-	-	1.4	-	0.94	-	2.5	0.41	0.2
Dissolved Molybdenum (Mo)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Nickel (Ni)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Phosphorus (P)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Potassium (K)	mg/L	-	-	9.7	-	30	-	44	29	2.5
Dissolved Selenium (Se)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Silicon (Si)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Silver (Ag)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Sodium (Na)	mg/L	-	-	130	-	100	-	810 (1)	86	76
Dissolved Strontium (Sr)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Sulphur (S)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Thallium (Tl)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Tin (Sn)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Titanium (Ti)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Uranium (U)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Vanadium (V)	mg/L	-	-	-	-	-	-	-	-	-
Dissolved Zinc (Zn)	mg/L	-	-	-	-	-	-	-	-	-

Notes:

[1] Canadian Water Quality Guidelines for Protection of Aquatic Life - Freshwater

-' = Not detected/not analyzed/no unit/no guidelines

(1) Detection Limit raised based on sample volume used for analysis or due to dilution to bring analyte within calibrated range

(2) Detection Limits raised due to matrix interference Sample was analyzed after holding time expired.

(3) Detection limits raised due to sample matrix. Sample was analyzed after holding time expired

(4) Detection Limit raised due to dilution to bring analyte within calibrated range. Sample was analyzed after holding time expired.

(5) Sample was analyzed after holidng time expired.

Bold = Greater than the referenced guideline

FIGURES

Figure 1	Hope Bay Project Location
Figure 2	Boston Camp Location
Figure 3	Boston Camp Site Details
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Figure 4D	AEC 6 - Incinerator
Figure 4E	APEC 1 - Land Farm Perimeter
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Figure 5	Groundwater and Surface Water Sampling Locations

STATUS
ISSUED FOR REVIEW

NOTES
BASED ON DRAWING FROM ROSCOE POSTLE ASSOCIATES INC.

0 1 000 m
Scale: 1: 20 000

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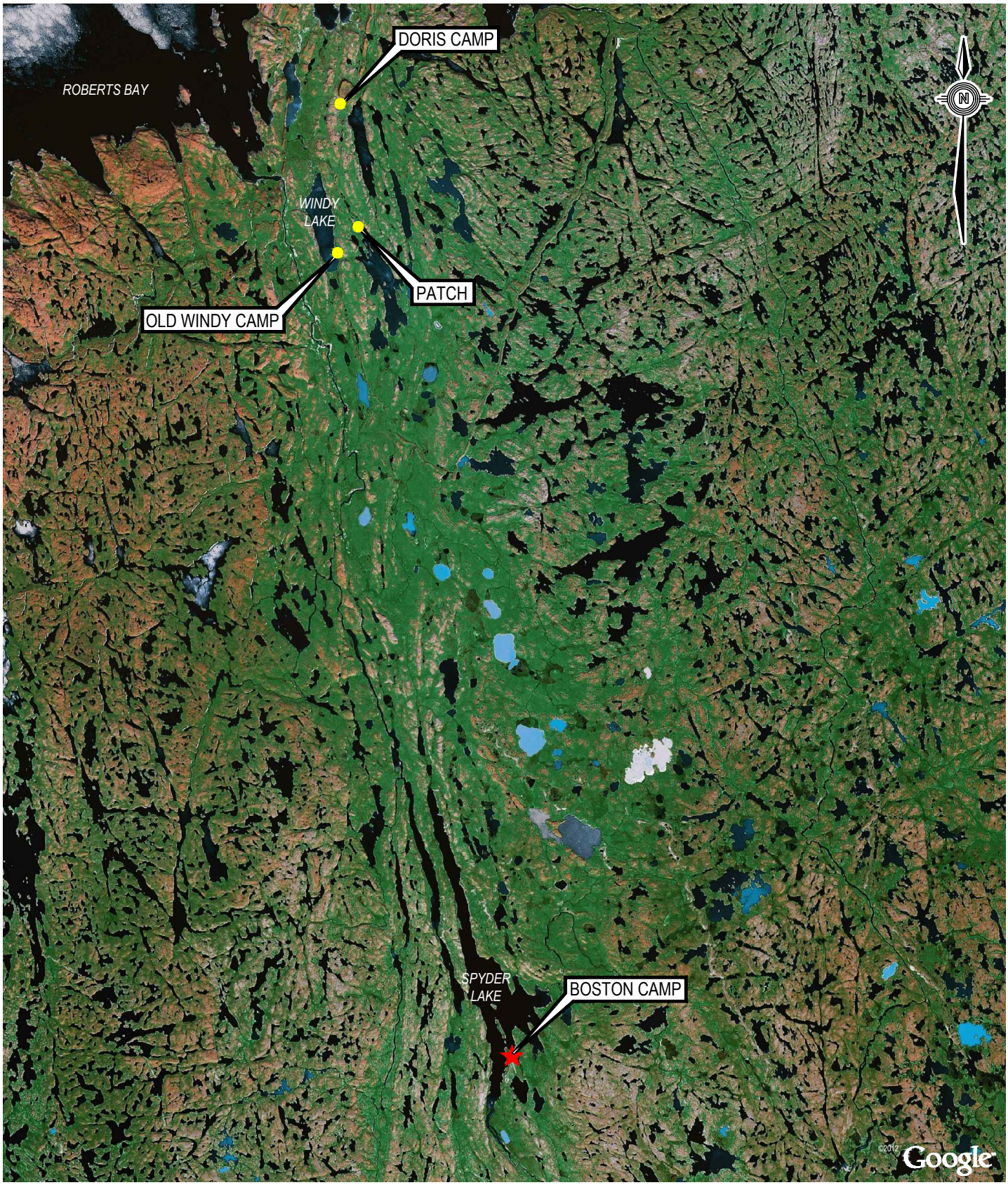
PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

HOPE BAY PROJECT LOCATION

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE	DATE
EDM	September 2012

Figure 1



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STATUS
ISSUED FOR REVIEW

0 10 km
Scale: 1: 300 000

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PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

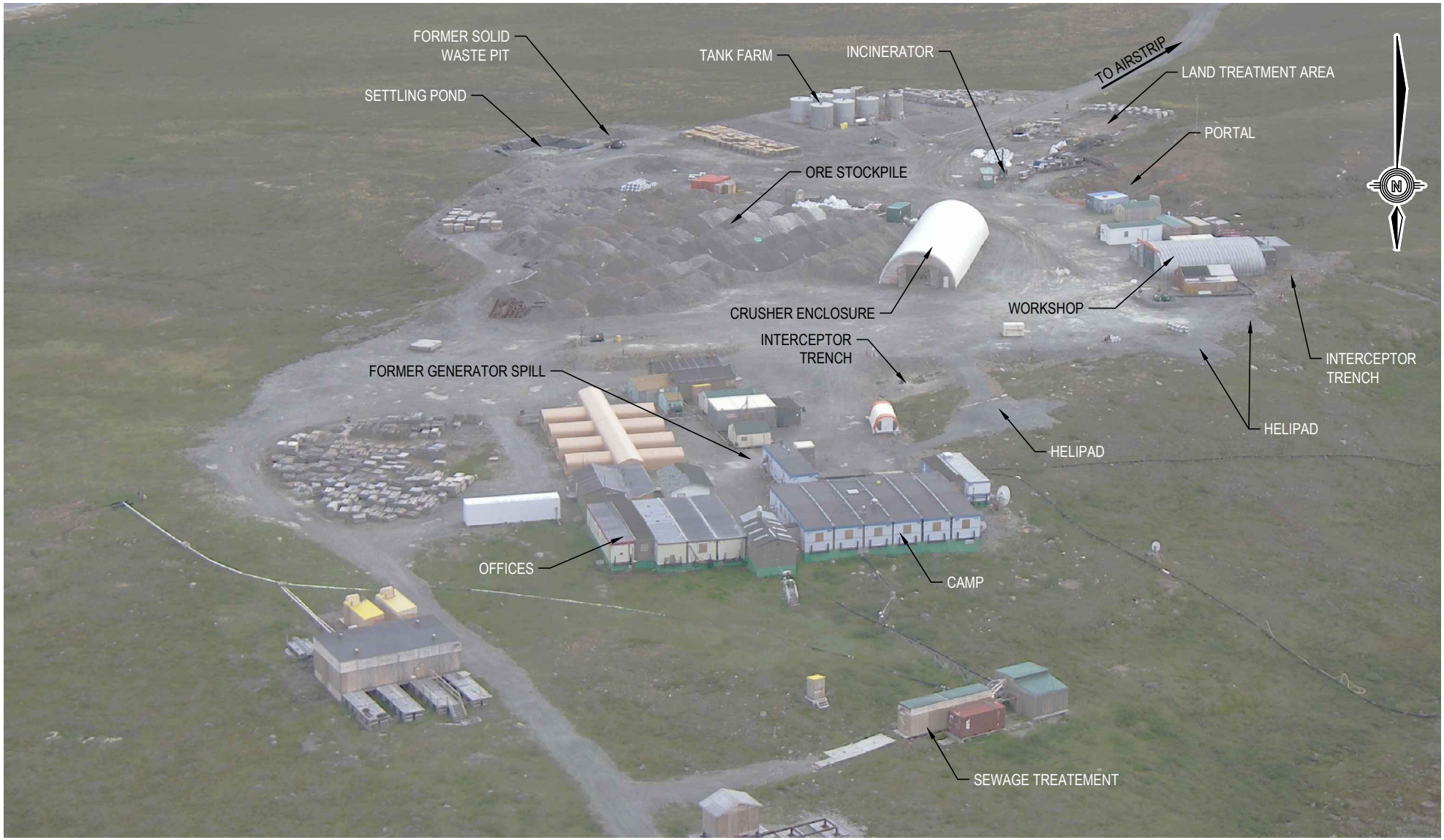
BOSTON CAMP LOCATION

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE	DATE
EDM	September 2012

Figure 2

Q:\Edmonton\Drafting\PROJECTS\E141\E14101223\01\Report Components\Phase 001\Autocad\E14101223_FIG 3_R0.dwg [FIGURE 3] September 04, 2012 - 4:17:38 pm (BY: LEE, ELVIN)



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PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

BOSTON CAMP SITE DETAILS

STATUS
ISSUED FOR REVIEW

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PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE	DATE
EDM	September 2012

Figure 3

APEC (Area of Potential Environmental Concern):

- AREA OF ASSESSMENT (For Planning Only)
- 1 - LAND FARM
- 5 - SETTLING POND

AEC (Area of Environmental Concern):

- AREA OF ASSESSMENT (For Planning Only)
- 1 - GENERATOR SHED / MAINTENANCE BUILDING
- 2 - GENERATOR
- 3 - TANK FARM (PERIMETER)
- 6 - INCINERATOR
- 7 - WATER PUMP BUILDING

▲ - TIDY TANK

STATUS
ISSUED FOR REVIEW

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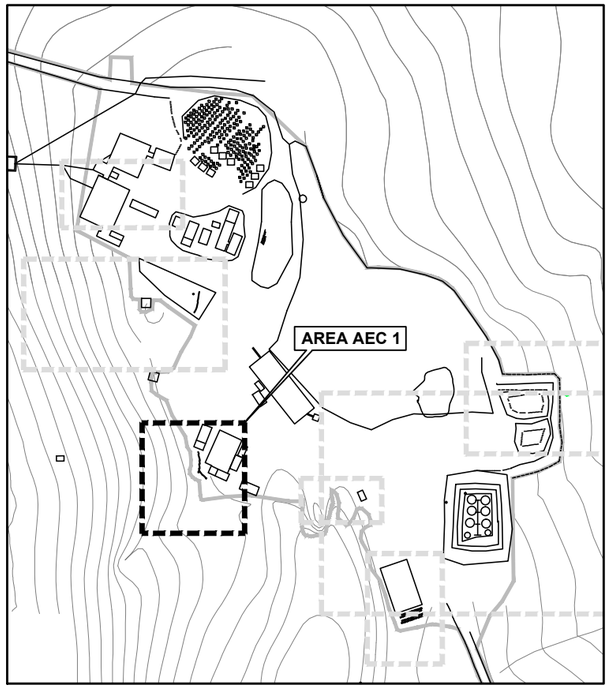
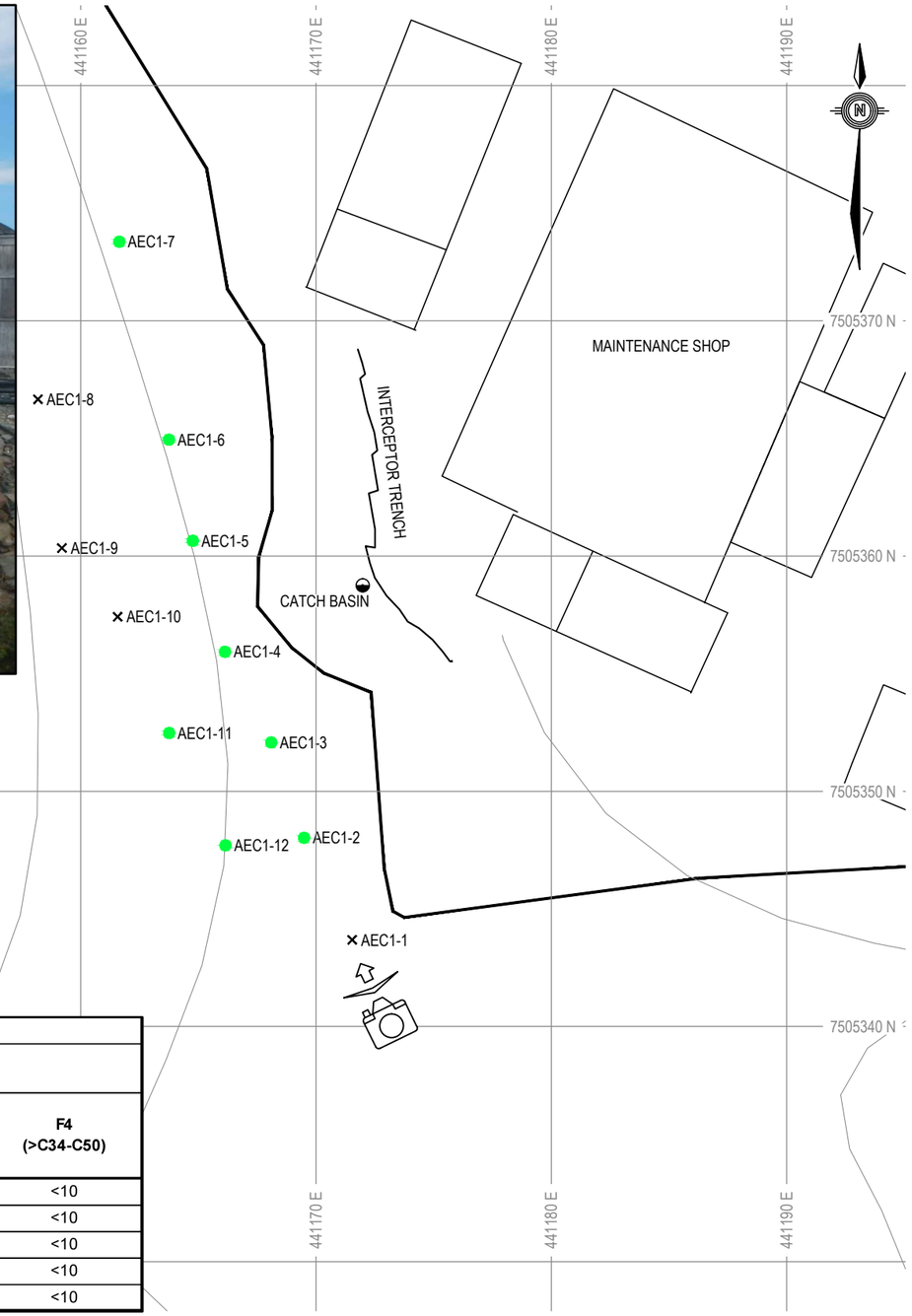
PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

BOSTON CAMP STUDY LOCATIONS

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0
OFFICE: EDM	DATE: September 13, 2012		

Figure 4





Soil Analytical Results For Hydrocarbons at AEC 1 (Old Spill Area)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 1 - 2	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	15	<10
AEC 1 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	88	38	<10
AEC 1 - 3	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	16	<10	<10
AEC 1 - 5	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10
AEC 1 - 7	0.20 to 0.40	<0.005	<0.02	<0.01	<0.04	<12	<10	17	<10

LEGEND

× - SOIL SCREENING POINT

● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 10 m

Scale: 1: 250

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

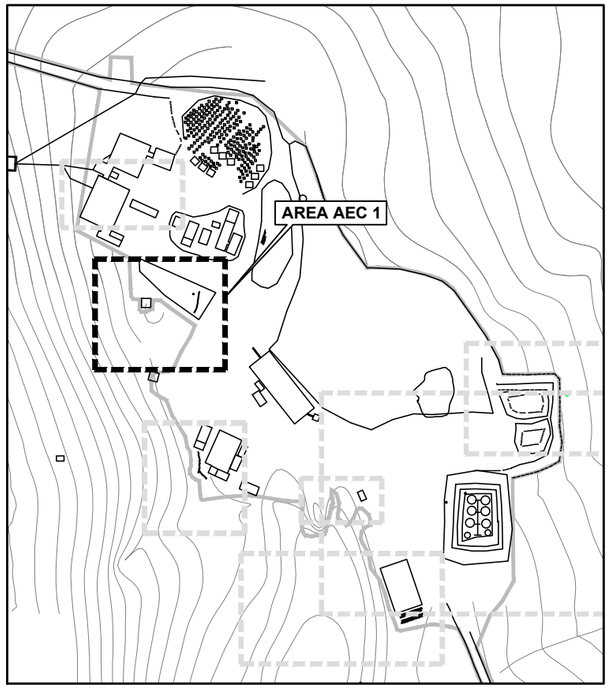
AEC 1 - OLD SPILL AREA

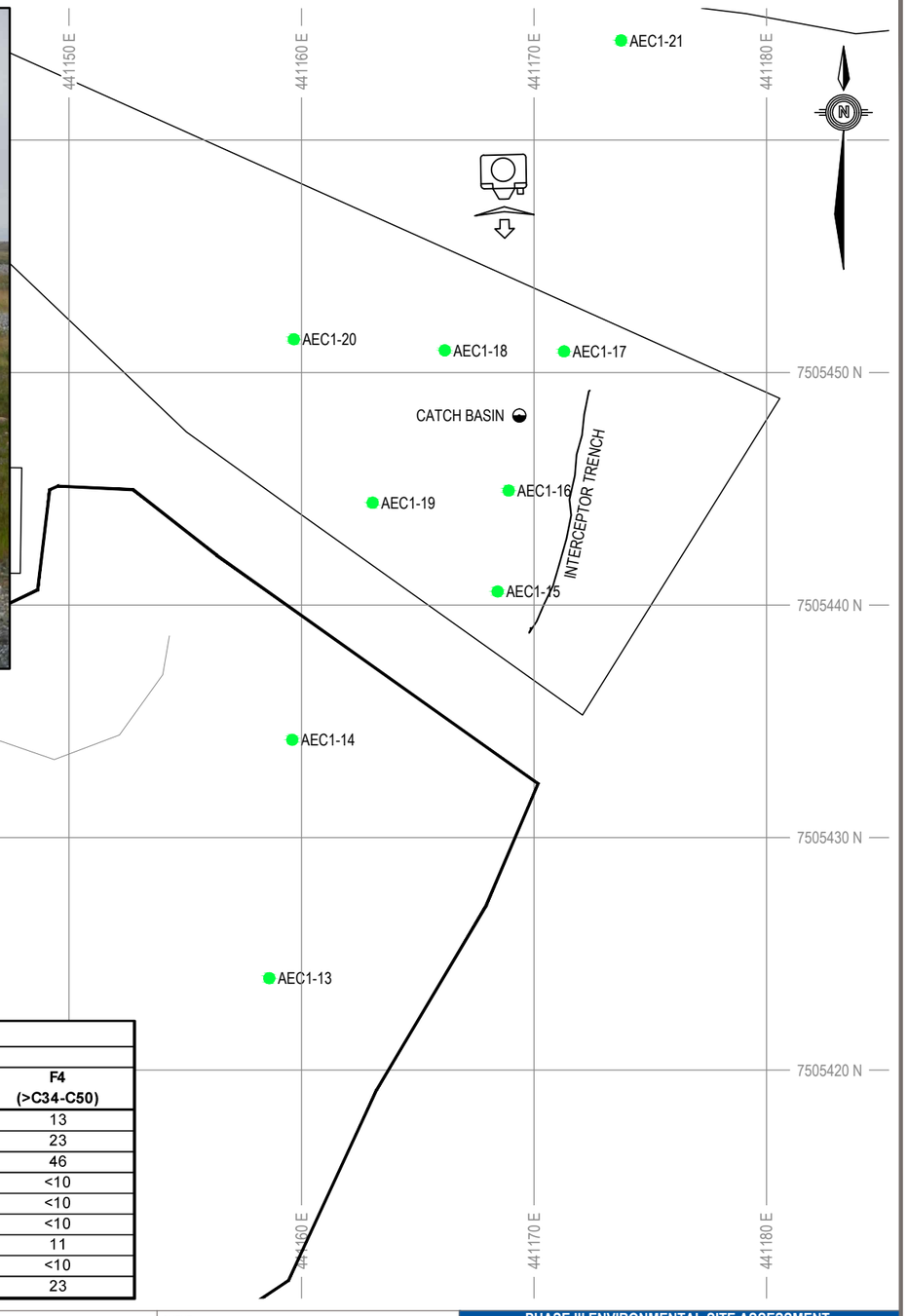
eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE: EDM
DATE: September 7, 2012

Figure 4Ai





Soil Analytical Results For Hydrocarbons at AEC 1 (Old Spill Area)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 1 - 13	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	48	13
AEC 1 - 14	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	83	23
AEC 1 - 15	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	67	46
AEC 1 - 16	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	16	<10	<10
AEC 1 - 17	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10
AEC 1 - 18	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	31	<10
AEC 1 - 19	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	74	11
AEC 1 - 20	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	22	<10
AEC 1 - 21	0.75 to 1.00	<0.005	0.35	<0.01	<0.04	<12	<10	78	23

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 10 m

Scale: 1: 250

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

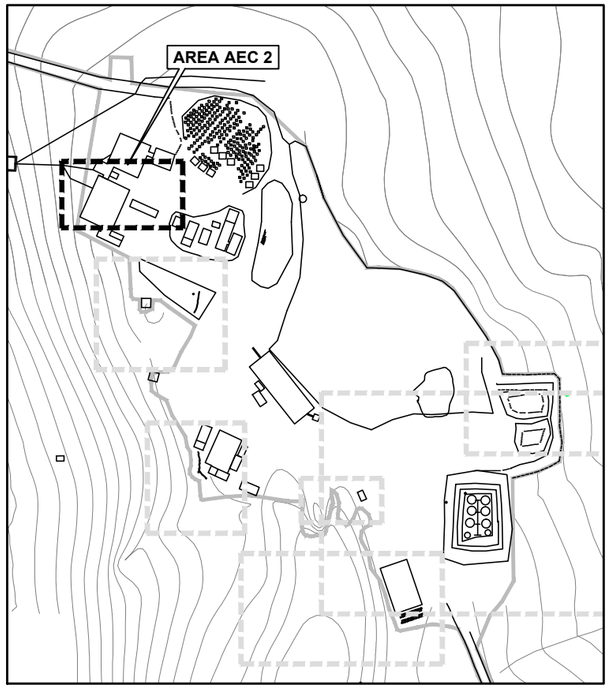
AEC 1 - OLD SPILL AREA

eba A TETRATECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0
OFFICE	DATE		
EDM	September 7, 2012		

Figure 4Aii

Q:\Edmonton\Drafting\PROJECTS\E141\E14101223\01\Report Components\Phase 001\Autocad\E14101223_FIG 4A-4G_R0.dwg [FIGURE 4Aii] November 26, 2012 - 3:27:54 pm (BY: RICHMOND, BOB)



441160 E

7505500 N

7505490 N

CAMP

GENERATORS

AEC2-7

AEC2-8

AEC2-4

AEC2-5

AEC2-3

AEC2-1

AEC2-2

AEC2-6

?

AEC2	
AREA (m²)	124
VOLUME (m³)	248

Soil Analytical Results For Hydrocarbons at AEC 2 (Generator Spill)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 2 - 1	0.75 to 1.00	**0.034**	**2.00**	**7.300**	**100**	**5,800**	**11,000**	1,700	14
AEC 2 - 1	1.50 to 1.75	**0.087**	**1.8**	**9.1**	**55**	**3,100**	**6,000**	680	<10
AEC 2 - 2	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10
AEC 2 - 3	1.25 to 1.50	**0.077**	**0.59**	**2.8**	**35**	**530**	**4,100**	800	28
AEC 2 - 4	0.50 to 0.70	<0.005	<0.02	<0.012	<0.04	150	**1,800**	600	<10
AEC 2 - 5	0.75 to 1.00	0.009	0.11	0.032	0.16	<12	<10	<10	<10
AEC 2 - 6	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	17
AEC 2 - 7	0.75 to 1.00	<0.005	<0.02	0.013	0.079	<12	41	<10	<10
AEC 2 - 8	0.75 to 1.00	**0.13**	**4.3**	**3.9**	**34**	**670**	**7,600**	1,500	50

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- - - - AREA HIGHER THAN INDUSTRIAL GUIDELINE

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

0 5 m

Scale: 1: 150

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

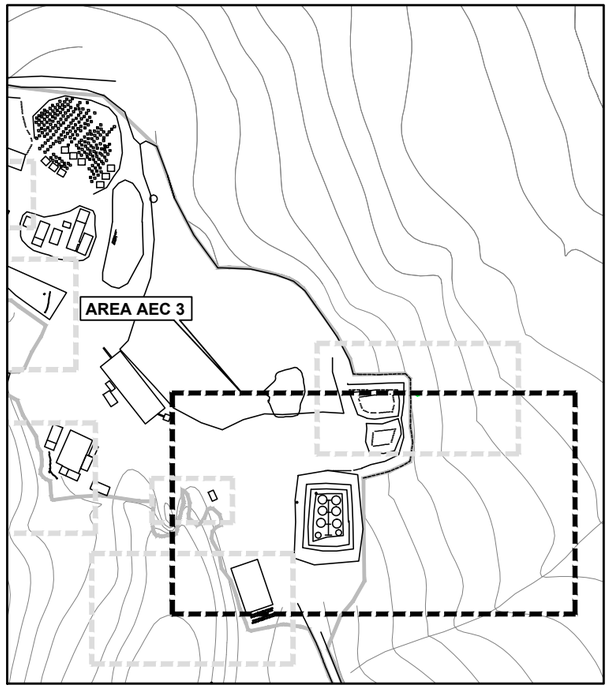
AEC 2 - GENERATOR SPILL

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0
OFFICE: EDM	DATE: September 7, 2012		

Figure 4B

Q:\Edmonton\Drafting\PROJECTSIE141\E14101223001\Report Components\Phase 001\Autocad\E14101223_FIG 4A-4G_R0.dwg [FIGURE 4B] December 18, 2012 - 8:47:34 am (BY: LEE, ELVIN)



441290 E
441300 E
441310 E
441320 E
441330 E
441340 E
441350 E
441370 E
441380 E
441390 E
441400 E
441410 E
441420 E
7505380 N
7505370 N
7505360 N
7505350 N
7505340 N
7505330 N
7505320 N
7505310 N
7505300 N
SETTLING POND
FORMER SOLID WASTE PIT
TANK FARM (AS-BUILT)
LAND FARM
AEC3-5
AEC3-4
AEC3-3
AEC3-2
AEC3-1
GW4

Soil Analytical Results For Hydrocarbons at AEC 3 (Tank Farm Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 3 - 1	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	65	16
AEC 3 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	74	28
AEC 3 - 5	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	18	<10

LEGEND
- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 25 m
Scale: 1: 500

NOTES
- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

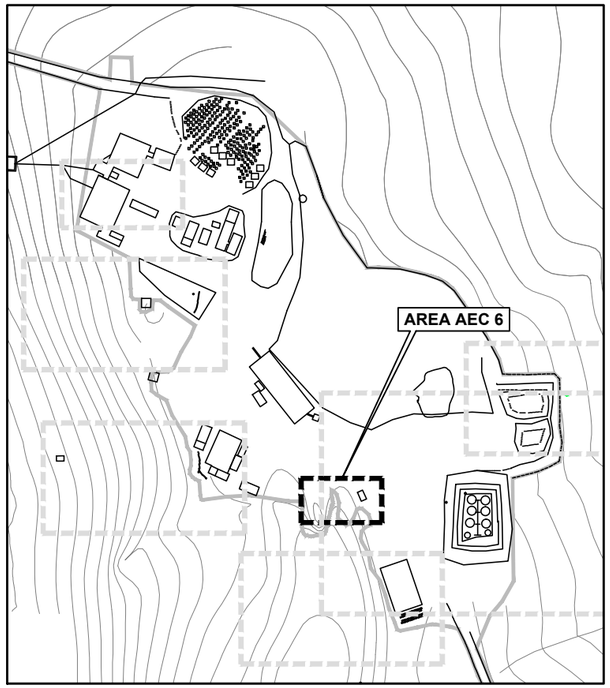
AEC 3 - TANK FARM PERIMETER

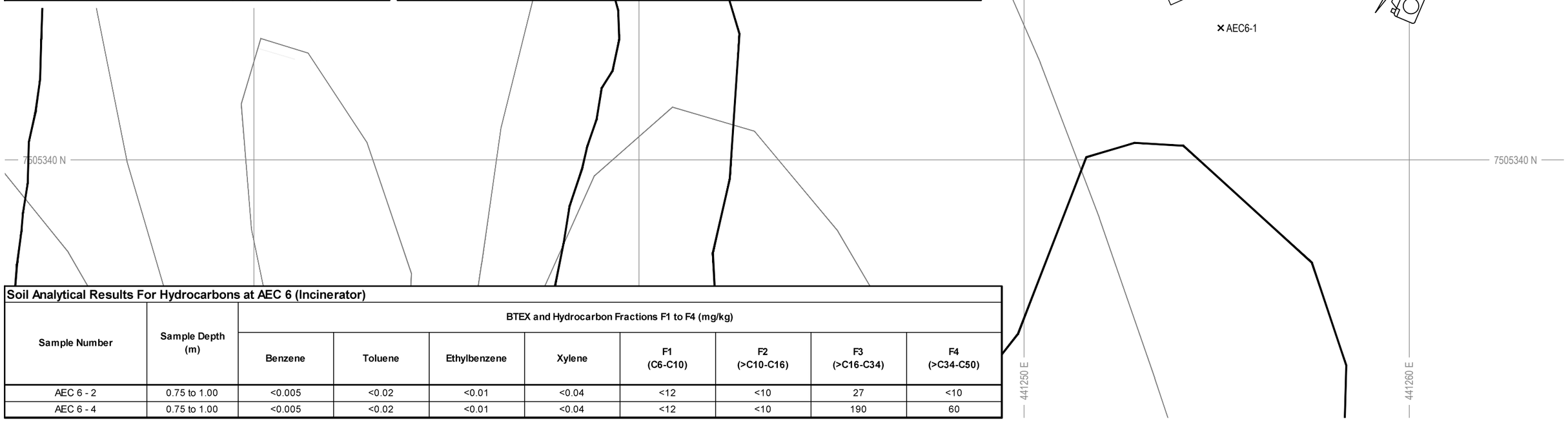
eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0
OFFICE: EDM	DATE: September 7, 2012		

Figure 4C

Q:\Edmonton\Drafting\PROJECTS\E14\E14101223\01\Report Components\Phase 001\Autocad\E14101223_FIG 4A-4G_R0.dwg - [FIGURE 4C] November 26, 2012 - 3:29:10 pm (BY: RICHMOND, BOB)





Soil Analytical Results For Hydrocarbons at AEC 6 (Incinerator)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
AEC 6 - 2	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	27	<10
AEC 6 - 4	0.75 to 1.00	<0.005	<0.02	<0.01	<0.04	<12	<10	190	60

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 5 m

Scale: 1: 100

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

A TETRATECH COMPANY

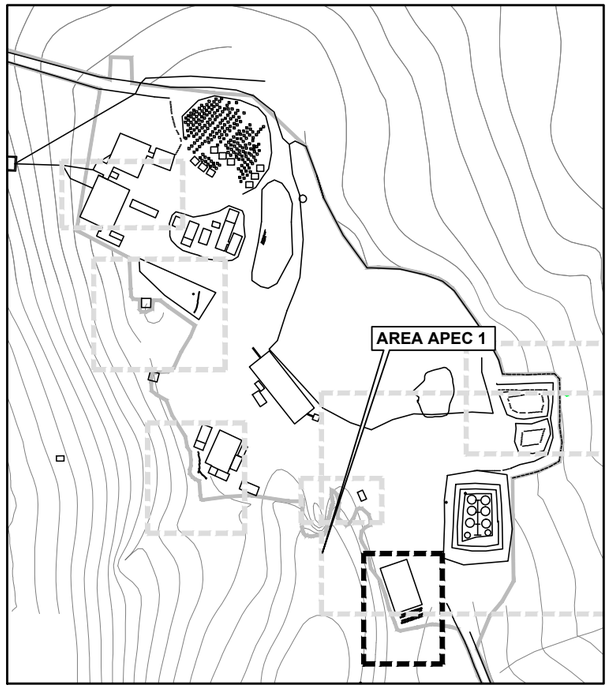
PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

AEC 6 - INCINERATOR

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE: EDM
DATE: September 7, 2012

Figure 4D



Soil Analytical Results For Hydrocarbons at APEC 1 (Land Farm Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
APEC 1 - 1	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	280	150
APEC 1 - 3	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<10
APEC 1 - 4	0.50 to 0.75	<0.005	<0.02	<0.01	<0.04	<12	<10	10	<10
APEC 1 - 6	0.25 to 0.50	<0.005	<0.02	<0.01	<0.04	<12	<10	<10	<20

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 10 m

Scale: 1: 250

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

APEC 1 - LAND FARM PERIMETER

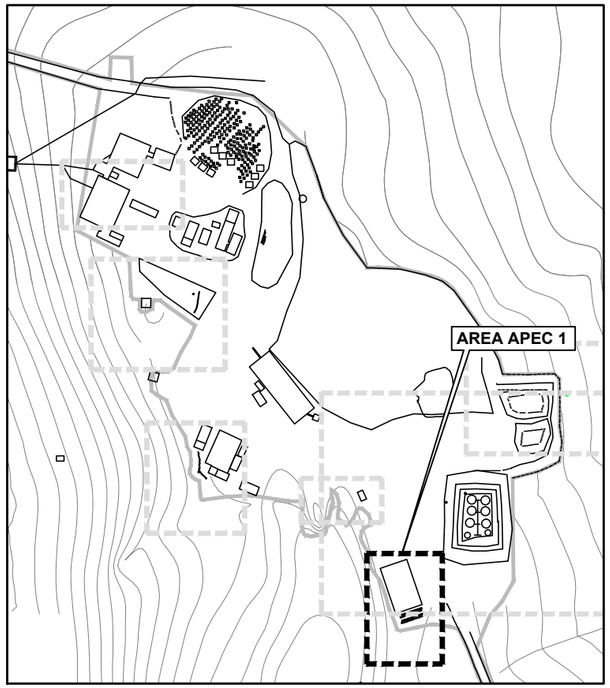
eba A TETRATECH COMPANY

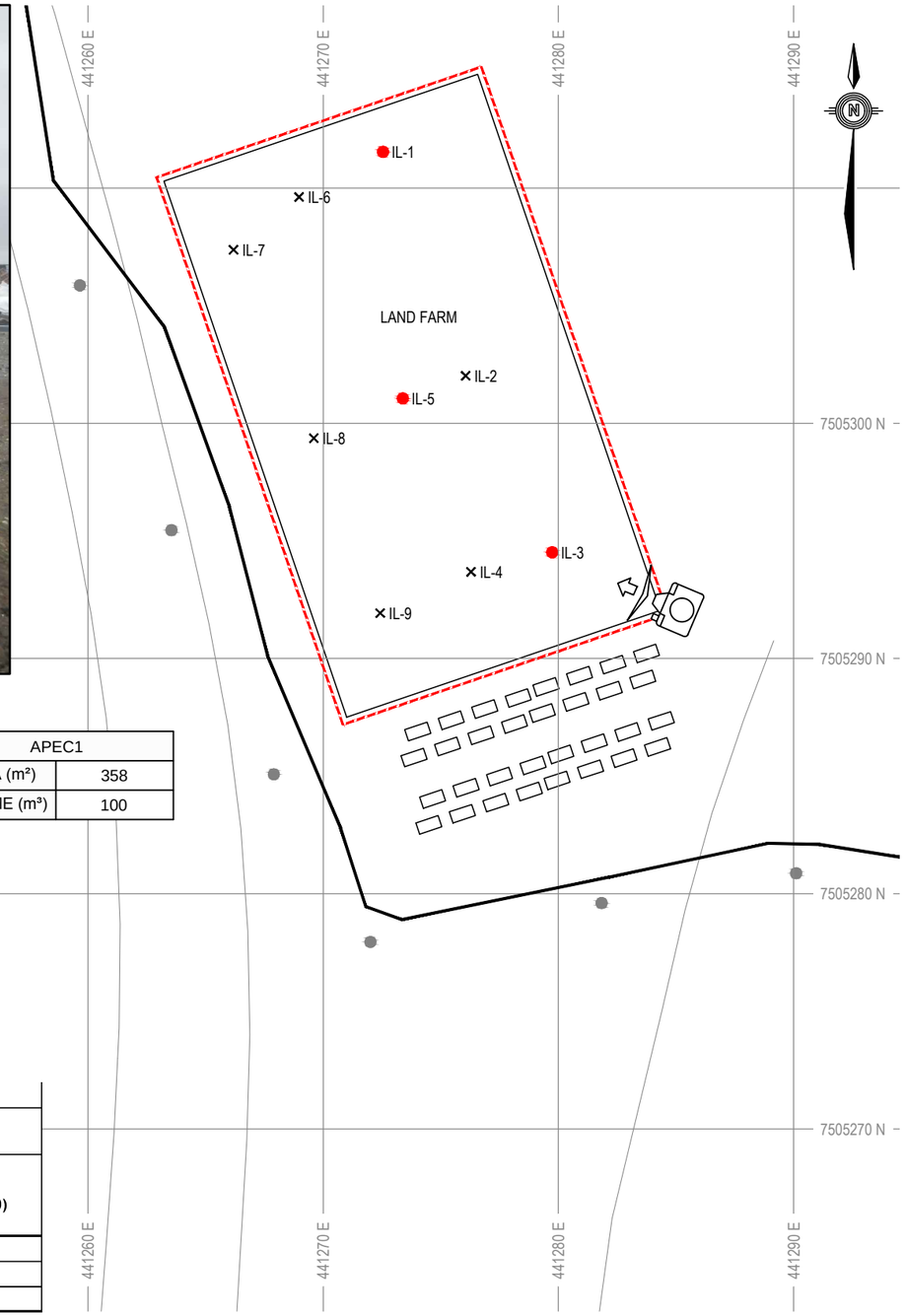
PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE: EDM
DATE: September 7, 2012

Figure 4E

Q:\Edmonton\Drafting\PROJECTS\E141\E14101223\01\Report Components\Phase 001\Autocad\E14101223_FIG 4A-4G_R0.dwg [FIGURE 4E] November 26, 2012 - 3:30:18 pm (BY: RICHMOND, BOB)





APEC1	
AREA (m²)	358
VOLUME (m³)	100

Soil Analytical Results For Hydrocarbons at APEC 1 (Inside Land Farm)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
Inside Land Farm 1	0.30 to 0.50	**0.33**	**25**	**17**	**140**	**5,300**	**47,000**	**9,600**	230
Inside Land Farm 3	0.30 to 0.50	<0.005	<0.02	<0.01	<0.04	76	**2,700**	1,400	27
Inside Land Farm 5	0 to 0.15	<0.005	0.045	0.014	<0.04	<12	**2,700**	**2,100**	76

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- - - - AREA HIGHER THAN INDUSTRIAL GUIDELINE

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

0 10 m

Scale: 1: 250

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

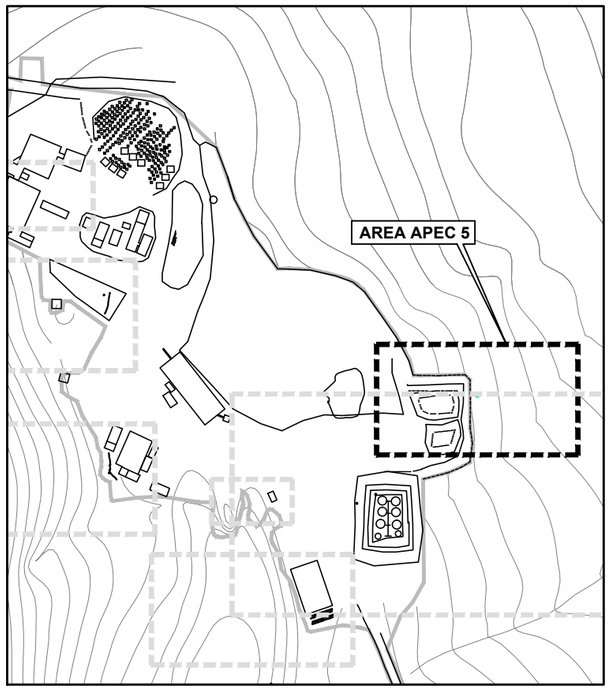
APEC 2 - INSIDE LAND FARM

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE: EDM
DATE: September 7, 2012

Figure 4F



Soil Analytical Results For Hydrocarbons at APEC 5 (Retention Pond Perimeter)

Sample Number	Sample Depth (m)	BTEX and Hydrocarbon Fractions F1 to F4 (mg/kg)							
		Benzene	Toluene	Ethylbenzene	Xylene	F1 (C6-C10)	F2 (>C10-C16)	F3 (>C16-C34)	F4 (>C34-C50)
APEC 5 - 1	0.25 to 0.50	<0.005	<0.01	<0.02	<0.04	<12	<10	28	<10
APEC 5 - 2	0.50 to 0.75	<0.005	<0.01	<0.02	<0.04	<12	<10	120	33
APEC 5 - 3	0.25 to 0.50	<0.005	<0.01	<0.02	<0.04	<12	<10	180	52

LEGEND

- ✕ - SOIL SCREENING POINT
- ● - SAMPLE BELOW TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)
- ● - SAMPLE ABOVE TIER 1 ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (INDUSTRIAL)

0 10 m

Scale: 1: 250

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

eba A TETRA TECH COMPANY

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

APEC 5 - RETENTION POND PERIMETER

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

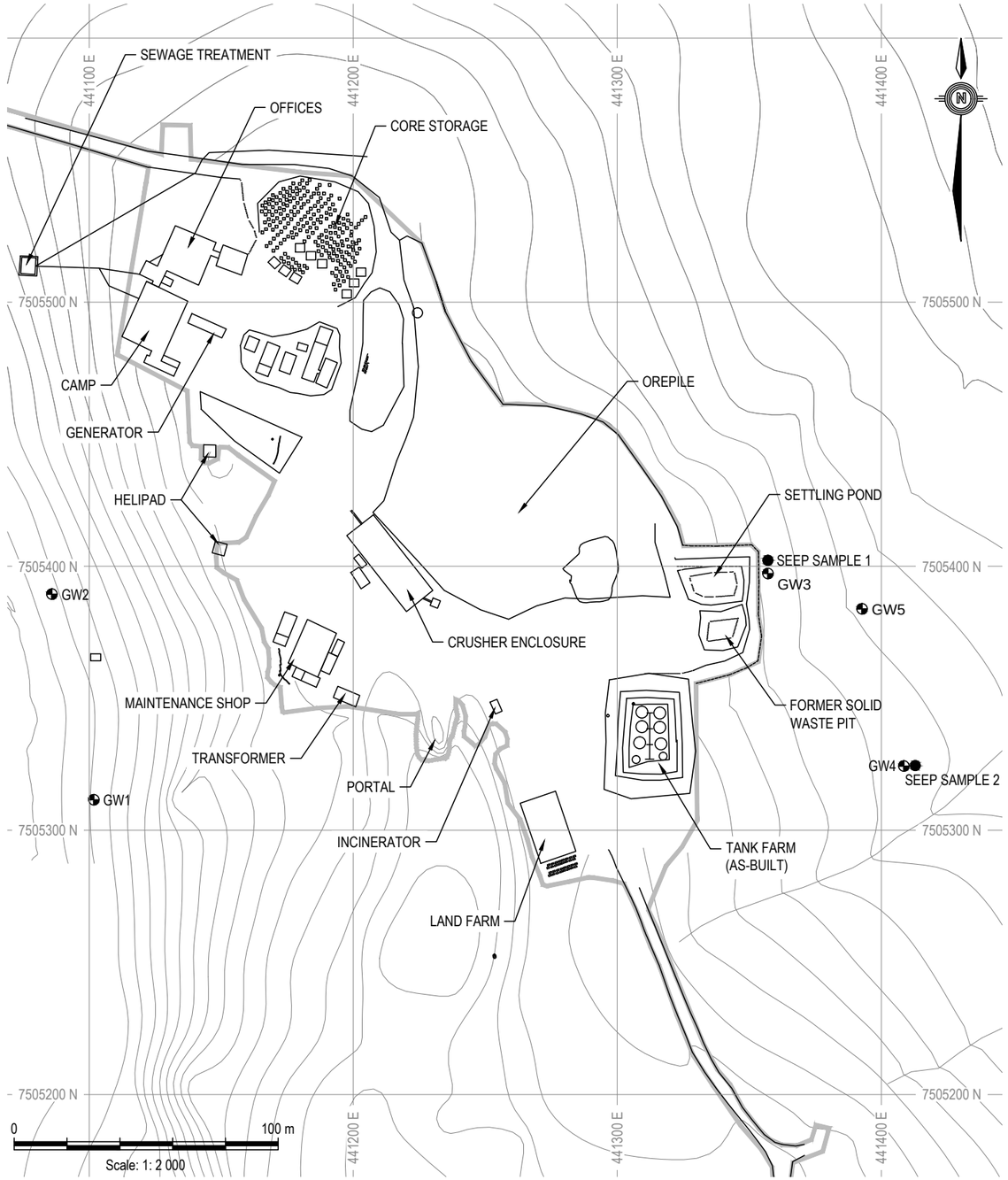
OFFICE: EDM
DATE: September 7, 2012

Figure 4G

Q:\Edmonton\Drafting\PROJECTS\E14\E14101223\01\Report Components\Phase 001\Autocad\E14101223_FIG 4A-4G_R0.dwg [FIGURE 4G] November 26, 2012 - 3:31:25 pm (BY: RICHMOND, BOB)

Groundwater and Surface Water Analytical Results for Hydrocarbons and Routine Water at Boston Camp

Test Parameter	Unit	CCME[1]	Licence No. 2BB-BOS1217	GW-1 Boston	GW-2 Boston	GW-3 Boston	GW-4 Boston	GW-5 Boston	Seep Sample 1	Seep Sample 2
BTEX and Hydrocarbon Fractions F1 to F2										
Benzene	mg/L	0.370	0.370	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Toluene	mg/L	0.002	0.002	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Ethylbenzene	mg/L	0.090	0.090	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Xylenes	mg/L	-	-	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
F1 (C6 - C10)	mg/L	-	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F2 (>C10 - C16)	mg/L	-	-	<0.30	<0.80	<0.80	<0.80	<0.30	<0.30	<0.30
Routine Water and Diss. Regulated Metals Misc. Inorganics										
Conductivity	uS/cm	-	-	3800	-	3000	-	11000	3000	2400
pH	-	6.5 to 9	6.0-9.5	7.46	-	7.21	-	6.76	7.19	7.11
Routine Water and Diss. Regulated Metals Calculated Parameters										
Anion Sum	meq/L	-	-	36	-	29	-	110	29	22
Cation Sum	meq/L	-	-	36	-	28	-	95	30	24
Hardness ($CaCO_3$)	mg/L	-	-	1500	-	1200	-	2900	1300	1000
Ion Balance	-	-	-	0.99	-	0.97	-	0.86	1.1	1.1
Dissolved Nitrate (N)	mg/L	-	-	0.47	-	19	-	0.11	36	0.008
Dissolved Nitrate (NO_3)	mg/L	13	-	2.1	-	**83**	-	0.49	**160**	0.035
Nitrate plus Nitrite (N)	mg/L	-	-	0.47	-	19	-	0.11	36	0.008
Dissolved Nitrite (N)	mg/L	-	-	<0.015	-	0.054	-	<0.030	0.012	<0.0030
Dissolved Nitrite (NO_2)	mg/L	0.06	-	<0.049	-	**0.18**	-	**<0.099**	0.039	<0.0099
Total Dissolved Solids	mg/L	-	-	2000	-	1700	-	5700	1800	1300
Routine Water and Diss. Regulated Metals Anions										
Alkalinity (PP as $CaCO_3$)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Alkalinity (Total as $CaCO_3$)	mg/L	-	-	54	-	24	-	180	24	17
Bicarbonate (HCO_3)	mg/L	-	-	66	-	29	-	220	29	21
Carbonate (CO_3)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Hydroxide (OH)	mg/L	-	-	<0.50	-	<0.50	-	<0.50	<0.50	<0.50
Dissolved Sulphate (SO_4)	mg/L	-	-	200	-	510	-	310	470	260
Dissolved Chloride (Cl)	mg/L	120	-	**1100**	-	**590**	-	**3600**	**560**	**580**
Routine Water and Diss. Regulated Metals Elements										
Dissolved Calcium (Ca)	mg/L	-	-	400	-	340	-	390	380	280
Dissolved Iron (Fe)	mg/L	0.3	-	0.22	-	**0.53**	-	**0.71**	0.17	**0.45**
Dissolved Magnesium (Mg)	mg/L	-	-	120	-	76	-	480	83	80
Dissolved Manganese (Mn)	mg/L	-	-	1.4	-	0.94	-	2.5	0.41	0.2
Dissolved Potassium (K)	mg/L	-	-	9.7	-	30	-	44	29	2.5
Dissolved Sodium (Na)	mg/L	-	-	130	-	100	-	810	86	76



LEGEND:

- GROUNDWATER MONITORING WELL LOCATION

NOTES

- GPS POINTS WERE COLLECTED IN UTM WITH NAD83 DATUM, ZONE 13, METER; CENTRAL MERIDIAN 105d W.
- **BOLD AND UNDERLINED**: VALUE GREATER THAN THE INDUSTRIAL GUIDELINE
- DEPTH SHOWN IS IN METRES BELOW BELOW GRADE

STATUS
ISSUED FOR REVIEW

CLIENT
NEWMONT

PHASE III ENVIRONMENTAL SITE ASSESSMENT
BOSTON CAMP
HOPE BAY GOLD PROJECT, NUNAVUT

GROUNDWATER AND SURFACE WATER SAMPLING LOCATIONS

eba A TETRA TECH COMPANY

PROJECT NO.	DWN	CKD	REV
E14101223	EL	MH	0

OFFICE: EDM
DATE: September 13, 2013

Figure 5

Q:\Edmonton\Drafting\PROJECTS\E14\E141012230\Report Components\Phase 000\Autocad\E14101223_FIG 5_R0.dwg [FIGURE 5] November 26, 2012 - 4:16:52 pm (BY: RICHMOND, BOB)

APPENDIX A
BOREHOLE LOGS

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, poorly graded, dry, soft, black, roots, (30 mm thick)				0
	SAND (TILL) - silty, trace of fine to medium gravel, fine to medium grained, poorly graded, loose, yellowish brown				
	END OF BOREHOLE (0.59 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.59 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-01	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	PEAT (ORGANIC) - dry, black, roots, (210 mm thick)				0
	SAND (TILL) - silty, trace of fine to medium grained, trace of clay, fine to medium grained, moist, loose, dark yellowish brown, few roots				
	END OF BOREHOLE (0.46 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.46 m
REVIEWED BY: MB	COMPLETE: 12/08/08
DRAWING NO: 14101223-02	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, damp, soft, black, roots, (110 mm thick)				0
	SAND (TILL) - silty, trace of fine to medium gravel, trace of clay, fine to medium grained, poorly graded, damp, loose, yellowish brown, few roots				
	- some silt, medium to coarse grained, wet, diesel odour				
1	END OF BOREHOLE (1.00 metre) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-03	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-04
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SAND (TILL) - some silt, medium to coarse grained, well graded, damp, loose, yellowish brown, (40 mm thick)				0
	SILT (ORGANIC) - sandy, trace of clay, fine to medium grained sand, damp, soft, black, few roots, (90 mm thick)				
	SAND (TILL) - silty, trace of clay, medium to coarse grained, well graded, damp, loose, yellowish brown, (300 mm thick)				
	SILT (ORGANIC) - silty, sandy, some clay, fine grained sand, well graded, moist, loose, low plastic, black, roots, (120 mm thick)				
	SAND (TILL) - some silt, trace of fine to medium grained, trace of clay, fine to medium grained, well graded, moist				
	END OF BOREHOLE (0.62 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.62 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-04	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-05
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - some fine grained sand, trace of clay, well graded, moist, soft, low plastic, black, roots, (70 mm thick)				0
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, occasional cobbles to 95 mm diameter, fine to medium grained, moist, soft, yellowish brown				
	END OF BOREHOLE (0.60 metres) Note: Stopped due to auger refusal.				
1					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.6 m
REVIEWED BY: MB	COMPLETE: 12/08/08
DRAWING NO: 14101223-05	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-06
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of fine to medium grained, trace of clay, fine grained sand, damp, soft, black, (60 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, fine to medium grained, moist, loose, yellowish brown, few roots		◆		
	END OF BOREHOLE (0.40 metres) Note: Stopped due to auger refusal.		◆		
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.4 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-06	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-07
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - sandy, silty, trace of fine gravel, trace of clay, fine grained sand, moist, soft, dark brown, roots, (30 mm thick)				0
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, fine to coarse grained, poorly graded, moist, loose, yellowish brown, few roots				
	END OF BOREHOLE (0.42 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.42 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-07	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-08
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, trace of fine gravel, fine grained sand, well graded, moist, soft, black, roots, (30 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of gravel, well graded, damp, loose, very dark brown, roots				
	END OF BOREHOLE (0.38 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.38 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-08	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-09
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - some sand, trace of clay, trace of gravel, well graded, damp, soft, black, roots, (70 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of gravel, well graded, moist, loose, yellowish brown, few roots				
	END OF BOREHOLE (0.47 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.47 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-09	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-10
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - some sand, trace of clay, trace of gravel, dry, soft, dark brown, roots, (40 mm thick)				0
	SAND (TILL) - silty, some fine to medium gravel, trace of clay, fine to medium grained, poorly graded, moist, loose, yellowish brown, few roots				
1	END OF BOREHOLE (1.00 metre) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-10	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-11
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - sandy, trace of clay, dry, loose, black, roots, (70 mm thick)				0
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, fine to medium grained, moist, loose, yellowish brown, roots				
1	END OF BOREHOLE (1.00 metre) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-11	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: HAND AUGER	E14101223-AEC1-12
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to coarse grained sand, damp, loose, black, roots, (30 mm thick) SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, fine to medium grained, poorly graded, moist, loose, light yellowish brown				0
1	END OF BOREHOLE (0.86 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.86 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-12	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-13
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, poorly graded, moist, soft, black, roots, (90 mm thick)				0
	SAND (TILL) - silty, some fine to medium gravel, trace of clay, trace of cobbles to 150 mm diameter, medium to coarse grained, well graded, loose, yellowish brown, few roots				
	END OF BOREHOLE (0.75 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.75 m
REVIEWED BY: MB	COMPLETE: 12/08/10
DRAWING NO: 14101223-13	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-14
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, some clay, trace of fine to medium gravel, trace of cobbles to 180 mm diameter, fine to medium grained, well graded, moist, soft, black, roots(220 mm thick)				0
	SAND (TILL) - some silt, some medium to coarse gravel, trace of cobbles to 250 mm diameter, medium to coarse grained, well graded, yellowish brown, roots				
	END OF BOREHOLE (0.50 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.5 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-14	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-15
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - trace of fine to medium grained sand, trace of clay, medium to coarse, poorly graded, moist, dense, grey, diesel odour, (240 mm thick)				0
	SILT (ORGANIC) - some fine grained sand, trace of clay, moist, soft, black, diesel odour, (20 mm thick)				
	SAND (TILL) - silty, some fine to medium gravel, trace of clay, trace of cobbles to 150 mm diameter, fine to medium grained, loose, yellowish brown, diesel odour				
	END OF BOREHOLE (0.75 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.75 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-15	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-16
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - some fine to medium cobbles, trace of sand, trace of clay, medium to coarse, moist, compact, grey, diesel odour, (240 mm thick)				0
	SILT (ORGANIC) - sandy, silty, some clay, fine grained sand, well graded, wet, low plastic, black, roots, diesel odour, (20 mm thick)				
	SAND (TILL) - silty, trace of medium to coarse gravel, occasional cobbles, fine to medium grained, well graded, wet, loose, dark brown, diesel odour				
	- free water, sheen on water				
	END OF BOREHOLE (0.75 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.75 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-16	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-17
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - some fine cobbles, trace of clay, fine to coarse, moist, compact, grey, diesel odour, (180 mm thick)				0
	SAND (TILL) - silty, trace of clay, fine to medium grained, moist, loose to compact, yellowish brown, few roots, diesel odour				
	- some clay, compact, low plastic, grey brown				
	- free water, sheen on water				
1					
	END OF BOREHOLE (1.25 metres) Note: Stopped due to auger refusal.				
					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.76 m
REVIEWED BY: MB	COMPLETE: 12/08/10
DRAWING NO: 14101223-17	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-18
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLES (FILL) - some medium to coarse grained sand, trace of clay, medium to coarse, poorly graded, dense, grey, diesel odour, (50 mm thick)				0
	SILT (ORGANIC) - silty, some fine grained sand, trace of clay, moist, compact, black, roots, diesel odour, (40 mm thick)				
	SAND (TILL) - silty, some clay, trace of gravel, trace of cobbles to 100 mm diameter, moist, loose, brown, diesel odour				
1	END OF BOREHOLE (1.00 metre) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-18	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-19
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of clay, occasional boulders to 420 mm diameter, fine to coarse gravel, fine cobbles, moist, compact, grey, (280 mm thick)				0
	SAND (TILL) - some silt, some fine to coarse gravel, trace of fine cobbles, trace of clay, medium to coarse grained, moist, loose, yellowish brown				
	END OF BOREHOLE (0.50 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.5 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-19	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-20
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - some fine grained sand, moist, loose, black, roots, (80 mm thick)				0
	SAND (TILL) - silty, some medium to coarse gravel, trace of clay, occasional cobbles, fine to coarse grained, moist, loose, yellowish brown, few roots				
	END OF BOREHOLE (0.73 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.73 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-20	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC1	DRILL: POWER AUGER	E14101223-AEC1-21
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - some medium to coarse grained sand, trace of clay, medium to coarse gravel, fine to medium cobbles to 130 mm diameter, moist, dense, grey				0
	SILT (ORGANIC) - some fine to medium grained sand, trace of clay, moist, loose, black, roots, diesel odour				
	SILT (TILL) - sandy, clayey, trace of gravel, fine grained sand, moist, compact, low plastic, dark brown, diesel odour				
1	SAND (TILL) - silty, trace of clay, fine to medium grained, moist, loose, yellowish brown, diesel odour				
	END OF BOREHOLE (1.15 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.15 m
	REVIEWED BY: MB	COMPLETE: 12/08/10
	DRAWING NO: 14101223-21	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - some sand, trace of clay, medium to coarse gravel, medium cobbles, dry, dense, grey		388		0
	- moist				
	- diesel odour		793		
			1685		
	PEAT (ORGANIC) - black, roots, diesel odour				
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, medium to coarse grained, well graded, moist, loose, light brown, diesel odour		20000		
1	- free water				
			454		5
			487		
	END OF BOREHOLE (1.75 metres)				
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.75 m
	REVIEWED BY: MB	COMPLETE: 12/08/06
	DRAWING NO: 14101223-22	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of sand, trace of clay, medium to coarse gravel, medium cobbles, dry, dense, grey				0
	- moist				
	PEAT (ORGANIC) - moist, black, roots				
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, medium to coarse grained, moist, loose, yellowish brown				
1					
	END OF BOREHOLE (1.50 metres)				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.5 m
	REVIEWED BY: MB	COMPLETE: 12/08/07
	DRAWING NO: 14101223-23	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of medium grained sand, trace of clay, occasional boulder to 335 mm thick, medium to coarse gravel and cobbles, dry, compact, light grey		116		0
	- moist, diesel odour		439		
	SILT (ORGANIC) - some sand, 5% cobbles, 3% gravel, fine granular, wet, loose, black, few rock inclusions, diesel odour		352		
1	SAND (TILL) - silty, trace of clay, trace of medium to coarse gravel, fine to medium grained, well graded, moist, diesel odour		614		
			222		
			360		
	END OF BOREHOLE (1.50 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.5 m
	REVIEWED BY: MB	COMPLETE: 12/08/07
	DRAWING NO: 14101223-24	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-04
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of clay and sand, dry, compact, grey				0
	- moist, diesel odour				
	PEAT (ORGANIC) - moist, loose, black, diesel odour				
	SAND (TILL) - some fine to medium gravel, medium to coarse grained, poorly graded, moist, loose, brownish yellow, diesel odour		918		
	SILT (ORGANIC) - sandy, trace of clay, moist, loose, black, diesel odour - boulder				
	END OF BOREHOLE (0.68 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.68 m
	REVIEWED BY: MB	COMPLETE: 12/08/07
	DRAWING NO: 14101223-25	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-05
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of clay and sand, medium to coarse gravel, fine to medium cobbles, damp, compact, slight diesel odour				0
	SILT (ORGANIC) - fine gravel, sandy, some clay, moist, loose, black, few roots				
	SAND (TILL) - silty, some fine to medium gravel, fine grained, poorly graded, damp, loose, brown				
	SILT (TILL) - sandy, some fine gravel, fine to medium grained sand, well graded, wet, loose, brown				
1	END OF BOREHOLE (1.20 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: MB	COMPLETE: 12/08/07
	DRAWING NO: 14101223-26	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-06
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of clay and silt, medium to coarse, well graded, dry, dense, grey				0
	- moist				
	SILT (ORGANIC) - some sand, moist, black, rock inclusions				
	SAND (TILL) - silty, some fine gravel, fine to medium grained, poorly graded, moist, brownish yellow				
	END OF BOREHOLE (0.75 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.75 m
	REVIEWED BY: MB	COMPLETE: 12/08/07
	DRAWING NO: 14101223-27	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-07
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of clay, trace of sand, medium to coarse gravel, medium to coarse cobbles to 180 mm diameter, well graded, dry, dense, dark grey - moist				0
	SILT (ORGANIC) - sandy, trace of fine to medium gravel, granular, few roots SAND (TILL) - silty, some angular gravel, medium to coarse grained, poorly graded, moist, loose, yellowish brown				
1	END OF BOREHOLE (1.00 metre)				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-28	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
GENERATOR #2	DRILL: POWER AUGER	E14101223-AEC2-08
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	PID READING (ppm) 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of sand, trace of clay, medium to coarse gravel, medium to coarse cobbles to 250 mm diameter, well graded, dry, dense, grey				0
	- moist, diesel odour		88		
	SILT (ORGANIC) - sandy, silty, trace of clay, trace of medium gravel, moist, soft, non plastic, black, diesel odour		155		
1					
	SAND (TILL) - silty, trace of fine to medium ravel, trace of cobbles, wet, loose, non plastic, diesel odour		217		
	END OF BOREHOLE (1.25 metres)				
					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 1.25 m
REVIEWED BY: MB	COMPLETE: 12/08/08
DRAWING NO: 14101223-29	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC3	DRILL: HAND AUGER	E14101223-AEC3-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (30 mm thick)				0
	SAND (TILL) - some silt, trace of fine to medium gravel, trace of clay, fine to medium grained, moist, loose, yellowish brown				
	- 200 mm thick silt (organic) layer - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (30 mm thick)				
1	END OF BOREHOLE (1.10 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.1 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-30	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC3	DRILL: HAND AUGER	E14101223-AEC3-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (50 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, fine to medium grained sand, moist, loose, yellowish brown, (200 mm thick)				
	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (40 mm thick)				
	SAND (TILL) - silty, trace of clay, trace of medium to coarse gravel, fine of medium grained, moist, loose, grey brown				
	END OF BOREHOLE (0.60 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.6 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-31	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC3	DRILL: HAND AUGER	E14101223-AEC3-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine grained sand, well graded, moist, soft, brown, roots, (170 mm thick)				0
	SAND (TILL) - some silt, trace of clay, trace of fine to medium gravel, fine to medium grained, moist, loose, grey brown				
	END OF BOREHOLE (0.50 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.5 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-32	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC3	DRILL: HAND AUGER	E14101223-AEC3-04
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (70 mm thick)				0
	SAND (TILL) - silty, trace of clay, fine to medium grained, poorly graded, moist, loose, yellowish brown		◆		
			◆		
			◆		
	SILT (TILL) - some fine to medium grained sand, some clay, trace of fine gravel, moist, firm, low plastic, grey		◆		
1	SAND (TILL) - silty, trace of clay, trace of medium gravel, fine to medium grained sand, wet, loose, yellowish brown		◆		
	END OF BOREHOLE (1.25 metres) Note: Stopped due to auger refusal.				
					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.25 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-33	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
AEC3	DRILL: HAND AUGER	E14101223-AEC3-05
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained, moist, soft, black, roots, (50 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, fine to medium grained, moist, loose, yellowish brown				
	- moist to wet				
1	SILT (TILL) - some fine to medium grained sand, some clay, trace of fine gravel, wet, firm, low plastic, grey				
	END OF BOREHOLE (1.20 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-34	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
INCINERATOR	DRILL: POWER AUGER	E14101223-AEC6-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - some fine to medium cobbles to 100 mm diameter, trace to fine to medium grained sand, fine to coarse, well graded, damp, compact, grey, (200 mm thick)		◆		0
	SILT (ORGANIC) - some sand, trace of clay, damp, soft, black, many roots, (230 mm thick)		◆		
	SILT (TILL) - sandy, some rounded gravel, some clay, trace of cobbles, damp, soft, low plastic, yellowish brown, iron oxide mottling				
	END OF BOREHOLE (0.50 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.5 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-35	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
INCINERATOR	DRILL: POWER AUGER	E14101223-AEC6-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - some medium and coarse cobbles to 300 mm diameter, medium to coarse, well graded, dry, dense, grey				0
	- damp				
	SILT (ORGANIC) - some sand, damp, soft, black, many roots				
	SAND (TILL) - silty, trace of medium to coarse gravel, trace of clay, fine to coarse grained, moist, loose, yellowish brown, iron oxides				
1	- 10-20 mm thick organic layer - black, iron oxide inclusions around layer				5
	END OF BOREHOLE (1.15 metres) Note: Stopped due to auger refusal.				
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.15 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-36	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
INCINERATOR	DRILL: POWER AUGER	E14101223-AEC6-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL AND COBBLE (FILL) - trace of sand, trace of clay, medium to coarse subangular gravel, medium to coarse cobbles to 230 mm diameter, well graded, dry, grey				0
	- damp				
	SILT (ORGANIC) - some sand, damp, soft, black, many roots				
	SAND (TILL) - silty, some fine to medium gravel, trace of medium cobbles to 90 mm diameter, medium to coarse grained, poorly graded, moist, loose, yellowish brown, iron oxides				
1					
	END OF BOREHOLE (1.20 metres) Note: Stopped due to auger refusal.				
					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.2 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-37	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
INCINERATOR	DRILL: POWER AUGER	E14101223-AEC6-04
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	GRAVEL (FILL) - some fine to medium cobbles to 140 mm diameter, trace of clay, trace of sand, dry, dense, grey				0
	- damp				
	PEAT (ORGANIC) - damp, compact, black, many roots				
	SILT (TILL) - gravelly, some sand, trace of clay, occasional cobble to 110 mm diameter, fine to medium, moist, soft, low plastic, black				
1	END OF BOREHOLE (1.00 metre) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/08
	DRAWING NO: 14101223-38	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, some clay, trace of fine gravel, fine to medium grained sand, well graded, moist, soft, black, roots, (60 mm thick)				0
	SAND (TILL) - some silt, some medium gravel, medium to coarse grained, well graded, moist, loose, dark brown, silt (organic) inclusions, roots				
	END OF BOREHOLE (0.56 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.56 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-39	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, some clay, trace of medium to coarse gravel, fine to medium grained sand, well graded, moist, soft, black, roots				0
	END OF BOREHOLE (0.45 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 0.45 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-40	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, some clay, trace of fine gravel, fine grained sand, well graded, moist, soft, black, roots, (50 mm thick)				0
	SAND (TILL) - some silt, trace of clay, fine to medium grained, poorly graded, moist, loose, yellowish brown, roots				
	END OF BOREHOLE (0.52 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.52 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-41	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-04
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, some clay, fine to medium grained sand, well graded, moist, soft, black, roots, (70 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, medium to coarse grained, moist, loose, yellowish brown, roots				
	- light grey brown				
1					
	END OF BOREHOLE (1.15 metres) Note: Stopped due to auger refusal.				
					5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1.15 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-42	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-05
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (50 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, medium to coarse grained, moist, loose, yellowish brown				
1	END OF BOREHOLE (1.00 metres) Note: Stopped due to auger refusal.				5
2					7

eba A TETRA TECH COMPANY	LOGGED BY: TH	COMPLETION DEPTH: 1 m
	REVIEWED BY: MB	COMPLETE: 12/08/09
	DRAWING NO: 14101223-43	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC1	DRILL: HAND AUGER	E14101223-APEC1-06
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, well graded, moist, soft, black, roots, (60 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, fine to coarse grained, moist, loose, yellowish brown				
	END OF BOREHOLE (0.50 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.5 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-44	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC5	DRILL: HAND AUGER	E14101223-APEC5-01
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, moist, soft, black, roots, no discernible odour, (110 mm thick)				0
	SAND (TILL) - silty, trace of clay, trace of fine to medium gravel, medium to coarse grained, moist, loose, yellowish brown, no discernible odour				
	END OF BOREHOLE (0.58 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.58 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-45	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC5	DRILL: HAND AUGER	E14101223-APEC5-02
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	PEAT (ORGANIC) - mesic, wet, black, (80 mm thick)				0
	SILT (TILL) - clayey, trace of fine grained sand, trace of fine to medium gravel, wet, firm, medium plastic, yellowish brown, roots - free water		◆		
	- grey brown		◆		
	END OF BOREHOLE (0.75 metres) Note: Stopped due to auger refusal.				
1					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.75 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-46	Page 1 of 1

PHASE 3 ENVIRONMENTAL SITE ASSESSMENT	HOPE BAY MINING LIMITED	PROJECT NO. - BOREHOLE NO.
APEC5	DRILL: HAND AUGER	E14101223-APEC5-03
HOPE BAY		

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	◆PID READING (ppm)◆ 10 20 30 40	NOTES & COMMENTS	Depth (ft)
0	SILT (ORGANIC) - silty, sandy, trace of clay, fine to medium grained sand, moist, soft, black, roots, (50 mm thick)				0
	SILT (TILL) - clayey, trace of fine grained sand, trace of fine gravel, moist, firm, medium plastic, yellowish brown, roots				
	END OF BOREHOLE (0.55 metres) Note: Stopped due to auger refusal.				
1					
					5
2					7

eba A TETRA TECH COMPANY

LOGGED BY: TH	COMPLETION DEPTH: 0.55 m
REVIEWED BY: MB	COMPLETE: 12/08/09
DRAWING NO: 14101223-47	Page 1 of 1

APPENDIX B
LABORATORY ANALYTICAL RESULTS

Maxxam

Success Through Science®

Your Project #: E14101223
Site Location: HOPE BAY, NT
Your C.O.C. #: A154884, A154885, A154886, A154887, A154888

Attention: MICHEL HEBERT
EBA ENGINEERING CONSULTANTS LTD.
14940-123 AVENUE
EDMONTON, AB
CANADA T5V 1B4

Report Date: 2012/09/06

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B272000
Received: 2012/08/13, 16:00

Sample Matrix: Soil
Samples Received: 48

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
BTEX/F1 by HS GC/MS (MeOH extract)	36	2012/08/16	2012/08/23	AB SOP-00039	CCME, EPA 8260C
BTEX/F1 by HS GC/MS (MeOH extract)	2	2012/08/16	2012/08/24	AB SOP-00039	CCME, EPA 8260C
CCME Hydrocarbons (F2-F4 in soil)	9	2012/08/16	2012/08/21	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	12	2012/08/16	2012/08/22	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
CCME Hydrocarbons (F2-F4 in soil)	17	2012/08/16	2012/08/23	AB SOP-00040 AB SOP-00036	CCME PHC-CWS
Moisture	48	N/A	2012/08/17	AB SOP-00002	CCME PHC-CWS
Particle Size by Sieve (75 micron)	5	N/A	2012/08/30	AB SOP-00022	SSMA 55.4

Sample Matrix: Water
Samples Received: 12

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO3,HCO3,OH	9	N/A	2012/08/16	AB SOP-00005	SM 2320-B
BTEX/F1 in Water by HS GC/MS	12	N/A	2012/08/18	AB SOP-00039	CCME, EPA 8260C
Chloride by Automated Colourimetry	9	N/A	2012/08/18	AB SOP-00020	EPA 325.2
Conductivity @25C	9	N/A	2012/08/16	AB SOP-00005	SM 2510-B
CCME Hydrocarbons in Water (F2; C10-C16)	1	2012/08/16	2012/08/20	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
CCME Hydrocarbons in Water (F2; C10-C16)	11	2012/08/16	2012/08/21	AB SOP-00040 AB SOP-00037	EPA3510C/CCME PHCCWS
Hardness	8	N/A	2012/08/21	AB WI-00065	SM 2340B
Elements by ICP - Dissolved	8	N/A	2012/08/21	AB SOP-00042	EPA 200.7
Ion Balance	8	N/A	2012/08/17	AB WI-00065	SM 1030E
Sum of cations, anions	8	N/A	2012/08/21	AB WI-00065	SM 1030E
Nitrate and Nitrite	9	N/A	2012/08/21	AB SOP-00023	SM4110B
Nitrate + Nitrite-N (calculated)	9	N/A	2012/08/21	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	2	N/A	2012/08/20	AB SOP-00023	SM 4110-B
Nitrogen, (Nitrite, Nitrate) by IC	7	N/A	2012/08/21	AB SOP-00023	SM 4110-B
pH @25°C (Alkalinity titrator)	9	N/A	2012/08/16	AB SOP-00005	SM 4500-H+B
Sulphate by Automated Colourimetry	9	N/A	2012/08/18	AB SOP-00018	EPA 375.4
Total Dissolved Solids (Calculated)	8	N/A	2012/08/21	AB WI-00065	SM 1030E

../2

Your Project #: E14101223
Site Location: HOPE BAY, NT
Your C.O.C. #: A154884, A154885, A154886, A154887, A154888

Attention: MICHEL HEBERT
EBA ENGINEERING CONSULTANTS LTD.
14940-123 AVENUE
EDMONTON, AB
CANADA T5V 1B4

Report Date: 2012/09/06

CERTIFICATE OF ANALYSIS

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Anna Gordon, Project Manager
Email: AGordon@maxxam.ca
Phone# (403) 291-3077

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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

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EE8483	EE8484	EE8485	EE8486		
Sampling Date		2012/08/11 13:50	2012/08/11 13:45	2012/08/11 14:00	2012/08/11 14:00		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-2 @ 0.25-0.5M**	**AEC1-3 @ 0.25-0.5M**	**AEC1-4 @ 0.25-0.5M**	**AEC1-5 @ 0.25-0.5M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	11	9.1	14	10	0.30	6090864

RDL = Reportable Detection Limit

Maxxam ID		EE8487	EE8488	EE8489	EE8490		
Sampling Date		2012/08/11 14:10	2012/08/11 14:10	2012/08/11 14:20	2012/08/11 14:20		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-6 @ 0.2-0.4M**	**AEC1-7 @ 0.2-0.4M**	**AEC1-11 @ 0.25-0.5M**	**AEC1-12 @ 0.25-0.5M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	11	2.4	11	12	0.30	6090864

RDL = Reportable Detection Limit

Maxxam ID		EE8491	EE8492	EE8493	EE8494		
Sampling Date		2012/08/11 13:40	2012/08/11 08:30	2012/08/11 08:35	2012/08/11 08:40		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-3 @ 0.5-0.75M**	**AEC2-1 @ 0.75-1M**	**AEC2-1 @ 1.5-1.75M**	**AEC2-2 @ 0.75-1M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	8.8	17	11	10	0.30	6090864
Sieve - Pan	%	36	N/A	N/A	N/A	0.20	6116609
Sieve - #200 (>0.075mm)	%	64	N/A	N/A	N/A	0.20	6116609
Grain Size	%	COARSE	N/A	N/A	N/A	0.20	6116609

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EE8495	EE8513	EE8514	EE8515		
Sampling Date		2012/08/11 08:50	2012/08/11 09:00	2012/08/11 09:10	2012/08/11 09:20		
COC Number		A154885	A154885	A154885	A154885		
	UNITS	**AEC2-3 @ 1.25-1.5**	**AEC2-4 @ 0.5-0.7M**	**AEC2-5 @ 0.75-1M**	**AEC2-6 @ 0.75-1M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	15	3.8	8.9	11	0.30	6090864
Sieve - Pan	%	N/A	N/A	N/A	39	0.20	6116609
Sieve - #200 (>0.075mm)	%	N/A	N/A	N/A	61	0.20	6116609
Grain Size	%	N/A	N/A	N/A	COARSE	0.20	6116609

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8516	EE8517	EE8518		EE8519		
Sampling Date		2012/08/11 09:30	2012/08/11 09:40	2012/08/11 12:10		2012/08/11 12:20		
COC Number		A154885	A154885	A154885		A154885		
	UNITS	**AEC2-7 @ 0.75-1M**	**AEC2-8 @ 0.75-1M**	**AEC3-1 @ 0.75-1M**	**QC Batch**	**AEC3-2 @ 0.25-0.5M**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	11	18	12	6090864	19	0.30	6090874

RDL = Reportable Detection Limit

Maxxam ID		EE8520	EE8521	EE8522	EE8523		
Sampling Date		2012/08/11 12:30	2012/08/11 12:40	2012/08/11 12:50	2012/08/11 09:50		
COC Number		A154885	A154885	A154885	A154885		
	UNITS	**AEC3-3 @ 0.25-0.5M**	**AEC3-4 @ 0.75-1M**	**AEC3-5 @ 0.75-1M**	**AEC6-1 @ 0.25-0.5**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	14	9.0	10	21	0.30	6090874
Sieve - Pan	%	25	N/A	N/A	N/A	0.20	6116609
Sieve - #200 (>0.075mm)	%	75	N/A	N/A	N/A	0.20	6116609
Grain Size	%	COARSE	N/A	N/A	N/A	0.20	6116609

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EE8524	EE8573	EE8574	EE8575		
Sampling Date		2012/08/11 10:00	2012/08/11 10:10	2012/08/11 10:20	2012/08/11 11:00		
COC Number		A154886	A154886	A154886	A154886		
	UNITS	**AEC6-2 @ 0.75-1M**	**AEC6-3 @ 0.75-1M**	**AEC6-4 @ 0.75-1M**	**APEC1-1 @ 0.25-0.5M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	14	14	26	31	0.30	6090874

RDL = Reportable Detection Limit

Maxxam ID		EE8576	EE8577	EE8578	EE8579		
Sampling Date		2012/08/11 11:10	2012/08/11 11:20	2012/08/11 11:30	2012/08/11 11:40		
COC Number		A154886	A154886	A154886	A154886		
	UNITS	**APEC1-2 @ 0.25-0.4M**	**APEC1-3 @ 0.25-0.5M**	**APEC1-4 @ 0.5-0.75M**	**APEC1-5 @ 0.75-1M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	66	12	11	11	0.30	6090874
Sieve - Pan	%	N/A	N/A	39	N/A	0.20	6116609
Sieve - #200 (>0.075mm)	%	N/A	N/A	61	N/A	0.20	6116609
Grain Size	%	N/A	N/A	COARSE	N/A	0.20	6116609

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8580	EE8581	EE8582	EE8583		
Sampling Date		2012/08/11 12:00	2012/08/11 10:30	2012/08/11 10:40	2012/08/11 10:50		
COC Number		A154886	A154886	A154886	A154886		
	UNITS	**APEC1-6 @ 0.25-0.5M**	**INSIDE LAND FARM 1 @ 0.3-0.5M**	**INSIDE LAND FARM 3 @ 0.3-0.5M**	**INSIDE LAND FARM 5 @ 0-0.15M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	12	41	12	11	0.30	6090874

RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF SOIL

Maxxam ID		EE8584	EE8721		EE8722	EE8769		
Sampling Date		2012/08/11 13:00	2012/08/11 13:10		2012/08/11 13:00	2012/08/11 14:30		
COC Number		A154887	A154887		A154887	A154888		
	UNITS	**APEC5-1 @ 0.25-0.5M**	**APEC5-2 @ 0.5-0.75M**	**QC Batch**	**APEC5-3 @ 0.25-0.5M**	**AEC1-13 @ 0.5-0.75M**	**RDL**	**QC Batch**
Physical Properties								
Moisture	%	12	13	6090874	25	6.6	0.30	6091444
Sieve - Pan	%	N/A	56	6116609	N/A	N/A	0.20	N/A
Sieve - #200 (>0.075mm)	%	N/A	44	6116609	N/A	N/A	0.20	N/A
Grain Size	%	N/A	FINE	6116609	N/A	N/A	0.20	N/A

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8770	EE8771	EE8772	EE8773		
Sampling Date		2012/08/11 14:30	2012/08/11 14:40	2012/08/11 14:40	2012/08/11 14:50		
COC Number		A154888	A154888	A154888	A154888		
	UNITS	**AEC1-14 @ 0.25-0.5M**	**AEC1-15 @ 0.5-0.75M**	**AEC1-16 @ 0.5-0.75M**	**AEC1-17 @ 0.75-1M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	6.3	11	8.8	11	0.30	6091444

RDL = Reportable Detection Limit

Maxxam ID		EE8774	EE8775	EE8776	EE8777		
Sampling Date		2012/08/11 14:50	2012/08/11 15:00	2012/08/11 15:00	2012/08/11 15:10		
COC Number		A154888	A154888	A154888	A154888		
	UNITS	**AEC1-18 @ 0.75-1M**	**AEC1-19 @ 0.25-0.5M**	**AEC1-20 @ 0.5-0.75M**	**AEC1-21 @ 0.75-1M**	**RDL**	**QC Batch**
Physical Properties							
Moisture	%	12	7.3	6.8	13	0.30	6091444

RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8483	EE8484	EE8486	EE8488		
Sampling Date		2012/08/11 13:50	2012/08/11 13:45	2012/08/11 14:00	2012/08/11 14:10		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-2 @ 0.25-0.5M**	**AEC1-3 @ 0.25-0.5M**	**AEC1-5 @ 0.25-0.5M**	**AEC1-7 @ 0.2-0.4M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	88	<10	<10	10	6100111
F3 (C16-C34 Hydrocarbons)	mg/kg	15	38	<10	17	10	6100111
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	6100111
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6100111
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	107	96	94	90	N/A	6100111

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8491	EE8492	EE8493	EE8494		
Sampling Date		2012/08/11 13:40	2012/08/11 08:30	2012/08/11 08:35	2012/08/11 08:40		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-3 @ 0.5-0.75M**	**AEC2-1 @ 0.75-1M**	**AEC2-1 @ 1.5-1.75M**	**AEC2-2 @ 0.75-1M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	16	11000	6000	<10	10	6100111
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	1700	680	<10	10	6100111
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	14	<10	<10	10	6100111
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6100111
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	88	92	91	95	N/A	6100111

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8495	EE8513	EE8514	EE8515		
Sampling Date		2012/08/11 08:50	2012/08/11 09:00	2012/08/11 09:10	2012/08/11 09:20		
COC Number		A154885	A154885	A154885	A154885		
	UNITS	**AEC2-3 @ 1.25-1.5**	**AEC2-4 @ 0.5-0.7M**	**AEC2-5 @ 0.75-1M**	**AEC2-6 @ 0.75-1M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	4100	1800	<10	<10	10	6100111
F3 (C16-C34 Hydrocarbons)	mg/kg	800	600	<10	<10	10	6100111
F4 (C34-C50 Hydrocarbons)	mg/kg	28	<10	<10	17	10	6100111
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6100111
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	87	91	92	98	N/A	6100111

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8516	EE8517	EE8518		EE8520		
Sampling Date		2012/08/11 09:30	2012/08/11 09:40	2012/08/11 12:10		2012/08/11 12:30		
COC Number		A154885	A154885	A154885		A154885		
	UNITS	**AEC2-7 @ 0.75-1M**	**AEC2-8 @ 0.75-1M**	**AEC3-1 @ 0.75-1M**	**QC Batch**	**AEC3-3 @ 0.25-0.5M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	41	7600	<10	6100111	<10	10	6108077
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	1500	65	6100111	74	10	6108077
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	50	16	6100111	28	10	6108077
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	6100111	Yes	N/A	6108077
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	89	91	93	6100111	104	N/A	6108077

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8522	EE8524	EE8574	EE8575		
Sampling Date		2012/08/11 12:50	2012/08/11 10:00	2012/08/11 10:20	2012/08/11 11:00		
COC Number		A154885	A154886	A154886	A154886		
	UNITS	**AEC3-5 @ 0.75-1M**	**AEC6-2 @ 0.75-1M**	**AEC6-4 @ 0.75-1M**	**APEC1-1 @ 0.25-0.5M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	<10	10	6108077
F3 (C16-C34 Hydrocarbons)	mg/kg	18	27	190	280	10	6108077
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	60	150	10	6108077
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6108077
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	98	89	101	98	N/A	6108077

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8577	EE8578		EE8580		EE8581		
Sampling Date		2012/08/11 11:20	2012/08/11 11:30		2012/08/11 12:00		2012/08/11 10:30		
COC Number		A154886	A154886		A154886		A154886		
	UNITS	**APEC1-3 @ 0.25-0.5M**	**APEC1-4 @ 0.5-0.75M**	**RDL**	**APEC1-6 @ 0.25-0.5M**	**RDL**	**INSIDE LAND FARM 1 @ 0.3-0.5M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon									
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	10	<10	10	47000	10	6108077
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	10	10	<10	10	9600	10	6108077
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	10	<20 (1)	20	230	10	6108077
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	Yes	N/A	Yes	N/A	6108077
Surrogate Recovery (%)									
O-TERPHENYL (sur.)	%	94	107	N/A	102	N/A	72	N/A	6108077

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limit raised due to interferent.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8582	EE8583	EE8584	EE8721		
Sampling Date		2012/08/11 10:40	2012/08/11 10:50	2012/08/11 13:00	2012/08/11 13:10		
COC Number		A154886	A154886	A154887	A154887		
	UNITS	**INSIDE LAND FARM 3 @ 0.3-0.5M**	**INSIDE LAND FARM 5 @ 0-0.15M**	**APEC5-1 @ 0.25-0.5M**	**APEC5-2 @ 0.5-0.75M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	2700	2700	<10	<10	10	6108077
F3 (C16-C34 Hydrocarbons)	mg/kg	1400	2100	28	120	10	6108077
F4 (C34-C50 Hydrocarbons)	mg/kg	27	76	<10	33	10	6108077
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6108077
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	91	86	91	86	N/A	6108077

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8722	EE8769	EE8770		EE8771		
Sampling Date		2012/08/11 13:00	2012/08/11 14:30	2012/08/11 14:30		2012/08/11 14:40		
COC Number		A154887	A154888	A154888		A154888		
	UNITS	**APEC5-3 @ 0.25-0.5M**	**AEC1-13 @ 0.5-0.75M**	**AEC1-14 @ 0.25-0.5M**	**QC Batch**	**AEC1-15 @ 0.5-0.75M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon								
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	<10	6108077	<10	10	6100111
F3 (C16-C34 Hydrocarbons)	mg/kg	180	48	83	6108077	67	10	6100111
F4 (C34-C50 Hydrocarbons)	mg/kg	52	13	23	6108077	46	10	6100111
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	6108077	Yes	N/A	6100111
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	85	90	93	6108077	106	N/A	6100111

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8772	EE8773	EE8774	EE8775		
Sampling Date		2012/08/11 14:40	2012/08/11 14:50	2012/08/11 14:50	2012/08/11 15:00		
COC Number		A154888	A154888	A154888	A154888		
	UNITS	**AEC1-16 @ 0.5-0.75M**	**AEC1-17 @ 0.75-1M**	**AEC1-18 @ 0.75-1M**	**AEC1-19 @ 0.25-0.5M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon							
F2 (C10-C16 Hydrocarbons)	mg/kg	16	<10	<10	<10	10	6100111
F3 (C16-C34 Hydrocarbons)	mg/kg	<10	<10	31	74	10	6100111
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	<10	<10	11	10	6100111
Reached Baseline at C50	mg/kg	Yes	Yes	Yes	Yes	N/A	6100111
Surrogate Recovery (%)							
O-TERPHENYL (sur.)	%	101	101	96	100	N/A	6100111

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam ID		EE8776	EE8777		
Sampling Date		2012/08/11 15:00	2012/08/11 15:10		
COC Number		A154888	A154888		
	UNITS	**AEC1-20 @ 0.5-0.75M**	**AEC1-21 @ 0.75-1M**	**RDL**	**QC Batch**
Ext. Pet. Hydrocarbon					
F2 (C10-C16 Hydrocarbons)	mg/kg	<10	<10	10	6108077
F3 (C16-C34 Hydrocarbons)	mg/kg	22	78	10	6108077
F4 (C34-C50 Hydrocarbons)	mg/kg	<10	23	10	6108077
Reached Baseline at C50	mg/kg	Yes	Yes	N/A	6108077
Surrogate Recovery (%)					
O-TERPHENYL (sur.)	%	85	94	N/A	6108077

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8483	EE8484	EE8486	EE8488		
Sampling Date		2012/08/11 13:50	2012/08/11 13:45	2012/08/11 14:00	2012/08/11 14:10		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-2 @ 0.25-0.5M**	**AEC1-3 @ 0.25-0.5M**	**AEC1-5 @ 0.25-0.5M**	**AEC1-7 @ 0.2-0.4M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6098991
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098991
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6098991
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098991
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098991
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098991
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6098991
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6098991
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	106	99	86	109	N/A	6098991
4-BROMOFLUOROBENZENE (sur.)	%	99	109	90	102	N/A	6098991
D10-ETHYLBENZENE (sur.)	%	97	96	85	103	N/A	6098991
D4-1,2-DICHLOROETHANE (sur.)	%	91	84	73	87	N/A	6098991

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8491	EE8492	EE8493	EE8494		
Sampling Date		2012/08/11 13:40	2012/08/11 08:30	2012/08/11 08:35	2012/08/11 08:40		
COC Number		A154884	A154884	A154884	A154884		
	UNITS	**AEC1-3 @ 0.5-0.75M**	**AEC2-1 @ 0.75-1M**	**AEC2-1 @ 1.5-1.75M**	**AEC2-2 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	0.034	0.087	<0.0050	0.0050	6098991
Toluene	mg/kg	<0.020	2.0	1.8	<0.020	0.020	6098991
Ethylbenzene	mg/kg	<0.010	7.3	9.1	<0.010	0.010	6098991
Xylenes (Total)	mg/kg	<0.040	100	55	<0.040	0.040	6098991
m & p-Xylene	mg/kg	<0.040	59	34	<0.040	0.040	6098991
o-Xylene	mg/kg	<0.020	41	21	<0.020	0.020	6098991
F1 (C6-C10) - BTEX	mg/kg	<12	5600	3000	<12	12	6098991
(C6-C10)	mg/kg	<12	5800	3100	<12	12	6098991
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	105	87	95	106	N/A	6098991
4-BROMOFLUOROBENZENE (sur.)	%	103	83	107	102	N/A	6098991
D10-ETHYLBENZENE (sur.)	%	98	88	101	103	N/A	6098991
D4-1,2-DICHLOROETHANE (sur.)	%	85	74	78	90	N/A	6098991

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8495		EE8513		EE8514		
Sampling Date		2012/08/11 08:50		2012/08/11 09:00		2012/08/11 09:10		
COC Number		A154885		A154885		A154885		
	UNITS	**AEC2-3 @ 1.25-1.5**	**RDL**	**AEC2-4 @ 0.5-0.7M**	**RDL**	**AEC2-5 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles								
Benzene	mg/kg	0.077	0.0050	<0.0050	0.0050	0.0090	0.0050	6098991
Toluene	mg/kg	0.59	0.020	<0.020	0.020	0.11	0.020	6098991
Ethylbenzene	mg/kg	2.8	0.010	<0.012 (1)	0.012	0.032	0.010	6098991
Xylenes (Total)	mg/kg	35	0.040	<0.040	0.040	0.16	0.040	6098991
m & p-Xylene	mg/kg	23	0.040	<0.040	0.040	0.10	0.040	6098991
o-Xylene	mg/kg	12	0.020	<0.020	0.020	0.062	0.020	6098991
F1 (C6-C10) - BTEX	mg/kg	500	12	150	12	<12	12	6098991
(C6-C10)	mg/kg	530	12	150	12	<12	12	6098991
Surrogate Recovery (%)								
1,4-Difluorobenzene (sur.)	%	100	N/A	104	N/A	108	N/A	6098991
4-BROMOFLUOROBENZENE (sur.)	%	92	N/A	100	N/A	93	N/A	6098991
D10-ETHYLBENZENE (sur.)	%	110	N/A	118	N/A	107	N/A	6098991
D4-1,2-DICHLOROETHANE (sur.)	%	65	N/A	72	N/A	73	N/A	6098991

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limits raised due to matrix interference.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8515	EE8516	EE8517	EE8518		
Sampling Date		2012/08/11 09:20	2012/08/11 09:30	2012/08/11 09:40	2012/08/11 12:10		
COC Number		A154885	A154885	A154885	A154885		
	UNITS	**AEC2-6 @ 0.75-1M**	**AEC2-7 @ 0.75-1M**	**AEC2-8 @ 0.75-1M**	**AEC3-1 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	0.13	<0.0050	0.0050	6098991
Toluene	mg/kg	<0.020	<0.020	4.3	<0.020	0.020	6098991
Ethylbenzene	mg/kg	<0.010	0.013	3.9	<0.010	0.010	6098991
Xylenes (Total)	mg/kg	<0.040	0.079	34	<0.040	0.040	6098991
m & p-Xylene	mg/kg	<0.040	0.050	22	<0.040	0.040	6098991
o-Xylene	mg/kg	<0.020	0.029	12	<0.020	0.020	6098991
F1 (C6-C10) - BTEX	mg/kg	<12	<12	630	<12	12	6098991
(C6-C10)	mg/kg	<12	<12	670	<12	12	6098991
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	100	103	103	99	N/A	6098991
4-BROMOFLUOROBENZENE (sur.)	%	92	90	91	92	N/A	6098991
D10-ETHYLBENZENE (sur.)	%	103	104	95	103	N/A	6098991
D4-1,2-DICHLOROETHANE (sur.)	%	75	74	76	71	N/A	6098991

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8520	EE8522	EE8524	EE8574		
Sampling Date		2012/08/11 12:30	2012/08/11 12:50	2012/08/11 10:00	2012/08/11 10:20		
COC Number		A154885	A154885	A154886	A154886		
	UNITS	**AEC3-3 @ 0.25-0.5M**	**AEC3-5 @ 0.75-1M**	**AEC6-2 @ 0.75-1M**	**AEC6-4 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6098991
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098991
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6098991
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098991
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098991
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098991
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6098991
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6098991
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	103	106	107	87	N/A	6098991
4-BROMOFLUOROBENZENE (sur.)	%	102	93	90	75	N/A	6098991
D10-ETHYLBENZENE (sur.)	%	98	105	100	79	N/A	6098991
D4-1,2-DICHLOROETHANE (sur.)	%	78	78	77	74	N/A	6098991

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8575		EE8577	EE8578		
Sampling Date		2012/08/11 11:00		2012/08/11 11:20	2012/08/11 11:30		
COC Number		A154886		A154886	A154886		
	UNITS	**APEC1-1 @ 0.25-0.5M**	**QC Batch**	**APEC1-3 @ 0.25-0.5M**	**APEC1-4 @ 0.5-0.75M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	6098991	<0.0050	<0.0050	0.0050	6098994
Toluene	mg/kg	<0.020	6098991	<0.020	<0.020	0.020	6098994
Ethylbenzene	mg/kg	<0.010	6098991	<0.010	<0.010	0.010	6098994
Xylenes (Total)	mg/kg	<0.040	6098991	<0.040	<0.040	0.040	6098994
m & p-Xylene	mg/kg	<0.040	6098991	<0.040	<0.040	0.040	6098994
o-Xylene	mg/kg	<0.020	6098991	<0.020	<0.020	0.020	6098994
F1 (C6-C10) - BTEX	mg/kg	<12	6098991	<12	<12	12	6098994
(C6-C10)	mg/kg	<12	6098991	<12	<12	12	6098994
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	96	6098991	108	110	N/A	6098994
4-BROMOFLUOROBENZENE (sur.)	%	83	6098991	97	126	N/A	6098994
D10-ETHYLBENZENE (sur.)	%	88	6098991	86	87	N/A	6098994
D4-1,2-DICHLOROETHANE (sur.)	%	79	6098991	117	130	N/A	6098994

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8580	EE8581	EE8582	EE8583		
Sampling Date		2012/08/11 12:00	2012/08/11 10:30	2012/08/11 10:40	2012/08/11 10:50		
COC Number		A154886	A154886	A154886	A154886		
	UNITS	**APEC1-6 @ 0.25-0.5M**	**INSIDE LAND FARM 1 @ 0.3-0.5M**	**INSIDE LAND FARM 3 @ 0.3-0.5M**	**INSIDE LAND FARM 5 @ 0-0.15M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	0.33	<0.0050	<0.0050	0.0050	6098994
Toluene	mg/kg	<0.020	25	<0.020	0.045	0.020	6098994
Ethylbenzene	mg/kg	<0.010	17	<0.010	0.014	0.010	6098994
Xylenes (Total)	mg/kg	<0.040	140	<0.040	<0.040	0.040	6098994
m & p-Xylene	mg/kg	<0.040	73	<0.040	<0.040	0.040	6098994
o-Xylene	mg/kg	<0.020	68	<0.020	<0.020	0.020	6098994
F1 (C6-C10) - BTEX	mg/kg	<12	5100	76	<12	12	6098994
(C6-C10)	mg/kg	<12	5300	76	<12	12	6098994
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	105	115	97	97	N/A	6098994
4-BROMOFLUOROBENZENE (sur.)	%	104	93	106	104	N/A	6098994
D10-ETHYLBENZENE (sur.)	%	85	83	79	96	N/A	6098994
D4-1,2-DICHLOROETHANE (sur.)	%	117	127	100	126	N/A	6098994

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8584	EE8721	EE8722	EE8769		
Sampling Date		2012/08/11 13:00	2012/08/11 13:10	2012/08/11 13:00	2012/08/11 14:30		
COC Number		A154887	A154887	A154887	A154888		
	UNITS	**APEC5-1 @ 0.25-0.5M**	**APEC5-2 @ 0.5-0.75M**	**APEC5-3 @ 0.25-0.5M**	**AEC1-13 @ 0.5-0.75M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6098994
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098994
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6098994
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098994
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6098994
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6098994
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	100	86	97	90	N/A	6098994
4-BROMOFLUOROBENZENE (sur.)	%	98	97	94	90	N/A	6098994
D10-ETHYLBENZENE (sur.)	%	85	83	82	95	N/A	6098994
D4-1,2-DICHLOROETHANE (sur.)	%	108	99	112	81	N/A	6098994

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8770	EE8771	EE8772	EE8773		
Sampling Date		2012/08/11 14:30	2012/08/11 14:40	2012/08/11 14:40	2012/08/11 14:50		
COC Number		A154888	A154888	A154888	A154888		
	UNITS	**AEC1-14 @ 0.25-0.5M**	**AEC1-15 @ 0.5-0.75M**	**AEC1-16 @ 0.5-0.75M**	**AEC1-17 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6098994
Toluene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098994
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6098994
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098994
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6098994
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6098994
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	100	100	100	108	N/A	6098994
4-BROMOFLUOROBENZENE (sur.)	%	102	113	96	97	N/A	6098994
D10-ETHYLBENZENE (sur.)	%	87	83	93	88	N/A	6098994
D4-1,2-DICHLOROETHANE (sur.)	%	105	107	113	116	N/A	6098994

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (SOIL)

Maxxam ID		EE8774	EE8775	EE8776	EE8777		
Sampling Date		2012/08/11 14:50	2012/08/11 15:00	2012/08/11 15:00	2012/08/11 15:10		
COC Number		A154888	A154888	A154888	A154888		
	UNITS	**AEC1-18 @ 0.75-1M**	**AEC1-19 @ 0.25-0.5M**	**AEC1-20 @ 0.5-0.75M**	**AEC1-21 @ 0.75-1M**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/kg	<0.0050	<0.0050	<0.0050	<0.0050	0.0050	6098994
Toluene	mg/kg	<0.020	<0.020	<0.020	0.35	0.020	6098994
Ethylbenzene	mg/kg	<0.010	<0.010	<0.010	<0.010	0.010	6098994
Xylenes (Total)	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
m & p-Xylene	mg/kg	<0.040	<0.040	<0.040	<0.040	0.040	6098994
o-Xylene	mg/kg	<0.020	<0.020	<0.020	<0.020	0.020	6098994
F1 (C6-C10) - BTEX	mg/kg	<12	<12	<12	<12	12	6098994
(C6-C10)	mg/kg	<12	<12	<12	<12	12	6098994
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	101	102	96	97	N/A	6098994
4-BROMOFLUOROBENZENE (sur.)	%	85	102	100	101	N/A	6098994
D10-ETHYLBENZENE (sur.)	%	83	90	92	85	N/A	6098994
D4-1,2-DICHLOROETHANE (sur.)	%	97	108	112	109	N/A	6098994

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EE8758		EE8760		EE8763		
Sampling Date		2012/08/12 09:00		2012/08/12 09:30		2012/08/12 10:00		
COC Number		A154887		A154887		A154887		
	UNITS	**GW-1 BOSTON**	**RDL**	**GW-3 BOSTON**	**RDL**	**GW-5 BOSTON**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	meq/L	36	N/A	29	N/A	110	N/A	6085516
Cation Sum	meq/L	36	N/A	28	N/A	95	N/A	6085516
Hardness (CaCO3)	mg/L	1500	0.50	1200	0.50	2900	0.50	6085502
Ion Balance	N/A	0.99	0.010	0.97	0.010	0.86	0.010	6085505
Dissolved Nitrate (NO3)	mg/L	2.1	0.066	83	0.66	0.49	0.13	6085549
Nitrate plus Nitrite (N)	mg/L	0.47	0.015	19	0.15	0.11	0.030	6085574
Dissolved Nitrite (NO2)	mg/L	<0.049	0.049	0.18	0.099	<0.099	0.099	6085549
Total Dissolved Solids	mg/L	2000	10	1700	10	5700	10	6085577
Misc. Inorganics								
Conductivity	uS/cm	3800	1.0	3000	1.0	11000	1.0	6087222
pH	N/A	7.46	N/A	7.21	N/A	6.76	N/A	6087225
Anions								
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Alkalinity (Total as CaCO3)	mg/L	54	0.50	24	0.50	180	0.50	6087215
Bicarbonate (HCO3)	mg/L	66	0.50	29	0.50	220	0.50	6087215
Carbonate (CO3)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Hydroxide (OH)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Dissolved Sulphate (SO4)	mg/L	200	1.0	510 (1)	5.0	310 (1)	2.0	6094857
Dissolved Chloride (Cl)	mg/L	1100 (1)	10	590 (1)	5.0	3600 (1)	25	6094856
Nutrients								
Dissolved Nitrite (N)	mg/L	<0.015 (2)	0.015	0.054 (3)	0.030	<0.030 (4)	0.030	6097798
Dissolved Nitrate (N)	mg/L	0.47 (5)	0.015	19 (6)	0.15	0.11 (4)	0.030	6097798

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Detection limits raised due to matrix interference.
Sample was analyzed after holding time expired.
(3) Sample was analyzed after holding time expired.
Detection limits raised due to sample matrix.
(4) Sample was analyzed after holding time expired.
Detection limits raised due to matrix interference.
(5) Sample was analyzed after holding time expired.Detection limits raised due to matrix interference.
(6) Sample was analyzed after holding time expired.Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EE8765			EE8766		EE8767		
Sampling Date		2012/08/12 11:20			2012/08/12 11:40		2012/08/12 13:30		
COC Number		A154887			A154887		A154887		
	UNITS	**PW-2**	**RDL**	**QC Batch**	**PW-5**	**RDL**	**W-1**	**RDL**	**QC Batch**
Calculated Parameters									
Anion Sum	meq/L	100	N/A	6085516	N/A	N/A	55	N/A	6086211
Cation Sum	meq/L	91	N/A	6085516	N/A	N/A	50	N/A	6086211
Hardness (CaCO3)	mg/L	3300	0.50	6086209	N/A	0.50	1100	0.50	6086209
Ion Balance	N/A	0.90	0.010	6085505	N/A	0.010	0.92	0.010	6086210
Dissolved Nitrate (NO3)	mg/L	2.0	0.13	6085549	<0.066	0.066	0.11	0.066	6085549
Nitrate plus Nitrite (N)	mg/L	0.45	0.030	6085574	<0.015	0.015	0.025	0.015	6086212
Dissolved Nitrite (NO2)	mg/L	<0.099	0.099	6085549	<0.049	0.049	<0.049	0.049	6085549
Total Dissolved Solids	mg/L	5400	10	6085577	N/A	10	3000	10	6086213
Misc. Inorganics									
Conductivity	uS/cm	8900	1.0	6087222	8600	1.0	5200	1.0	6087222
pH	N/A	6.77	N/A	6087225	6.96	N/A	7.82	N/A	6087225
Anions									
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	6087215	<0.50	0.50	<0.50	0.50	6087215
Alkalinity (Total as CaCO3)	mg/L	38	0.50	6087215	75	0.50	520	0.50	6087215
Bicarbonate (HCO3)	mg/L	46	0.50	6087215	91	0.50	640	0.50	6087215
Carbonate (CO3)	mg/L	<0.50	0.50	6087215	<0.50	0.50	<0.50	0.50	6087215
Hydroxide (OH)	mg/L	<0.50	0.50	6087215	<0.50	0.50	<0.50	0.50	6087215
Dissolved Sulphate (SO4)	mg/L	1000 (1)	10	6094857	98 (2)	10	540 (1)	5.0	6094857
Dissolved Chloride (Cl)	mg/L	2800 (1)	20	6094856	3200 (1)	50	1200 (1)	10	6094856
Nutrients									
Dissolved Nitrite (N)	mg/L	<0.030 (3)	0.030	6097798	<0.015 (4)	0.015	<0.015 (3)	0.015	6097798
Dissolved Nitrate (N)	mg/L	0.45 (3)	0.030	6097798	<0.015 (4)	0.015	0.025 (3)	0.015	6097798

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Due to the sample matrix, sample required dilution. Detection limit was adjusted accordingly
(3) Sample was analyzed after holding time expired.
Detection limits raised due to matrix interference.
(4) Sample was analyzed after holding time expired.
Detection limits raised due to insufficient sample volume.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		EE8768		EE8778		EE8779		
Sampling Date		2012/08/12 14:00		2012/08/12 10:10		2012/08/12 10:20		
COC Number		A154888		A154888		A154888		
	UNITS	**W-3**	**RDL**	**SEEP SAMPLE 1 (SS1)**	**RDL**	**SEEP SAMPLE 2 (SS2)**	**RDL**	**QC Batch**
Calculated Parameters								
Anion Sum	meq/L	20	N/A	29	N/A	22	N/A	6086211
Cation Sum	meq/L	19	N/A	30	N/A	24	N/A	6086211
Hardness (CaCO3)	mg/L	470	0.50	1300	0.50	1000	0.50	6086209
Ion Balance	N/A	0.93	0.010	1.1	0.010	1.1	0.010	6086210
Dissolved Nitrate (NO3)	mg/L	0.018	0.013	160	0.066	0.035	0.013	6085549
Nitrate plus Nitrite (N)	mg/L	0.0040	0.0030	36	0.015	0.0080	0.0030	6086212
Dissolved Nitrite (NO2)	mg/L	<0.0099	0.0099	0.039	0.0099	<0.0099	0.0099	6085549
Total Dissolved Solids	mg/L	1100	10	1800	10	1300	10	6086213
Misc. Inorganics								
Conductivity	uS/cm	2100	1.0	3000	1.0	2400	1.0	6087222
pH	N/A	6.84	N/A	7.19	N/A	7.11	N/A	6087225
Anions								
Alkalinity (PP as CaCO3)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Alkalinity (Total as CaCO3)	mg/L	200	0.50	24	0.50	17	0.50	6087215
Bicarbonate (HCO3)	mg/L	250	0.50	29	0.50	21	0.50	6087215
Carbonate (CO3)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Hydroxide (OH)	mg/L	<0.50	0.50	<0.50	0.50	<0.50	0.50	6087215
Dissolved Sulphate (SO4)	mg/L	190	1.0	470 (1)	5.0	260 (1)	2.0	6094857
Dissolved Chloride (Cl)	mg/L	430 (1)	5.0	560 (1)	5.0	580 (1)	5.0	6094856
Nutrients								
Dissolved Nitrite (N)	mg/L	<0.0030 (2)	0.0030	0.012 (2)	0.0030	<0.0030 (2)	0.0030	6097798
Dissolved Nitrate (N)	mg/L	0.0040 (2)	0.0030	36 (3)	0.015	0.0080 (2)	0.0030	6097798

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.
(2) Sample was analyzed after holding time expired.
(3) Sample was analyzed after holding time expired.
Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8758		EE8759	EE8760	EE8761		
Sampling Date		2012/08/12 09:00		2012/08/12 09:15	2012/08/12 09:30	2012/08/12 09:45		
COC Number		A154887		A154887	A154887	A154887		
	UNITS	**GW-1 BOSTON**	**RDL**	**GW-2 BOSTON**	**GW-3 BOSTON**	**GW-4 BOSTON**	**RDL**	**QC Batch**
Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.30 (1)	0.30	<0.80 (1)	<0.80 (1)	<0.80 (1)	0.80	6090795
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	110	N/A	104	108	92	N/A	6090795

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis

Maxxam ID		EE8763		EE8764		EE8765		
Sampling Date		2012/08/12 10:00		2012/08/12 11:00		2012/08/12 11:20		
COC Number		A154887		A154887		A154887		
	UNITS	**GW-5 BOSTON**	**RDL**	**PW-1**	**RDL**	**PW-2**	**RDL**	**QC Batch**
Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.30 (1)	0.30	<0.50 (1)	0.50	<0.30 (1)	0.30	6090795
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	89	N/A	91	N/A	92	N/A	6090795

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis

Maxxam ID		EE8766		EE8767	EE8768	EE8778		
Sampling Date		2012/08/12 11:40		2012/08/12 13:30	2012/08/12 14:00	2012/08/12 10:10		
COC Number		A154887		A154887	A154888	A154888		
	UNITS	**PW-5**	**RDL**	**W-1**	**W-3**	**SEEP SAMPLE 1 (SS1)**	**RDL**	**QC Batch**
Hydrocarbons								
F2 (C10-C16 Hydrocarbons)	mg/L	<0.40 (1)	0.40	<0.30 (1)	<0.30 (1)	<0.30 (1)	0.30	6090795
Surrogate Recovery (%)								
O-TERPHENYL (sur.)	%	110	N/A	102	107	114	N/A	6090795

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		EE8779		
Sampling Date		2012/08/12 10:20		
COC Number		A154888		
	UNITS	**SEEP SAMPLE 2 (SS2)**	**RDL**	**QC Batch**
Hydrocarbons				
F2 (C10-C16 Hydrocarbons)	mg/L	<0.30 (1)	0.30	6090795
Surrogate Recovery (%)				
O-TERPHENYL (sur.)	%	109	N/A	6090795

N/A = Not Applicable
RDL = Reportable Detection Limit
(1) Detection limit raised based on sample volume used for analysis

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EE8758	EE8760		EE8763		
Sampling Date		2012/08/12 09:00	2012/08/12 09:30		2012/08/12 10:00		
COC Number		A154887	A154887		A154887		
	UNITS	**GW-1 BOSTON**	**GW-3 BOSTON**	**RDL**	**GW-5 BOSTON**	**RDL**	**QC Batch**
Elements							
Dissolved Calcium (Ca)	mg/L	400	340	0.30	390	0.30	6086248
Dissolved Iron (Fe)	mg/L	0.22	0.53	0.060	0.71	0.060	6086248
Dissolved Magnesium (Mg)	mg/L	120	76	0.20	480 (1)	1.0	6086248
Dissolved Manganese (Mn)	mg/L	1.4	0.94	0.0040	2.5	0.0040	6086248
Dissolved Potassium (K)	mg/L	9.7	30	0.30	44	0.30	6086248
Dissolved Sodium (Na)	mg/L	130	100	0.50	810 (1)	2.5	6086248

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam ID		EE8765		EE8767		EE8768		
Sampling Date		2012/08/12 11:20		2012/08/12 13:30		2012/08/12 14:00		
COC Number		A154887		A154887		A154888		
	UNITS	**PW-2**	**RDL**	**W-1**	**RDL**	**W-3**	**RDL**	**QC Batch**
Elements								
Dissolved Calcium (Ca)	mg/L	520 (1)	1.5	140	0.30	59	0.30	6086248
Dissolved Iron (Fe)	mg/L	0.52	0.060	0.36	0.060	0.31	0.060	6086248
Dissolved Magnesium (Mg)	mg/L	480	0.20	190	0.20	77	0.20	6086248
Dissolved Manganese (Mn)	mg/L	10	0.0040	0.45	0.0040	0.92	0.0040	6086248
Dissolved Potassium (K)	mg/L	20	0.30	54	0.30	25	0.30	6086248
Dissolved Sodium (Na)	mg/L	560 (1)	2.5	610 (1)	2.5	210	0.50	6086248

RDL = Reportable Detection Limit
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
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Sampler Initials: MH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		EE8778	EE8779		
Sampling Date		2012/08/12 10:10	2012/08/12 10:20		
COC Number		A154888	A154888		
	UNITS	**SEEP SAMPLE 1 (SS1)**	**SEEP SAMPLE 2 (SS2)**	**RDL**	**QC Batch**
Elements					
Dissolved Calcium (Ca)	mg/L	380	280	0.30	6086248
Dissolved Iron (Fe)	mg/L	0.17	0.45	0.060	6086248
Dissolved Magnesium (Mg)	mg/L	83	80	0.20	6086248
Dissolved Manganese (Mn)	mg/L	0.41	0.20	0.0040	6086248
Dissolved Potassium (K)	mg/L	29	2.5	0.30	6086248
Dissolved Sodium (Na)	mg/L	86	76	0.50	6086248

RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		EE8758	EE8759	EE8760	EE8761		
Sampling Date		2012/08/12 09:00	2012/08/12 09:15	2012/08/12 09:30	2012/08/12 09:45		
COC Number		A154887	A154887	A154887	A154887		
	UNITS	**GW-1 BOSTON**	**GW-2 BOSTON**	**GW-3 BOSTON**	**GW-4 BOSTON**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	6091836
Xylenes (Total)	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	6091836
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	6091836
(C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	6091836
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	102	96	89	103	N/A	6091836
4-BROMOFLUOROBENZENE (sur.)	%	98	86	77	88	N/A	6091836
D4-1,2-DICHLOROETHANE (sur.)	%	122	112	103	114	N/A	6091836

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		EE8763	EE8764	EE8765	EE8766		
Sampling Date		2012/08/12 10:00	2012/08/12 11:00	2012/08/12 11:20	2012/08/12 11:40		
COC Number		A154887	A154887	A154887	A154887		
	UNITS	**GW-5 BOSTON**	**PW-1**	**PW-2**	**PW-5**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	6091836
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	6091836
Xylenes (Total)	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	6091836
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	6091836
(C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	6091836
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	104	95	103	102	N/A	6091836
4-BROMOFLUOROBENZENE (sur.)	%	94	89	102	104	N/A	6091836
D4-1,2-DICHLOROETHANE (sur.)	%	120	112	114	116	N/A	6091836

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

VOLATILE ORGANICS BY GC-MS (WATER)

Maxxam ID		EE8767	EE8768	EE8778	EE8779		
Sampling Date		2012/08/12 13:30	2012/08/12 14:00	2012/08/12 10:10	2012/08/12 10:20		
COC Number		A154887	A154888	A154888	A154888		
	UNITS	**W-1**	**W-3**	**SEEP SAMPLE 1 (SS1)**	**SEEP SAMPLE 2 (SS2)**	**RDL**	**QC Batch**
Volatiles							
Benzene	mg/L	0.091	<0.00040	<0.00040	<0.00040	0.00040	6091836
Toluene	mg/L	0.0016	<0.00040	<0.00040	<0.00040	0.00040	6091836
Ethylbenzene	mg/L	0.0075	<0.00040	<0.00040	<0.00040	0.00040	6091836
o-Xylene	mg/L	0.012	<0.00040	<0.00040	<0.00040	0.00040	6091836
m & p-Xylene	mg/L	0.021	<0.00080	<0.00080	<0.00080	0.00080	6091836
Xylenes (Total)	mg/L	0.034	<0.00080	<0.00080	<0.00080	0.00080	6091836
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	6091836
(C6-C10)	mg/L	0.12	<0.10	<0.10	<0.10	0.10	6091836
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	94	96	102	108	N/A	6091836
4-BROMOFLUOROBENZENE (sur.)	%	82	94	99	89	N/A	6091836
D4-1,2-DICHLOROETHANE (sur.)	%	107	116	112	124	N/A	6091836

N/A = Not Applicable
RDL = Reportable Detection Limit

Maxxam Job #: B272000
Report Date: 2012/09/06

EBA ENGINEERING CONSULTANTS LTD.
Client Project #: E14101223
Site Location: HOPE BAY, NT
Sampler Initials: MH

General Comments

Sample EE8763-01: Cation anion balance investigated, data quality confirmed.

Results relate only to the items tested.

EBA ENGINEERING CONSULTANTS LTD.
Attention: MICHEL HEBERT
Client Project #: E14101223
P.O. #:
Site Location: HOPE BAY, NT

Quality Assurance Report

Maxxam Job Number: CB272000

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
6086248	MAP	Matrix Spike	Dissolved Calcium (Ca)	2012/08/21		99	%	80 - 120
			Dissolved Iron (Fe)	2012/08/21		96	%	80 - 120
			Dissolved Magnesium (Mg)	2012/08/21		92	%	80 - 120
			Dissolved Manganese (Mn)	2012/08/21		93	%	80 - 120
			Dissolved Potassium (K)	2012/08/21		92	%	80 - 120
			Dissolved Sodium (Na)	2012/08/21		90	%	80 - 120
		Spiked Blank	Dissolved Calcium (Ca)	2012/08/21		104	%	80 - 120
			Dissolved Iron (Fe)	2012/08/21		101	%	80 - 120
			Dissolved Magnesium (Mg)	2012/08/21		97	%	80 - 120
			Dissolved Manganese (Mn)	2012/08/21		97	%	80 - 120
			Dissolved Potassium (K)	2012/08/21		97	%	80 - 120
			Dissolved Sodium (Na)	2012/08/21		94	%	80 - 120
		Method Blank	Dissolved Calcium (Ca)	2012/08/21	<0.30		mg/L	
			Dissolved Iron (Fe)	2012/08/21	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2012/08/21	<0.20		mg/L	
			Dissolved Manganese (Mn)	2012/08/21	<0.0040		mg/L	
			Dissolved Potassium (K)	2012/08/21	<0.30		mg/L	
			Dissolved Sodium (Na)	2012/08/21	<0.50		mg/L	
6087215	JLD	Spiked Blank	Alkalinity (Total as CaCO3)	2012/08/16		98	%	80 - 120
		Method Blank	Alkalinity (PP as CaCO3)	2012/08/16	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2012/08/16	<0.50		mg/L	
			Bicarbonate (HCO3)	2012/08/16	<0.50		mg/L	
			Carbonate (CO3)	2012/08/16	<0.50		mg/L	
			Hydroxide (OH)	2012/08/16	<0.50		mg/L	
		RPD	Alkalinity (PP as CaCO3)	2012/08/16	9.2		%	20
			Alkalinity (Total as CaCO3)	2012/08/16	0.8		%	20
			Bicarbonate (HCO3)	2012/08/16	0.3		%	20
			Carbonate (CO3)	2012/08/16	9.2		%	20
			Hydroxide (OH)	2012/08/16	NC		%	20
6087222	JLD	Spiked Blank	Conductivity	2012/08/16		101	%	90 - 110
		Method Blank	Conductivity	2012/08/16	<1.0		uS/cm	
		RPD	Conductivity	2012/08/16	0		%	20
6087225	JLD	Spiked Blank	pH	2012/08/16		100	%	97 - 102
		RPD	pH	2012/08/16	0.8		%	5
6090795	LQ	Matrix Spike	O-TERPHENYL (sur.)	2012/08/20		98	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/20		103	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2012/08/20		110	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/20		112	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2012/08/20		109	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/20	<0.10		mg/L	
6090864	KSA	Method Blank	Moisture	2012/08/17	<0.30		%	
		RPD [EE8494-01]	Moisture	2012/08/17	5.0		%	20
6090874	KSA	Method Blank	Moisture	2012/08/17	<0.30		%	
		RPD [EE8580-01]	Moisture	2012/08/17	7.9		%	20
6091444	KSA	Method Blank	Moisture	2012/08/17	<0.30		%	
		RPD [EE8773-01]	Moisture	2012/08/17	10.8		%	20
6091836	WZ0	Matrix Spike	1,4-Difluorobenzene (sur.)	2012/08/18		104	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2012/08/18		107	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2012/08/18		111	%	70 - 130
			Benzene	2012/08/18		107	%	70 - 130
			Toluene	2012/08/18		107	%	70 - 130
			Ethylbenzene	2012/08/18		111	%	70 - 130
			o-Xylene	2012/08/18		112	%	70 - 130
			m & p-Xylene	2012/08/18		114	%	70 - 130
			(C6-C10)	2012/08/18		96	%	70 - 130

EBA ENGINEERING CONSULTANTS LTD.
Attention: MICHEL HEBERT
Client Project #: E14101223
P.O. #:
Site Location: HOPE BAY, NT

Quality Assurance Report (Continued)

Maxxam Job Number: CB272000

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
6091836	WZ0	Spiked Blank	1,4-Difluorobenzene (sur.)	2012/08/18		85	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2012/08/18		84	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2012/08/18		92	%	70 - 130
			Benzene	2012/08/18		95	%	70 - 130
			Toluene	2012/08/18		92	%	70 - 130
			Ethylbenzene	2012/08/18		96	%	70 - 130
			o-Xylene	2012/08/18		97	%	70 - 130
			m & p-Xylene	2012/08/18		101	%	70 - 130
			(C6-C10)	2012/08/18		84	%	70 - 130
		Method Blank	1,4-Difluorobenzene (sur.)	2012/08/17		95	%	70 - 130
			4-BROMOFLUOROBENZENE (sur.)	2012/08/17		89	%	70 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2012/08/17		105	%	70 - 130
			Benzene	2012/08/17	<0.00040		mg/L	
			Toluene	2012/08/17	<0.00040		mg/L	
			Ethylbenzene	2012/08/17	<0.00040		mg/L	
			o-Xylene	2012/08/17	<0.00040		mg/L	
			m & p-Xylene	2012/08/17	<0.00080		mg/L	
			Xylenes (Total)	2012/08/17	<0.00080		mg/L	
			F1 (C6-C10) - BTEX	2012/08/17	<0.10		mg/L	
			(C6-C10)	2012/08/17	<0.10		mg/L	
		RPD	Benzene	2012/08/17	NC		%	40
			Toluene	2012/08/17	3.5		%	40
			Ethylbenzene	2012/08/17	NC		%	40
			o-Xylene	2012/08/17	NC		%	40
			m & p-Xylene	2012/08/17	NC		%	40
			Xylenes (Total)	2012/08/17	NC		%	40
			F1 (C6-C10) - BTEX	2012/08/17	NC		%	40
			(C6-C10)	2012/08/17	NC		%	40
6094856	RK6	Matrix Spike	Dissolved Chloride (Cl)	2012/08/18		100	%	80 - 120
		Spiked Blank	Dissolved Chloride (Cl)	2012/08/18		99	%	80 - 120
		Method Blank	Dissolved Chloride (Cl)	2012/08/18	<1.0		mg/L	
		RPD	Dissolved Chloride (Cl)	2012/08/18	NC		%	20
6094857	RK6	Matrix Spike	Dissolved Sulphate (SO4)	2012/08/18		NC	%	80 - 120
		Spiked Blank	Dissolved Sulphate (SO4)	2012/08/18		99	%	80 - 120
		Method Blank	Dissolved Sulphate (SO4)	2012/08/18	<1.0		mg/L	
		RPD	Dissolved Sulphate (SO4)	2012/08/18	7.0		%	20
6097798	APW	Matrix Spike						
		[EE8758-01]	Dissolved Nitrite (N)	2012/08/21		110	%	80 - 120
			Dissolved Nitrate (N)	2012/08/21		98	%	80 - 120
		Spiked Blank	Dissolved Nitrite (N)	2012/08/20		106	%	90 - 110
			Dissolved Nitrate (N)	2012/08/20		102	%	90 - 110
		Method Blank	Dissolved Nitrite (N)	2012/08/20	<0.0030		mg/L	
			Dissolved Nitrate (N)	2012/08/20	<0.0030		mg/L	
		RPD [EE8758-01]	Dissolved Nitrite (N)	2012/08/21	NC		%	20
			Dissolved Nitrate (N)	2012/08/21	9.0		%	20
6098991	MJ0	Matrix Spike						
		[EE8483-01]	1,4-Difluorobenzene (sur.)	2012/08/23		110	%	60 - 140
			4-BROMOFLUOROBENZENE (sur.)	2012/08/23		107	%	60 - 140
			D10-ETHYLBENZENE (sur.)	2012/08/23		105	%	60 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		90	%	60 - 140
			Benzene	2012/08/23		86	%	60 - 140
			Toluene	2012/08/23		94	%	60 - 140
			Ethylbenzene	2012/08/23		99	%	60 - 140
			m & p-Xylene	2012/08/23		107	%	60 - 140
			o-Xylene	2012/08/23		100	%	60 - 140

EBA ENGINEERING CONSULTANTS LTD.
Attention: MICHEL HEBERT
Client Project #: E14101223
P.O. #:
Site Location: HOPE BAY, NT

Quality Assurance Report (Continued)

Maxxam Job Number: CB272000

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
6098991 MJ0	Matrix Spike						
	[EE8483-01]	(C6-C10)	2012/08/23		86	%	60 - 140
	Spiked Blank	1,4-Difluorobenzene (sur.)	2012/08/23		110	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2012/08/23		108	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2012/08/23		109	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		93	%	60 - 140
		Benzene	2012/08/23		84	%	60 - 140
		Toluene	2012/08/23		89	%	60 - 140
		Ethylbenzene	2012/08/23		97	%	60 - 140
		m & p-Xylene	2012/08/23		100	%	60 - 140
		o-Xylene	2012/08/23		94	%	60 - 140
		(C6-C10)	2012/08/23		97	%	60 - 140
	Method Blank	1,4-Difluorobenzene (sur.)	2012/08/23		101	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2012/08/23		98	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2012/08/23		103	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		86	%	60 - 140
		Benzene	2012/08/23	<0.0050		mg/kg	
		Toluene	2012/08/23	<0.020		mg/kg	
		Ethylbenzene	2012/08/23	<0.010		mg/kg	
		Xylenes (Total)	2012/08/23	<0.040		mg/kg	
		m & p-Xylene	2012/08/23	<0.040		mg/kg	
		o-Xylene	2012/08/23	<0.020		mg/kg	
		F1 (C6-C10) - BTEX	2012/08/23	<12		mg/kg	
		(C6-C10)	2012/08/23	<12		mg/kg	
	RPD [EE8483-01]	Benzene	2012/08/23	NC		%	50
		Toluene	2012/08/23	NC		%	50
		Ethylbenzene	2012/08/23	NC		%	50
		Xylenes (Total)	2012/08/23	NC		%	50
		m & p-Xylene	2012/08/23	NC		%	50
		o-Xylene	2012/08/23	NC		%	50
		F1 (C6-C10) - BTEX	2012/08/23	NC		%	50
		(C6-C10)	2012/08/23	NC		%	50
6098994 RSU	Matrix Spike						
	[EE8770-01]	1,4-Difluorobenzene (sur.)	2012/08/23		102	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2012/08/23		99	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2012/08/23		91	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		103	%	60 - 140
		Benzene	2012/08/23		89	%	60 - 140
		Toluene	2012/08/23		91	%	60 - 140
		Ethylbenzene	2012/08/23		85	%	60 - 140
		m & p-Xylene	2012/08/23		79	%	60 - 140
		o-Xylene	2012/08/23		87	%	60 - 140
		(C6-C10)	2012/08/23		115	%	60 - 140
	Spiked Blank	1,4-Difluorobenzene (sur.)	2012/08/23		101	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2012/08/23		101	%	60 - 140
		D10-ETHYLBENZENE (sur.)	2012/08/23		106	%	60 - 130
		D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		111	%	60 - 140
		Benzene	2012/08/23		103	%	60 - 140
		Toluene	2012/08/23		100	%	60 - 140
		Ethylbenzene	2012/08/23		105	%	60 - 140
		m & p-Xylene	2012/08/23		98	%	60 - 140
		o-Xylene	2012/08/23		97	%	60 - 140
		(C6-C10)	2012/08/23		76	%	60 - 140
	Method Blank	1,4-Difluorobenzene (sur.)	2012/08/23		99	%	60 - 140
		4-BROMOFLUOROBENZENE (sur.)	2012/08/23		96	%	60 - 140

EBA ENGINEERING CONSULTANTS LTD.
Attention: MICHEL HEBERT
Client Project #: E14101223
P.O. #:
Site Location: HOPE BAY, NT

Quality Assurance Report (Continued)

Maxxam Job Number: CB272000

QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	UNITS	QC Limits
6098994	RSU	Method Blank	D10-ETHYLBENZENE (sur.)	2012/08/23		93	%	60 - 130
			D4-1,2-DICHLOROETHANE (sur.)	2012/08/23		101	%	60 - 140
			Benzene	2012/08/23	<0.0050		mg/kg	
			Toluene	2012/08/23	<0.020		mg/kg	
			Ethylbenzene	2012/08/23	<0.010		mg/kg	
			Xylenes (Total)	2012/08/23	<0.040		mg/kg	
			m & p-Xylene	2012/08/23	<0.040		mg/kg	
			o-Xylene	2012/08/23	<0.020		mg/kg	
			F1 (C6-C10) - BTEX	2012/08/23	<12		mg/kg	
			(C6-C10)	2012/08/23	<12		mg/kg	
		RPD [EE8770-01]	Benzene	2012/08/23	NC		%	50
			Toluene	2012/08/23	NC		%	50
			Ethylbenzene	2012/08/23	NC		%	50
			Xylenes (Total)	2012/08/23	NC		%	50
			m & p-Xylene	2012/08/23	NC		%	50
			o-Xylene	2012/08/23	NC		%	50
			F1 (C6-C10) - BTEX	2012/08/23	NC		%	50
			(C6-C10)	2012/08/23	NC		%	50
6100111	LQ	Matrix Spike						
		[EE8771-01]	O-TERPHENYL (sur.)	2012/08/21		93	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/21		93	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2012/08/21		98	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2012/08/21		96	%	50 - 130
		Spiked Blank	O-TERPHENYL (sur.)	2012/08/21		82	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/21		91	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2012/08/21		98	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2012/08/21		99	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2012/08/21		92	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/21	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2012/08/21	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2012/08/21	<10		mg/kg	
		RPD [EE8771-01]	F2 (C10-C16 Hydrocarbons)	2012/08/21	NC		%	50
			F3 (C16-C34 Hydrocarbons)	2012/08/21	36.5		%	50
			F4 (C34-C50 Hydrocarbons)	2012/08/21	NC		%	50
6108077	LQ	Spiked Blank	O-TERPHENYL (sur.)	2012/08/22		88	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/22		98	%	70 - 130
			F3 (C16-C34 Hydrocarbons)	2012/08/22		98	%	70 - 130
			F4 (C34-C50 Hydrocarbons)	2012/08/22		94	%	70 - 130
		Method Blank	O-TERPHENYL (sur.)	2012/08/22		94	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2012/08/22	<10		mg/kg	
			F3 (C16-C34 Hydrocarbons)	2012/08/22	<10		mg/kg	
			F4 (C34-C50 Hydrocarbons)	2012/08/22	<10		mg/kg	
6116609	YU	QC Standard	Sieve - Pan	2012/08/30		100	%	97 - 103
			Sieve - #200 (>0.075mm)	2012/08/30		99	%	92 - 108
		RPD	Sieve - Pan	2012/08/30	22.3		%	35
			Sieve - #200 (>0.075mm)	2012/08/30	10.7		%	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 blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.
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

EBA ENGINEERING CONSULTANTS LTD.
Attention: MICHEL HEBERT
Client Project #: E14101223
P.O. #:
Site Location: HOPE BAY, NT

Quality Assurance Report (Continued)

Maxxam Job Number: CB272000

reliable calculation.

Maxxam

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Chain of Custody

Page: 1 of

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☑
Company:	EBA	
Contact:	Michel Hebert / Tyrel Hemsley	
Address:	14940-123 Ave NW	
	Prov: Alberta PC: T5V 1B4	Prov: PC:
Contact #s:	Ph: 780-451-2121 Cell: 780-697-9600	Ph: Cell:

Report Distribution (E-Mail): mhebert@eba.ca; themsley@eba.ca

REGULATORY GUIDELINES:
☐ AT1 ☐ CCME ☐ Regulated Drinking Water ☑ Other: Site specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH / TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs ☐BTEX F1	☐BTEX F1-F2 ☐BTEX F1-F4	☐Routine Water ☐Turb. ☐F	☐TOC ☐DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury	☐Total ☐Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC1-2	0.25 to 0.5m	Soil	12/08/11 13:50																	2
2	AEC1-3	0.25 to 0.6m	Soil	12/08/11 13:45																	2
3	AEC1-4	0.25 to 0.5m	Soil	12/08/11 14:00																	2
4	AEC1-5	0.25 to 0.5m	Soil	12/08/11 14:00																	2
5	AEC1-6	0.2 to 0.4m	Soil	12/08/11 14:10																	2
6	AEC1-7	0.2 to 0.4m	Soil	12/08/11 14:10																	2
7	AEC1-11	0.25 to 0.5m	Soil	12/08/11 14:20																	2
8	AEC1-12	0.25 to 0.5m	Soil	12/08/11 14:20																	2
9	AEC1-3	0.5 to 0.75m	Soil	12/08/11 13:40																	2
10	AEC2-1	0.75 to 1m	Soil	12/08/11 8:30																	2
11	AEC2-1	1.5 to 1.75m	Soil	12/08/11 8:35																	2
12	AEC2-2	0.75 to 1m	Soil	12/08/11 8:40																	2
																					F/P

ARRIVED AT DEPOT: 4pm AUG 13 2012 TEMP: 5 5 15!

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Hebert	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Contact Jeremy W. for analytical Instructions

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: 272000
Alex Colliver	2012/08/14	16:37	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments:

Maxxam

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Chain of Custody

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):	REGULATORY GUIDELINES:
Company:				☐ AT1
Contact:	Same as	Same as	Same as Page 1	☐ CCME
Address:	Prov: Page 1 PC:	Prov: Page 1 PC:		☐ Regulated Drinking Water
Contact #s:	Ph: Cell:	Ph: Cell:		☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E1410223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐BTEX F1 ☐VOCs	☐BTEX F1-F2 ☐BTEX F1-F4	☐ Routine Water ☐ Turb ☐ F	☐ TOC ☐ DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐ Total ☐ Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC2-3	1.25 to 1.5m	Soil	12/08/11 8:50																2
2	AEC2-4	0.5 to 0.7m	Soil	12/08/11 9:00																2
3	AEC2-5	0.75 to 1m	Soil	12/08/11 9:10																2
4	AEC2-6	0.75 to 1m	Soil	12/08/11 9:20																2
5	AEC2-7	0.75 to 1m	Soil	12/08/11 9:30																2
6	AEC2-8	0.75 to 1m	Soil	12/08/11 9:40																2
7	AEC3-1	0.75 to 1m	Soil	12/08/11 12:00																2
8	AEC3-2	0.25 to 0.5m	Soil	12/08/11 12:20																2
9	AEC3-3	0.25 to 0.5m	Soil	12/08/11 12:30																2
10	AEC3-4	0.75m to 1m	Soil	12/08/11 12:40																2
11	AEC3-5	0.75 to 1m	Soil	12/08/11 12:50																2
12	AEC6-1	0.25 to 0.5m	Soil	12/08/11 9:50																2

Please indicate Filtered, Preserved or Both (F, P, F/P) →

ARRIVED AT DEPOT: AUG 13 2012 TEMP: 5 5 5 1 4pm 1106

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Nelson	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Same as Page 1

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B270003		
Alex Colburn	2012/08/14	16:37	Custody Seal	Temperature	Ice
Lab Comments:			Y		Y

Maxxam

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Chain of Custody

Page: 3 of

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	Same as Page 1	Same as Page 1	Same as Page 1
Address:	Prov: PC:	Prov: PC:	
Contact #s:	Ph: Cell:	Ph: Cell:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs ☐BTEX F1 ☐BTEX F1-F2	☐BTEX F1-F4 ☐BTEX F2	☐Routine Water ☐Turb ☐F	☐TOC ☐DOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury ☐Total ☐Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC6-2	0.75 to 1m	Soil	12/08/11 10:00																2
2	AEC6-3	0.75 to 1m	Soil	12/08/11 10:10																2
3	AEC6-4	0.75 to 1m	Soil	12/08/11 10:20																2
4	APEC1-1	0.25 to 0.5m	Soil	12/08/11 11:00																2
5	APEC1-2	0.25 to 0.4m	Soil	12/08/11 11:10																2
6	APEC1-3	0.25 to 0.5m	Soil	12/08/11 11:20																2
7	APEC1-4	0.5 to 0.75m	Soil	12/08/11 11:30																2
8	APEC1-5	0.75 to 1m	Soil	12/08/11 11:40																2
9	APEC1-6	0.25 to 0.5m	Soil	12/08/11 12:00																2
10	Inside Landfarm 1	0.3 to 0.5m	Soil	12/08/11 10:30																2
11	Inside Landfarm 3	0.3 to 0.6m	Soil	12/08/11 10:40																2
12	Inside Landfarm 5	0 to 0.15m	Soil	12/08/11 10:50																2
																				F/P

4pm 1P6

ARRIVED AT DEPOT:
AUG 13 2012
TEMP: 5 5 5

Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Mich Mehet	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Same as Page 1

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B272000		
Alex Colburn	12/08/14	1637	Custody Seal	Temperature	Ice
Lab Comments:			Y		Y

Maxxam

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Chain of Custody

Page: 4 of ____

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	Same as	Same as	Same as
Address:	Page 1	Page 1	Page 1
	Prov: PC:	Prov: PC:	
Contact #s:	Ph: Cell:	Ph: Cell:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ____ ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☑BTEX F1	☐BTEX F1-F2	☑Routine Water	☐Turb ☐F	☐TOC	☐DOC	Regulated Metals (CCME / AT1) Total	Dissolved	☐Total ☐Dissolved Mercury	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	APEC5-1	0.25 to 0.5m	Soil	12/08/11 13:00																		2
2	APEC5-2	0.5 to 0.75m	Soil	12/08/11 13:10																		2
3	APEC5-3	0.25 to 0.5m	Soil	12/08/11 13:20																		2
4	GW-1 Boston	—	GW	12/08/12 9:00							X		X									3
5	GW-2 Boston	—	GW	12/08/12 9:15							X		X									1
6	GW-3 Boston	—	GW	12/08/12 9:30							X		X									2
7	GW-4 Boston	—	GW	12/08/12 9:45							X		X									1
8	GW-5 Boston	—	GW	12/08/12 10:00							X		X									3
9	PW-1	—	GW	12/08/12 11:00							X		X									2
10	PW-2	—	GW	12/08/12 11:20							X		X									3
11	PW-5	—	GW	12/08/12 11:40							X		X									3
12	W-1	—	GW	12/08/12 13:30							X		X									3

4 PM MH

ARRIVED AT DEPOT:
AUG 13 2012
TEMP: 5.5

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michael Meleer	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B270000
Alex Coldham	2012/08/14	16:37	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments: Coldham

Maxxam

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Chain of Custody

Page: 5 of

	Invoice To:	C/O Report Address ☐	Report To:	Same as invoice ☐
Company:				
Contact:	Same as		Same as	
Address:	page 1		page 1	
	Prov:	PC:	Prov:	PC:
Contact #s:	Ph:	Cell:	Ph:	Cell:

Report Distribution (E-Mail): Same as Page 1

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH / TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs ☒BTEX F1	☐BTEX F1-F2	☐BTEX F1-F4	☒Routine Water ☐Turb ☐F	☐DOC ☐TOC	Regulated Metals (CCME / AT1) Total	Dissolved	☐Total ☐Dissolved Mercury	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	W-3	—	GW	12/08/12 14:00							X			X							3
2	AEC1-13	0.5 to 0.75m	Soil	12/08/11 14:30																	2
3	AEC1-14	0.25 to 0.5m	Soil	12/08/11 14:30																	2
4	AEC1-15	0.5 to 0.75m	Soil	12/08/11 14:40																	2
5	AEC1-16	0.5 to 0.75m	Soil	12/08/11 14:40																	2
6	AEC1-17	0.75 to 1m	Soil	12/08/11 14:50																	2
7	AEC1-18	0.75 to 1m	Soil	12/08/11 14:50																	2
8	AEC1-19	0.25 to 0.5m	Soil	12/08/11 15:00																	2
9	AEC1-20	0.5 to 0.75m	Soil	12/08/11 15:00																	2
10	AEC1-21	0.75 to 1m	Soil	12/08/11 15:10																	2
11	Seep Sample 1 (SS1)	—	SW	12/08/12 10:10																	3
12	Seep Sample 2 (SS2)	—	SW	12/08/12 10:20																	3

ARRIVED AT DEPOT:
AUG 13 2012
TEMP: 5.5 5.5

APN
MB

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Hebert	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Special Instructions:		# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B272000		
Alex Coldham	2012/08/14	16:57	Custody Seal	Temperature	Ice
Lab Comments:			4		4

Maxxam

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Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 485-8889
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Chain of Custody

Page: 1 of 5

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☑	Report Distribution (E-Mail):
Company:	EBA		mhebert@eba.ca
Contact:	Michel Hebert / Tyrel Hemsley		themsley@eba.ca
Address:	14940-123 Ave NW		
	Prov: Alberta PC: T5V 1B4	Prov: PC:	
Contact #s:	Ph: 780-451-2121 Cell: 780-697-9600	Ph: Cell:	

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☐ Regulated Drinking Water
☑ Other: Site specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH / TH

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve) Date Required:
☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	SOIL: Sieve (75 micron)	SOIL: Regulated Metals (CCME / AT1)	SOIL: Salinity 4	SOIL: Assessment ICP Metals	SOIL: Basic Class II Landfill	WATER: ☐VOCs ☐BTEX F1 ☐BTEX F1-F2	WATER: ☐BTEX F1-F4 ☐Routine Water ☐TOC	WATER: ☐Turb ☐F ☐DOC ☐TOC	WATER: Regulated Metals (CCME / AT1) Total	WATER: Dissolved	WATER: Mercury ☐Total ☐Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC1-2	0.25 to 0.5m	Soil	12/08/11 13:50	X														2
2	AEC1-3	0.25 to 0.6m	Soil	12/08/11 13:45	X														2
3	AEC1-4	0.25 to 0.5m	Soil	12/08/11 14:00														X	2
4	AEC1-5	0.25 to 0.5m	Soil	12/08/11 14:00	X														2
5	AEC1-6	0.2 to 0.4m	Soil	12/08/11 14:10														X	2
6	AEC1-7	0.2 to 0.4m	Soil	12/08/11 14:10	X														2
7	AEC1-11	0.25 to 0.5m	Soil	12/08/11 14:20															2
8	AEC1-12	0.25 to 0.5m	Soil	12/08/11 14:20															2
9	AEC1-3	0.5 to 0.75m	Soil	12/08/11 13:40	X														2
10	AEC2-1	0.75 to 1m	Soil	12/08/11 8:30	X														2
11	AEC2-1	1.5 to 1.75m	Soil	12/08/11 8:35	X														2
12	AEC2-2	0.75 to 1m	Soil	12/08/11 8:40	X														2

ARRIVED AT DEPOT: 4pm AUG 13 2012 TEMP: 5 5 5

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Hebert	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Contact Jeremy W. for analytical Instructions

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: 272000
Alex Colburn	2012/08/14	16:37	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments:

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Chain of Custody

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	Same as	Same as	Same as Page 1
Address:	Page 1	Page 1	
Prov: PC:			
Contact #s: Ph: Cell:		Ph: Cell:	

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☐ Regulated Drinking Water
☑ Other: site specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: EM10223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve) Date Required: ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	SOIL: Sieve (75 micron)	SOIL: Regulated Metals (CCME / AT1)	SOIL: Salinity 4	SOIL: Assessment ICP Metals	SOIL: Basic Class II Landfill	WATER: ☐ VOCs ☐ BTEX F1 ☐ BTEX F1-F2	WATER: ☐ BTEX F1-F4 ☐ Routine Water ☐ TOC	WATER: ☐ Turb. ☐ F ☐ DOC ☐ Total	WATER: Regulated Metals (CCME / AT1) ☐ Dissolved	WATER: ☐ Total ☐ Dissolved ☐ Mercury	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC2-3	1.25 to 1.5m	Soil	12/08/11 8:50	X													2
2	AEC2-4	0.5 to 0.7m	Soil	12/08/11 9:00	X													2
3	AEC2-5	0.75 to 1m	Soil	12/08/11 9:10	X													2
4	AEC2-6	0.75 to 1m	Soil	12/08/11 9:20	X													2
5	AEC2-7	0.75 to 1m	Soil	12/08/11 9:30	X													2
6	AEC2-8	0.75 to 1m	Soil	12/08/11 9:40	X													2
7	AEC3-1	0.75 to 1m	Soil	12/08/11 12:00	X													2
8	AEC3-2	0.25 to 0.5m	Soil	12/08/11 12:20														2
9	AEC3-3	0.25 to 0.5m	Soil	12/08/11 12:30	X													2
10	AEC3-4	0.75m to 1m	Soil	12/08/11 12:40													X	2
11	AEC3-5	0.75 to 1m	Soil	12/08/11 12:50	X													2
12	AEC6-1	0.25 to 0.5m	Soil	12/08/11 9:50													X	2

4 pm
MC X

ARRIVED AT DEPOT:
AUG 13 2014
TEMP: 5.5 5.1

Please Indicate Filtered, Preserved or Both (F, P, F/P) →

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Hebert	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Same as Page 1

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B278000
Alex Colburn	2012/08/14	16:37	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments:

Maxxam

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Chain of Custody

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	Same as Page 1	Same as Page 1	Same as Page 1
Address:	Purf: PC:	Prov: PC:	
Contact #s:	Ph: Cell:	Ph: Cell:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED:
- ☐ RUSH (Contact lab to reserve) Date Required:
- ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	SOIL: Sieve (75 micron)	SOIL: Regulated Metals (CCME / AT1)	SOIL: Salinity 4	SOIL: Assessment ICP Metals	SOIL: Basic Class II Landfill	WATER: ☐VOCs ☐BTEX F1	WATER: ☐BTEX F1-F2	WATER: ☐BTEX F1-F4	WATER: ☐ Routine Water ☐ Turb ☐ F	WATER: ☐ TOC ☐ DOC	WATER: Regulated Metals (CCME / AT1) Total	WATER: Regulated Metals (CCME / AT1) Dissolved	WATER: Regulated Metals (CCME / AT1) Mercury ☐ Total ☐ Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	AEC6-2	0.75 to 1m	Soil	12/08/11 10:00	X																2
2	AEC6-3	0.75 to 1m	Soil	12/08/11 10:10																X	2
3	AEC6-4	0.75 to 1m	Soil	12/08/11 10:20	X																2
4	APEC1-1	0.25 to 0.5m	Soil	12/08/11 11:00	X																2
5	APEC1-2	0.25 to 0.4m	Soil	12/08/11 11:10																	2
6	APEC1-3	0.25 to 0.5m	Soil	12/08/11 11:20	X																2
7	APEC1-4	0.5 to 0.75m	Soil	12/08/11 11:30	X																2
8	APEC1-5	0.75 to 1m	Soil	12/08/11 11:40															ARRIVED AT DEPOT:	X	2
9	APEC1-6	0.25 to 0.5m	Soil	12/08/11 12:00	X																2
10	Inside Landfarm 1	0.3 to 0.5m	Soil	12/08/11 10:30	X														DEC 13 2012		2
11	Inside Landfarm 3	0.3 to 0.5m	Soil	12/08/11 10:40	X																2
12	Inside Landfarm 5	0 to 0.15m	Soil	12/08/11 10:50	X														TEMP: 5.5/5.1		2

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Mich Meloche	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions: Same as Page 1

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B272000
Alex Colburn	12/08/14	1637	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments:

Maxxam

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Page: 4 of 5

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:			
Address:	Same as Page 1	Same as Page 1	Same as Page 1
	Prov: PC:	Prov: PC:	
Contact #s:	Ph: Cel:	Ph: Cel:	

REGULATORY GUIDELINES:
- ☐ AT1
- ☐ CCME
- ☐ Regulated Drinking Water
- ☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED:
- ☐ RUSH (Contact lab to reserve) Date Required:
- ☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: ☐VOCs	☐BTEX F1	☐BTEX F1-F2	☐BTEX F1-F4	☐Routine Water ☐Turb ☐F	☐DOC	☐TOC	Regulated Metals (CCME / AT1) Total	Dissolved	Mercury	☐Total ☐Dissolved	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	APEC5-1	0.25 to 0.5m	Soil	12/08/11 13:00	X																			2
2	APEC5-2	0.5 to 0.75m	Soil	12/08/11 13:10	X																			2
3	APEC5-3	0.25 to 0.5m	Soil	12/08/11 13:20	X																			2
4	GW-1 Boston	—	GW	12/08/12 9:50								X	X											3
5	GW-2 Boston	—	GW	12/08/12 9:15								X	X											1
6	GW-3 Boston	—	GW	12/08/12 9:30								X	X											2
7	GW-4 Boston	—	GW	12/08/12 9:45								X	X											1
8	GW-5 Boston	—	GW	12/08/12 10:00								X	X											3
9	PW-1	—	GW	12/08/12 11:00								X	X											2
10	PW-2	—	GW	12/08/12 11:20								X	X											3
11	PW-5	—	GW	12/08/12 11:40								X	X											3
12	W-1	—	GW	12/08/12 13:30								X	X											3

ARRIVED AT DEPOT: AUG 13 2012 TEMP: 5.5°C

Please indicate Filtered, Preserved or Both (F, P, F/P) → F/P

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michael Nelen	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B270000
Alex Coldham	2012/08/14	16:37	

Custody Seal	Temperature	Ice
Y		Y

Lab Comments:

Maxxam

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Chain of Custody

	Invoice To: C/O Report Address ☐	Report To: Same as Invoice ☐	Report Distribution (E-Mail):
Company:			
Contact:	Same as	Same as	Same as Page 1
Address:	Page 1	Page 1	
Prov: PC:			
Contact #s: Ph: Cell:			

REGULATORY GUIDELINES:
☐ AT1
☐ CCME
☐ Regulated Drinking Water
☑ Other: Site Specific

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.

PO #:
Project # / Name: E14101223
Site Location: Hope Bay, NT
Quote #:
Sampled By: MH/TH

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve)
Date Required:
☑ REGULAR (5 to 7 Days)

See reverse for package specifics

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	SOIL: BTEX F1-F4	Sieve (75 micron)	Regulated Metals (CCME / AT1)	Salinity 4	Assessment ICP Metals	Basic Class II Landfill	WATER: BTEX F1 ☐VOCs	BTEX F1-F2	BTEX F1-F4	Routine Water ☐ Turb ☐ F	☐ DOC	☐ TOC	Regulated Metals (CCME / AT1) Total	Dissolved	☐ Total ☐ Dissolved Mercury	Other Analysis	HOLD - Do not Analyze	# of Containers Submitted
1	W-3	—	GW	12/08/12 14:00							X	X	X									3
2	AEC1-13	0.5 to 0.75m	Soil	12/08/11 14:30	X																	2
3	AEC1-14	0.25 to 0.5m	Soil	12/08/11 14:30	X																	2
4	AEC1-15	0.5 to 0.75m	Soil	12/08/11 14:40	X																	2
5	AEC1-16	0.5 to 0.75m	Soil	12/08/11 14:50	X																	2
6	AEC1-17	0.75 to 1m	Soil	12/08/11 14:50	X																	2
7	AEC1-18	0.75 to 1m	Soil	12/08/11 14:50	X																	2
8	AEC1-19	0.25 to 0.5m	Soil	12/08/11 15:00	X																	2
9	AEC1-20	0.5 to 0.75m	Soil	12/08/11 15:00	X																	2
10	AEC1-21	0.75 to 1m	Soil	12/08/11 15:10	X																	2
11	Seep Sample 1 (SS1)	—	SW	12/08/12 10:10								X	X									3
12	Seep Sample 2 (SS2)	—	SW	12/08/12 10:20								X	X									3

Please Indicate Filtered, Preserved or Both (F, P, F/P) → F/P

ARRIVED AT DEPOT:
AUG 13 2012
TEMP: 5/55

Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):
Michel Hétu	12/08/13	12:00
Relinquished By (Signature/Print):	Date (YY/MM/DD):	Time (24:00):

Special Instructions:

# of Jars Used & Not Submitted:

LAB USE ONLY

Received By:	Date:	Time:	Maxxam Job #: B272000		
Alex Cobham	2012/08/14	16:37	Custody Seal	Temperature	Ice
Lab Comments:			Y		Y

APPENDIX C
EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA’s client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

Appendix B: Boston Camp Closure Cost Estimate

Boston Closure Cost Estimate

Work task	Cost (rounded to the nearest	
	By task	By Facility
Direct Cost Items		
1. Transportation infrastructure (roads, airstrips, docks)		**$66,000**
Helipads	$5,000	
Road to Aimaokatalok Lake	$3,000	
Road to Airstrip	$4,000	
Airstrip	$13,000	
Core Storage Road	$3,000	
Drill Road	$3,000	
Permafrost Remediation and Revegetation	$35,000	
2. Drill Sites/Drill Hole Abandonment		**$184,000**
Drill Sites/Drill Hole Abandonment	$184,000	
3. Portals/Adits		**$21,000**
Portal/Decline	$7,000	
Vent Raise	$14,000	
4. Non-Process Ponds & Reservoirs		**$10,000**
Settling Pond #1	$4,000	
Settling Pond #2	$3,000	
Diamond Drill Cuttings Settling Pond	$3,000	
5. Dumps , Stockpiles, Landfills		**$416,000**
Ore Stockpiles	$375,000	
Contaminated Soil Implementation Plan	$41,000	
6. Facilities Demolition		**$683,000**
Accommodation Complex/Buildings	$89,000	
Maintenance Shop Complex	$24,000	
Crusher Enclosure	$6,000	
Water Treatment Facilities	$57,000	
Incinerator	$3,000	
Mobile Equipment	$7,000	
Other Structures	$34,000	
Primary Tank Farm	$425,000	
Power Plant Fuel Containment	$3,000	
Jet Fuel Containment System	$4,000	
Soil Treatment Facility	$17,000	
Camp Complex Foundation Pad	$14,000	
7. Off-site Shipping for Disposal	$390,000	**$390,000**
8. Off-Site Disposal Fees	$16,000	**$16,000**
Total Direct Costs		**$1,786,000**
9. Contingency	$274,000	**$274,000**
10. Mobilization & Demobilization	$2,937,000	**$2,937,000**
11. General and Administration costs	$438,000	**$438,000**
12. Field Support	$203,000	**$203,000**
13. Engineering and Consultants Services	$150,000	**$150,000**
14. Post-closure Monitoring	$200,000	**$200,000**
Total Indirect Costs		**$4,202,000**
Total Closure Cost		**$5,988,000**

Table 2. Cost Itemized by Task

Work Area Code	Item	Task	Sub-task	Activity	Task	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
DIRECT COSTS												
Camp Structures												
Accommodation Complex/Buildings											$ 89,416	
B01	1	1	1	Portable Trailers	Decommission (electrical, mechanical)	1	ls	C.1.05	$ 568.88	$ 569		
B01	1	1	2		Prep Trailers for movement (remove boards/piping, etc.).	12	ea	C.1.08	$ 743.07	$ 8,917		
B01	1	1	3		Haul trailers to Doris North for re-use.	12	ea	C.4.06	$ 3,342.69	$ 40,112		
B01	1	2	1	Recreation Tent	Remove heating stove	1	ea	C.1.01	$ 47.68	$ 48		
B01	1	2	2		Demolish	9	m^3	C.3.05	$ 10.61	$ 94		
B01	1	2	3		Collect Debris	23	m^2	C.3.10	$ 0.13	$ 3		
B01	1	2	4		Load debris into containers for transport (to Roberts Bay)	12	m^3	C.4.01	$ 8.16	$ 94		
B01	1	2	5		Haul debris to Roberts Bay	12	m^3	C.4.04	$ 75.78	$ 876		
B01	1	3	1	Site Office	Demolish	50	m^3	C.3.05	$ 10.61	$ 534		
B01	1	3	2		Collect Debris	62	m^2	C.3.10	$ 0.13	$ 8		
B01	1	3	3		Load debris into containers for transport (to Roberts Bay)	101	m^3	C.4.01	$ 8.16	$ 821		
B01	1	3	4		Haul debris to Roberts Bay	101	m^3	C.4.04	$ 75.78	$ 7,625		
B01	1	4	1	Geotech Tent	Remove heating stove	1	ls	C.1.01	$ 47.68	$ 48		
B01	1	4	2		Demolish	13	m^3	C.3.05	$ 10.61	$ 135		
B01	1	4	3		Collect Debris	33	m^2	C.3.10	$ 0.13	$ 4		
B01	1	4	4		Load debris into containers for transport (to Roberts Bay)	17	m^3	C.4.01	$ 8.16	$ 135		
B01	1	4	5		Haul debris to Roberts Bay	17	m^3	C.4.04	$ 75.78	$ 1,256		
B01	1	5	1	Core Shack and Core Splitter	Remove heating stoves	2	ls	C.1.01	$ 47.68	$ 95		
B01	1	5	2		Demolish	102	m^3	C.3.05	$ 10.61	$ 1,078		
B01	1	5	3		Collect Debris	115	m^2	C.3.10	$ 0.13	$ 15		
B01	1	5	4		Load debris into containers for transport (to Roberts Bay)	198	m^3	C.4.01	$ 8.16	$ 1,612		
B01	1	5	5		Haul debris to Roberts Bay	198	m^3	C.4.04	$ 75.78	$ 14,983		
B01	1	6	1	Muster Station	Remove heating stoves	1	ls	C.1.01	$ 47.68	$ 48		
B01	1	6	3		Demolish	44	m^3	C.3.05	$ 10.61	$ 470		
B01	1	6	4		Collect Debris	49	m^2	C.3.10	$ 0.13	$ 6		
B01	1	6	5		Load debris into containers for transport (to Roberts Bay)	66	m^3	C.4.01	$ 8.16	$ 542		
B01	1	6	6		Haul debris to Roberts Bay	66	m^3	C.4.04	$ 75.78	$ 5,034		
B01	1	7	1	Communication Equipment	Dismantle and package Satellite Dish and communication equipment	1	ls	C.1.07	$ 313.10	$ 313		
B01	1	8	1	Generators	Decommission generator	1	ls	C.1.06	$ 599.98	$ 600		
B01	1	8	2		Transport Trailer to Doris Camp for re-use/salvage	1	ls	C.4.06	$ 3,342.69	$ 3,343		
B01	1	9	1	Hazardous Waste	Collect and place in suitable containers	0.48	m^3	C.2.01	$ 1,947.00	$ 925		
B01	1	9	2		Haul to Doris North	0	m^3	C.4.03	$ 71.92	$ 34		
Maintenance Shop Complex											$ 23,906	
B01	2	1	1	Heating System	Relocate tanks to tank farm for draining/cleaning	2	ea	C.1.01	$ 47.68	$ 95		
B01	2	2	1	Maintenance Shop	Decommission electrical, mechanical (including connections to generator house & transformer)	1	ls	C.1.05	$ 568.88	$ 569		
B01	2	2	3		Demolish (steel modular structure)	17	m^3	C.3.05	$ 10.61	$ 183		
B01	2	2	4		Demolish wood structures (survival, electrical and compressor sheds)	48	m^3	C.3.05	$ 10.61	$ 508		
B01	2	2	5		Collect Debris	306	m^3	C.3.10	$ 0.13	$ 39		
B01	2	2	6		Load debris into containers for transport (to Roberts Bay)	98	m^3	C.4.01	$ 8.16	$ 797		
B01	2	2	7		Haul debris to Roberts Bay	98	m^3	C.4.04	$ 75.78	$ 7,403		
B01	2	3	1	Powerhouse	Decommission (electrical)	1	ls	C.1.05	$ 568.88	$ 569		
B01	2	3	2		Demolish	49	m^3	C.3.05	$ 10.61	$ 518		
B01	2	3	3		Collect Debris	61	m^2	C.3.10	$ 0.13	$ 8		
B01	2	3	4		Load debris into containers for transport (to Roberts Bay)	98	m^3	C.4.01	$ 8.16	$ 797		
B01	2	3	5		Haul debris to Roberts Bay	98	m^3	C.4.04	$ 75.78	$ 7,405		
B01	2	4	1	Transformer building	Decommission (electrical)	1	ls	C.1.05	$ 568.88	$ 569		
B01	2	4	2		Demolish (hazardous material removed above)	33	m^3	C.3.05	$ 10.61	$ 345		
B01	2	4	3		Collect Debris	41	m^2	C.3.10	$ 0.13	$ 5		
B01	2	4	4		Load debris into containers for transport (to Roberts Bay)	49	m^3	C.4.01	$ 8.16	$ 398		
B01	2	4	5		Haul debris to Roberts Bay	49	m^3	C.4.04	$ 75.78	$ 3,698		

Work Area Code	Item	Task	Sub-task	Activity	Task	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
Crusher Enclosure											$ 5,583	
B01	3	1	1	Equipment	Dismantle hopper/crusher parts for transport	1	ls	C.3.08	$ 352.28	$ 352		
B01	3	1	2		Load equipment into containers for transport (to Roberts Bay)	20	m^3	C.4.01	$ 8.16	$ 161		
B01	3	2	1	Crusher building	Demolish (tent/steel enclosure)	37	m^3	C.3.05	$ 10.61	$ 389		
B01	3	2	2		Collect Debris	467	m^2	C.3.10	$ 0.13	$ 60		
B01	3	2	3		Load debris into containers for transport (to Roberts Bay)	55	m^3	C.4.01	$ 8.16	$ 449		
B01	3	2	4		Haul debris to Roberts Bay	55	m^3	C.4.04	$ 75.78	$ 4,171		
Water Treatment Facilities											$ 56,693	
B01	4	1	1	Water Supply Pipelines	Cut pipelines into manageable pieces	607	m	C.3.03	$ 1.96	$ 1,190		
B01	4	1	2		Load debris into containers for transport (to Roberts Bay)	182	m^3	C.4.01	$ 8.16	$ 1,486		
B01	4	1	3		Haul debris to Roberts Bay	182	m^3	C.4.04	$ 75.78	$ 13,808		
B01	4	2	1	Sewage water pipelines	Flush sewage water pipelines	1	ls	C.2.06	$ 504.33	$ 504		
B01	4	2	2		Cut pipelines into manageable pieces	489	m	C.3.03	$ 1.96	$ 958		
B01	4	2	3		Load debris into containers for transport (to Roberts Bay)	147	m^3	C.4.01	$ 8.16	$ 1,196		
B01	4	2	4		Haul debris to Roberts Bay	147	m^3	C.4.04	$ 75.78	$ 11,118		
B01	4	3	1	Camp Water Intake	Collect and dismantle intake system	1	ls	C.1.03	$ 1,063.54	$ 1,064		
B01	4	4	1	Old Sewage Treatment (RBC)	Flush and remove sewage plumbing	1	ls	C.2.06	$ 504.33	$ 504		
B01	4	4	2		Load sewage sludge/waste water in 55 gallon drums	1	m^3	C.2.06	$ 504.33	$ 504		
B01	4	4	3		Demolish buildings	37	m^3	C.3.05	$ 10.61	$ 392		
B01	4	4	4		Collect Debris	35	m^2	C.3.10	$ 0.13	$ 4		
B01	4	4	5		Load debris into containers for transport (to Roberts Bay)	55	m^3	C.4.01	$ 8.16	$ 452		
B01	4	4	6		Haul debris to Roberts Bay	55	m^3	C.4.04	$ 75.78	$ 4,198		
B01	4	4	7		Regrade treatment foundation pad to ensure positive drainage	460	m^2	C.5.05	$ 2.38	$ 1,094		
B01	4	5	1	New Sewage Treatment System	Flush and remove sewage plumbing	1	ls	C.2.06	$ 504.33	$ 504		
B01	4	5	2		Load sewage sludge/waste water in 55 gallon drums	1	m^3	C.2.06	$ 504.33	$ 504		
B01	4	5	3		Decommission (electrical)	1	ls	C.1.05	$ 568.88	$ 569		
B01	4	5	4		Demolish buildings/tanks	122	m^3	C.3.05	$ 10.61	$ 1,293		
B01	4	5	5		Collect Debris	30	m^2	C.3.10	$ 0.13	$ 4		
B01	4	5	6		Load debris into containers for transport (to Roberts Bay)	183	m^3	C.4.01	$ 8.16	$ 1,491		
B01	4	5	7		Haul debris to Roberts Bay	183	m^3	C.4.04	$ 75.78	$ 13,854		
Helipads											$ 4,692	
B01	5	1	1	Demolish	Demolish pads	32	m^3	C.3.05	$ 10.61	$ 337		
B01	5	1	2		Collect debris	21	m^2	C.3.10	$ 0.13	$ 3		
B01	5	1	3		Load debris into containers for transport (to Roberts Bay)	48	m^3	C.4.01	$ 8.16	$ 388		
B01	5	1	4		Haul debris to Roberts Bay	48	m^3	C.4.04	$ 75.78	$ 3,608		
B01	5	2	1	Regrade	Regrade area to ensure positive drainage	150	m^2	C.5.05	$ 2.38	$ 357		
Incinerator											$ 1,486	
B01	8	1	1	Disassemble	Collect ashes and place in containers	0.01	m^3	C.2.07	$ 535.08	$ 5		
B01	8	1	2		Dismantle (welding crew)	1	ls	C.1.04	$ 913.95	$ 914		
B01	8	1	3		Load into containers for transport (to Roberts Bay)	7	m^3	C.4.01	$ 8.16	$ 55		
B01	8	1	4		Haul debris to Roberts Bay	7	m^3	C.4.04	$ 75.78	$ 512		
Mobile Equipment											$ 6,583	
B01	9	1	1	Decontaminate	Wash/decontaminate misc. equipment in lined facility	5	ea	C.3.08	$ 352.28	$ 1,761		
B01	9	1	2		Operate oil/water separator (qnty = # of tanks/equip. treated)	5	ea	C.2.08	$ 45.47	$ 227		
B01	9	2	1	Disassemble	Dismantle (welding crew)	5	ea	C.3.08	$ 352.28	$ 1,761		
B01	9	2	2		Load into containers for transport (to Roberts Bay)	34	m^3	C.4.01	$ 8.16	$ 275		
B01	9	2	3		Haul debris to Roberts Bay	34	m^3	C.4.04	$ 75.78	$ 2,558		
Other Structures											$ 34,121	
B01	10	1	1	Demolish	Demolish buildings and other structures	44	m^3	C.3.05	$ 10.61	$ 467		
B01	10	1	2		Dismantle radio towers	2	each	C.3.11	$ 14,052.00	$ 28,104		
B01	10	1	3		Collect debris	80	m^2	C.3.10	$ 0.13	$ 10		
B01	10	1	4		Load debris into containers for transport (to Roberts Bay)	66	m^3	C.4.01	$ 8.16	$ 538		
B01	10	1	5		Haul debris to Roberts Bay	66	m^3	C.4.04	$ 75.78	$ 5,002		
Subtotal Direct Costs - Camp Structures											$ 222,481	

Work Area Code	Item	Task	Sub-task	Activity	Task	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
Containment Structures												
Primary Tank Farm											$ 425,496	
B02	1	1	1	Above ground storage tanks	Drain fuel and consolidate in one tank	8	ea	C.2.03	$ 227.84	$ 1,823		
B02	1	1	2		Decommission fuel tanks	8	ea	C.1.02	$ 398.36	$ 3,187		
B02	1	1	3		Pressure wash tanks	8	ea	C.2.04	$ 249.84	$ 1,999		
B02	1	1	4		Operate oil/water separator	8	ea	C.2.08	$ 45.47	$ 364		
B02	1	1	5		Demolish and cut tanks into manageable pieces	8	ea	LS	$ 50,000.00	$ 400,000		
B02	1	1	6		Haul residual fuel on skid to Doris Camp	1	ls	C.4.06	$ 3,342.69	$ 3,343		
B02	1	1	7		Load into containers for transport (to Roberts Bay)	25	m^3	C.4.01	$ 8.16	$ 202		
B02	1	1	8		Haul debris to Roberts Bay	25	m^3	C.4.04	$ 75.78	$ 1,876		
B02	1	2	1	Heating Systems Tanks	Drain of fuel (consolidate in one tank) and pressure wash tank	7	ea	C.2.02	$ 18.99	$ 133		
B02	1	2	2		Operate oil/water separator (qnty = # of tanks/equip. treated)	7	ea	C.2.08	$ 45.47	$ 318		
B02	1	2	3		Load into containers for transport (to Roberts Bay)	5	m^3	C.4.01	$ 8.16	$ 43		
B02	1	2	4		Haul debris to Roberts Bay	5	m^3	C.4.04	$ 75.78	$ 398		
B02	1	3	1	Secondary containment system	Excavate liner cover material and consolidate on ore pile	406	m^3	C.5.02	$ 17.47	$ 7,084		
B02	1	3	2		Load HC contaminated bedding in containers for transport	-	m^3	C.4.01	$ 8.16	$ -		
B02	1	3	3		Cut liner into manageable pieces and clean	825	m^2	C.3.02	$ 2.14	$ 1,762		
B02	1	3	4		Load liner into container for transport (to Roberts Bay)	12	m^3	C.4.01	$ 8.16	$ 101		
B02	1	3	5		Haul debris to Roberts Bay	12	m^3	C.4.04	$ 75.78	$ 938		
B02	1	3	6		Regrade area to ensure positive drainage	810	m^2	C.5.05	$ 2.38	$ 1,926		
Power Plant Fuel Containment											$ 2,831	
B02	2	1	1	Green Storage tanks (2)	Drain of fuel and consolidate in one tank	2	ea	C.2.03	$ 227.84	$ 456		
B02	2	1	2		Pressure wash tanks	2	ea	C.2.04	$ 249.84	$ 500		
B02	2	1	3		Operate oil/water separator	2	ea	C.2.08	$ 45.47	$ 91		
B02	2	1	4		Load into containers for transport (to Roberts Bay)	2	ea	C.4.07	$ 123.41	$ 247		
B02	2	1	5		Haul debris to Roberts Bay	2	ea	C.4.04	$ 75.78	$ 152		
B02	2	2	1	Secondary containment system	Excavate liner cover material and consolidate on ore pile	60	m^3	C.5.02	$ 17.47	$ 1,048		
B02	2	2	2		Load HC contaminated bedding in containers for transport	-	m^3	C.4.01	$ 8.16	$ -		
B02	2	2	3		Cut liner into manageable pieces and clean	12	m^2	C.3.02	$ 2.14	$ 26		
B02	2	2	4		Load liner into container for transport (to Roberts Bay)	0.2	m^3	C.4.01	$ 8.16	$ 1		
B02	2	2	5		Haul debris to Roberts Bay	0	m^3	C.4.04	$ 75.78	$ 14		
B02	2	2	6		Regrade area to ensure positive drainage	125	m^2	C.5.05	$ 2.38	$ 297		
Jet Fuel Containment System											$ 3,571	
B02	3	1	1	Tidy Tanks/Jet fuel Drums	Remove to Doris Camp for reuse	1	ls	C.4.06	$ 3,342.69	$ 3,343		
B02	3	2	1	Portable Pollution Control Berm	Dismantle and prep for shipping	1	ls	C.3.04	$ 227.84	$ 228		
B02	3	2	2		Haul to Doris Camp for reuse (include in jet fuel trip)	1	ls	-	$ -	$ -		
B02	3	2	3		Haul debris to Roberts Bay	1	ls	C.4.04	$ 75.78	$ 76		
Settling Pond #1											$ 3,548	
B02	4	1	1	Remove liner	Excavate settled material, temp. stockpile	79	m^3	C.5.04	$ 2.56	$ 203		
B02	4	1	2		Remove liner and cut into manageable pieces	400	m^2	C.3.02	$ 2.14	$ 854		
B02	4	1	3		Load liner into container for transport (to Roberts Bay)	6	m^3	C.4.01	$ 8.16	$ 49		
B02	4	1	4		Haul debris to Roberts Bay	6	m^3	C.4.04	$ 75.78	$ 455		
B02	4	2	1	Backfill pond	Backfill pond with settled solids and drill cuttings	79	m^3	C.5.04	$ 2.56	$ 203		Cutting placement included elsewhere
B02	4	2	2		Regrade over pond with pad/berm materials	750	m^2	C.5.05	$ 2.38	$ 1,784		
Settling Pond #2 (incl. Burn Pit)											$ 1,793	
B02	5	1	1	Remove Solid Waste	Load into containers for transport (to Roberts Bay)	-	m^3	C.4.01	$ 8.16	$ -		
B02	5	2	1	Backfill pond	Backfill pond with settled solids and drill cuttings	59	m^3	C.5.04	$ 2.56	$ 152		
B02	5	2	2		Regrade over pond with pad/berm materials	690	m^2	C.5.05	$ 2.38	$ 1,641		
Soil Treatment Facility											$ 16,745	
B02	7	1	1	Current landfarmed soils	Test existing soils in landfarm	10	ea	C.6.01	$ 93.48	$ 935		
B02	7	1	2		Use passing soils for reclamation	90	m^3	-	$ -	$ -		Costed where used
B02	7	1	3		Load failing soils into containers for transport	90	m^3	C.4.01	$ 8.16	$ 734		
B02	7	2	1	Soil in drums	Empty Drums	100	ea	C.2.09	$ 92.56	$ 9,256		
B02	7	2	2		Wash drums (in tank farm)	100	ea	C.2.05	$ 16.35	$ 1,635		
B02	7	2	3		Crush drums	100	ea	C.3.01	$ 13.56	$ 1,356		
B02	7	2	4		Load into containers for transport (to Roberts Bay)	6	m^3	C.4.01	$ 8.16	$ 52		
B02	7	2	5		Haul debris to Roberts Bay	6	m^3	C.4.04	$ 75.78	$ 482		
B02	7	3	1	Remove liner	Remove liner and cut into manageable pieces	368	m^2	C.3.02	$ 2.14	$ 786		
B02	7	3	2		Load liner into container for transport (to Roberts Bay)	6	m^3	C.4.01	$ 8.16	$ 45		

Work Area Code	Item	Task	Sub-task	Activity	Task	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
B02	7	3	3		Haul debris to Roberts Bay	6	m^3	C.4.04	$ 75.78	$ 418		
B02	7	4	1	Regrade	Regrade area to ensure positive drainage	440	m^2	C.5.05	$ 2.38	$ 1,046		
Diamond Drill Cuttings Settling Pond											$ 3,110	
B02	8	1	1	Excavate cuttings	Stockpile cuttings on-site	336	m^3	C.5.04	$ 2.56	$ 861		
B02	8	2	1	Remove pond	Excavate textile and place in container for transport	5	m^3	C.4.01	$ 8.16	$ 37		
B02	8	2	2		Regrade area to ensure positive drainage	930	m^2	C.5.05	$ 2.38	$ 2,212		
Subtotal Direct Costs - Containment Structures											$ 457,093	
Site Regrading												
Camp Complex Foundation Pad											$ 13,667	
B03	1	1	1	Regrade	Stake-out low-lying areas in summer to place fill	1	days	C.5.14	$ 6,543.52	$ 6,544		
B03	1	1	2		Regrade to fill in any low lying areas	2,995	m^2	C.5.05	$ 2.38	$ 7,123		
Road to Aimaokatalok Lake											$ 1,838	
B03	2	1	1	Regrade	Regrade (crown)	773	m^2	C.5.05	$ 2.38	$ 1,838		
Road to Airstrip											$ 4,193	
B03	3	1	1	Regrade	Regrade to fill in any low lying areas and crown road	1,763	m^2	C.5.05	$ 2.38	$ 4,193		
Airstrip											$ 12,697	
B03	4	1	1	Regrade	Regrade to fill in any low lying areas	5,222	m^2	C.5.05	$ 2.38	$ 12,419		
B03	4	2	1	Decommission	Place large white X's at each end of strip	1	ls	C.1.09	$ 277.84	$ 278		
Core Storage Road											$ 1,316	
B03	5	1	1	Remove Wind Sock & Culvert	Excavate culvert	7	m^3	C.5.15	$ 87.05	$ 603		
B03	5	1	2		Dismantle windsock	1	ls	C.3.08	$ 352.28	$ 352		
B03	5	1	3		Load culvert/sock/pole/drum into container for transport (to Roberts Bay	0.3	m^3	C.4.01	$ 8.16	$ 2		
B03	5	1	4		Haul debris to Roberts Bay	0	m^3	C.4.04	$ 75.78	$ 20		
B03	5	2	1	Regrade	Regrade to fill in any low lying areas and crown road	142	m^2	C.5.05	$ 2.38	$ 338		
Drill Road											$ 728	
B03	1	1	1	Regrade	Regrade to fill in any low lying areas and crown road	306	m^2	C.5.05	$ 2.38	$ 728		
Subtotal Direct Costs - Camp Surface Infrastructure											$ 34,438	
Mine Openings												
Portal/Decline											$ 7,257	
B04	1	1	1	Remove fencing	Collect Debris (ski fence and supports)	2.2	m^3	C.3.05	$ 10.61	$ 23		
B04	1	1	2		Load debris into container for transport (to Roberts Bay)	2.2	m^3	C.4.01	$ 8.16	$ 18		
B04	1	1	3		Haul debris to Roberts Bay	2	m^3	C.4.04	$ 75.78	$ 168		
B04	1	2	1	Scaling	Use excavator to knock down debris	1	hrs	C.5.11	$ 256.32	$ 256		Est. 1 hr. Excavator time
B04	1	3	1	Backfill decline	Load, haul, dump waste ore to plug incline	389	m3	C.5.02	$ 17.47	$ 6,791		
Vent Raise											$ 13,771	
B04	2	1	1	Demolish	Demolish garden shed and wood support structures	13	m^3	C.3.05	$ 10.61	$ 133		
B04	2	1	2		Load debris into container for transport (to Roberts Bay)	19	m^3	C.4.01	$ 8.16	$ 153		
B04	2	1	3		Haul debris to Roberts Bay	19	m^3	C.4.04	$ 75.78	$ 1,421		
B04	2	2	1	Construct Cap	1.5mx2.1m concrete cap with gas vent	1	LS	C.6.03	$ 12,064.56	$ 12,065		
Subtotal Direct Costs - Mine Openings											$ 21,028	
Ore Stockpiles												
Consolidate, Reslope, Encapsulate, and Cover (0.3 m)											$ 375,307	
B05	6	1	1	Consolidate stockpiles and dispersed ore	Scrape up and dump ore within consolidated pile	3,803	m^3	C.5.03	$ 23.29	$ 88,564		
B05	6	1	2		Consolidate ore into large pile	8,265	m^3	C.5.03	$ 23.29	$ 192,472		
B05	6	2	1	Reslope stockpile	Dozer - D7	2,026	m^2	C.5.06	$ 3.17	$ 6,423		
B05	6	3	1	Place Synthetic cover	Supply and place HDPE liner	2,330	m^3	C.5.01	$ 31.70	$ 73,838		
B05	6	3	2	Cover stockpile	Load, haul, place cover material (assumed sourced within 0.5km)	802	m^3	C.5.02	$ 17.47	$ 14,011		
Subtotal Direct Costs - Ore Stockpiles											$ 375,307	
Contaminated Soils												
Contaminated Soil Implementation Plan											$ 41,333	
B06	1	1	1	Develop Implementation Plan	Includes field investigation, laboratory costs, and reporting	1	ls	-	$ 41,333.33	$ 41,333		
Subtotal Direct Costs - Contaminated Soils											$ 41,333	

Work Area Code	Item	Task	Sub-task	Activity	Task	Quantity	Unit	Cost Code	Unit Cost	Activity Total	Subtotals	Source / Comments
Other Areas												
Drill Sites											$ 183,660	
B07	1	1	1	Drill piping	Cut of top of drill pipes and cap.	545	ea	C.3.09	$ 31.11	$ 16,954		
B07	1	1	2		Load top debris into containers for transport to Roberts Bay	9	m^3	C.4.01	$ 8.16	$ 74		
B07	1	1	3		Haul debris to Roberts Bay	9	m^3	C.4.04	$ 75.78	$ 692		
B07	1	2	1	Core	Remove any core to the core storage area	-	each	C.5.07	$ 35.10	$ -		done in 2012
B07	1	3	1	Regrade	Fill in low-lying areas (assumed sourced within 0.5km)	9,000	m^3	C.5.02	$ 17.47	$ 157,196		
B07	1	4	1	Revegetate	Revegetate: Supply and place cocoa matting	450	m^2	C.5.08	$ 4.04	$ 1,820		
B07	1	4	2		Revegetate: Seed/Fertilize, by hand, high application rate	9,000	m^2	C.5.13	$ 0.77	$ 6,922		
Vegetation Die-Back and Permafrost remediation Areas											$ 35,091	
B07	2	1	1	Areas by the Airstrip (excluding drill sites)	Fill in low-lying areas (assumed sourced within 0.5km)	168	m^3	C.5.02	$ 17.47	$ 2,930		
B07	2	1	1	Area by Drill Road	Fill in low-lying areas (assumed sourced within 0.5km)	267	m^3	C.5.02	$ 17.47	$ 4,662		
B07	2	1	2		Revegetate: Supply and place cocoa matting	890	m2	C.5.08	$ 4.04	$ 3,599		
B07	2	1	3		Revegetate: Seed/Fertilize, by hand, high application rate	17,795	m2	C.5.13	$ 0.77	$ 13,686		
B07	2	2	1	Area by Core Storage Road	Fill in low-lying areas (assumed sourced within 0.5km)	149	m^3	C.5.02	$ 17.47	$ 2,594		
B07	2	2	2		Revegetate: Supply and place cocoa matting	50	m^2	C.5.08	$ 4.04	$ 200		
B07	2	2	3		Revegetate: Seed/Fertilize, by hand, high application rate	990	m^2	C.5.13	$ 0.77	$ 761		
B07	2	3	1	Area by Grey Water Discharge	Fill in low-lying areas (assumed sourced within 0.5km)	81	m^3	C.5.02	$ 17.47	$ 1,414		
B07	2	3	2		Revegetate: Supply and place cocoa matting	270	m^2	C.5.08	$ 4.04	$ 1,092		
B07	2	3	3		Revegetate: Seed/Fertilize, by hand, high application rate	5,398	m^2	C.5.13	$ 0.77	$ 4,152		
Subtotal Direct Costs - Other Areas											$ 218,750	
Waste Shipping Off-site												
B08	1	1	1	Non-Hazardous Waste	Ship by barge to Hay River	1,948	m^3	S.03	$ 200.00	$ 389,589		
B08	1	2	1	HC Contaminated Soils	Ship by barge to Hay River	-	m^3	S.01	$ 989.00	$ -		
B08	1	3	1	Hazardous Waste	Ship by barge to Hay River	0.48	m^3	S.02	$ 200.00	$ 95		
Subtotal Direct Costs - Waste Shipping											$ 389,684	
Waste Disposal												
B09	1	1	1	Non-hazardous waste	Disposal fee at Hay River	1,948	m^3	M.10	$ 5.51	$ 10,730		
B09	1	2	1	Sewage sludge	RBC + New Treatment system sludge/solid waste	2	m^3	C.4.04	$ 75.78	$ 152		
B09	1	3	1	HC Contaminated Soils	Dump fee at Hay River	0	m^3	H.05	$ 100.00	$ -		
B09	1	4	1	Hazardous Waste	Dump fee at Hay River	0.48	m^3	M.09	$ 10,000.00	$ 4,750		
Subtotal Direct Costs - Waste Disposal											$ 15,631	
TOTAL DIRECT COSTS												
					TOTAL DIRECT COSTS						$ 1,775,746	
INDIRECT CLOSURE COSTS												
Contingency											$ 274,086	
-	1	1	-	Contingency	20% of direct costs	20	%	x	$ 1,370,430.52	$ 274,086		
Mobilization & Demobilization											$ 2,937,251	
-	2	1	-	Winter Closure activities	Equipment Mobilization/Demobilization	1	ls	x	$ 337,503.53	$ 337,504		
				Equipment stand-by		1	LS	x	$ 632,097.00	$ 632,097		
-	3	1	1	Construct and maintain Winter Road	Required during closure	59	km	M.08	$ 33,350.00	$1,967,650		Assumed open for 4 months
General and Administration costs											$ 437,722	
-	4	1	-	Travel allowance		1	LS	x	$7,500.00	$7,500		
-	4	2	-	Camp Management		21	day	OC.01	$ 677.00	$14,338		
-	4	3	-	Camp Operations		106	person-days	OC.02	$ 150.00	$15,884		
-	4	4	-	Camp Rental		1	year	OC.03	$ 400,000.00	$400,000		
Field support											$ 203,397	
-	5	1	-	Supervision		21	days		$ 1,172.40	$ 24,830		
-	5	2	-	Equipment maintenance support - Mechanic	10% of project duration	2	days	x	$ 1,023.12	$ 2,167		
-	5	3	1	Helicopter Support	transport to camp	21	days	x	$ 8,400.00	$ 176,400		4 trips, 6 hrs/day;
Post-closure Monitoring											$ 200,000	
-	5	1	-	Contractor profit	Yearly monitoring cost	5	LS	x	$ 40,000.00	$ 200,000		
Engineering and Consultants Services											$ 150,000	
	5	3		Engineering Design		1	LS	x	$ 50,000.00	$ 50,000		
-	5	4	-	Cofirmatory sampling and analysis		1	LS	x	$ 100,000.00	$ 100,000		
Subtotal Indirect Costs												
				Subtotal Indirect Costs							$ 4,202,456	
CLOSURE COSTS - TOTAL												
				Subtotal Indirect Costs							$ 5,978,202	

Table 3. Mobilization/ Demobilization costs

Mob/Demob Costs

Crew mobilization costs included in loaded labour rates.
The barging fee for equipment is calculated on a square foot basis.

No. of units	Description	Units	Quantity	Unit cost	2012 Task cost	Notes
	Crew					
	Note: Labour costs included in loaded Labour Unit Rates found on the Unit Rates and Task Unit Rates worksheets					
	Construction equipment	Footprint				
1	Bobcat	m^3	11.0	$ 332.96	$ 3,658	From Hay River to Roberts Bay
1	Loader	m^2	10.2	$ 332.96	$ 3,400	From Hay River to Roberts Bay
1	Dozer	m^2	20.3	$ 332.96	$ 6,750	From Hay River to Roberts Bay
1	Excavator	m^2	38.1	$ 332.96	$ 12,688	From Hay River to Roberts Bay
1	Small equipment	m^3	24.1	$ 332.96	$ 8,025	From Hay River to Roberts Bay
1	Trucks (CAT 735)	m^2	41.6	$ 332.96	$ 13,860	From Hay River to Roberts Bay
0	Tractor trailer	m^3	86.8	$ 332.96	$ -	From Hay River to Roberts Bay
1	Crew cab pickup (Ford F350)	m^3	33.8	$ 332.96	$ 11,254	From Hay River to Roberts Bay
	Truck equipment to Hay River (6 trucks)	each	7	$15,000.00	$ 105,000	= hauling 8 trailers from Edmonton / source: Doris cost estimate
				Subtotal Mobilisation	**$ 164,636**	
				Subtotal Demobilisation	**$ 172,868**	Assumes same cost as mobilisation, updated by 5%
				Total	***$ 337,504***	

Equipment stand-by							
	Stand-by time	days	123	2569.5	$316,048.50	fall	May 1st to August 31; assume 10 hr days
		days	123	2569.5	$316,048.50	spring	October 1st to January 31st; assume 10 hr days
				Total	***$632,097***		

Camp costs

Description	Units	Cost Code	Quantity	Unit Cost	Task Cost	
Camp Management	day	OC.01	21	$677.00	$14,338	
Camp Operations	per day per person	OC.02	105.894867	$150.00	$15,884	5 person crew for 21 days
Camp Rental	year	OC.03	1	$400,000.00	$400,000	
Travel allowance	charter flights	OC.05	0	$10,000.00	$0	charter flights for 15 person crews
	commercial flights	OC.04	10	$750.00	$7,500	maximum of 2 weeks rotations
					$437,722	

Table 4. Unit Rates

Cost Code	Item	Unit rate	Unit	Comment	Source
Equipment					
E.01	Dozer (CAT D7)	$ 166.50	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.02	Dozer (CAT D4)	$ 86.60	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.03	Dozer (CAT D4) w/ Tiller	$ 99.59	hr.	15% added for tiller attachment	Nuna 2012 equipment rates
E.04	Truck (CAT 730)	$ 138.70	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.05	Excavator (CAT 330 CL)	$ 185.00	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.06	Loader (CAT IT38/930)	$ 82.30	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.07	Skidder (CAT Bobcat)	$ 80.10	hr.	hourly equipment rate (less operator)	Nuna 2012 equipment rates
E.08	Helicopter	$ 2,100.00	hr.	fuel surcharge applies	IMiskolczi (from Angela Holtzapfel@HBML ESR)
E.09	Welding Equipment	$ 52.58	day	300 Amps, gas/diesel driven	2009 BC Blue Book + 10% Northern Allowance, 10% fuel factor
E.10	Power washer	$ 110.00	day	Hot water pressure washer - 3000 PSI	www.abtoolrentals.com/equipment.asp?action=category&category=190&key=190%2D0079
E.11	Drum crusher	$ 35.60	hr.	30 tones, mobile	RSMeans, 2005; adjusted to 2009 dollars based on CPI + 15% rate increase to 2012
E.12	Oil-water separator	$ 27.50	hr.	10 GPM, underground	RSMeans, 2005; adjusted to 2009 dollars based on CPI + 15% rate increase to 2012
E.13	Air Track Drill	$ 296.34	hr.		2009 BC Blue Book + 10% Northern Allowance + 15% rate increase to 2012, 10% fuel facto
Materials					
M.01	Liner - HDPE	$ 28.93	m^2	supply and install	from JDS (Surface Water Management Options Analysis)
M.02	Liner - geotextile	$ 26.62	m^2	supply and install	from JDS (Surface Water Management Options Analysis)
M.03	Fuel (Diesel)	$ 1.17	L	2008 Landed fuel cost at Hope Bay	Maritz (from Jeff Reinson @ Newmont)
M.04	Explosives	$ 21.38	m^2	15% freight cost added	RSMeans, 2005; adjusted to 2009 dollars based on CPI + 15% rate increase to 2012
M.05	Silt Fencing	$ 1.32	m	15% freight cost added	Cost Mine 2011; original price quoted in linear f
M.06	Coco-matting	$ 1.79	m^2	15% freight cost added	Cost Mine 2011; original price quoted in sq. yards
M.07	Seed/Fertilizer	$ 15.67	kg	15% freight cost added	Arctic Alpine seed mix + fertilizer (2009)
M.08	Winter road	$ 16,675.00	km	open and maintain for 2 months	NUNA Logistics (from Court Smith) + 15% cost increase to 2012
M.09	Hazardous Waste Disposal fee	$ 10,000.00	m^3	Disposal + handling and cleaning fee	SRK estimate
M.10	Demolition Debris Disposal Fee (@Hay River)	$ 5.51	m^3	Disposal + handling fee	Personal communication with Rob Jamieson@Hay River Disposals Ltd.
M.12	Bentonite chips	$ 570.96	m^3	In 50 pound bags, 15% freight cost added	Holly North Production Supplies Limited
Labour					
L.01	Labour general	$ 56.96	hr.		Nuna Blended 2012 rate POH in
L.02	Labour - Trades	$ 85.26	hr.	Electrician, Welder, plumber etc.	Nuna Blended 2012 rate POH in
L.05	Supervision	$ 97.70	hr.		Nuna Blended 2012 rate POH in
L.06	Truck Drivers	$ 65.81	hr.	Heavy Equipment	Nuna Blended 2012 rate POH in
L.07	Heavy Equipment Operator	$ 71.32	hr.	Light equipment	Nuna Blended 2012 rate POH in
L.08	Technician (Consultant)	$ 130.00	hr.	Staff Consultant	SRK-Estimate (all inclusive)
L.09	Note: Loading Rate includes allowances for (EI, CPP, MSP/Benefits/Travel/OT)				
Shipping					
S.01	Outbound Shipping - Soils	$ 989.00	m^3	1.7 t/m^3 bulk density	(7.75 m^3/seacan based on 29,000 lbs. limit per seacan, seacan is 38.5 m^3) - from NTCL 17APR 12
S.02	Outbound Shipping - Haz Waste	$ 200.00	m^3	1.0 t/m^3 bulk density	(7.75 m^3/seacan based on 29,000 lbs. limit per seacan, seacan is 38.5 m^3) - from NTCL 17APR 13
S.03	Outbound Shipping - Demolition	$ 200.00	m^3	0.733 t/m^3 bulk density	$7661/seacan (seacan is 38.5 m^3) - from NTCL 17APR 12
Hydrocarbon Soils and Haz Waste					
H.01	Excavate impacted soil	$ 19.18	m^3		WESA estimate
H.02	Low temperature thermal desorption	$ 100.00	m^3		WESA estimate
H.03	Rehydrate and backfill	$ 10.69	m^3		WESA estimate
H.04	Regrade and reshape	$ 2.38	m^2		WESA estimate
H.05	Tipping Fee for HC Soils at Hay River	$ 100.00	tonne		Communication with Hay River Landfill Tharp 18APR12
Owner's cost					
OC.01	Camp management	$ 677.00	day		Newmont
OC.02	Camp operations	$ 150.00	day	includes food and camp maintenance	Newmont
OC.03	Camp rental	$ 400,000.00	year	25 man mobile camp	Newmont
OC.04	Commercial flight	$ 750.00	person	flight from Yellowknife to Cambridge Bay and return	
OC.05	Charter flight	$ 10,000.00	flight	Return from Yellowknife	
Stand by equipment rates					
SB. 01	Dozer (CAT D7)	83.25	hr	50 % hourly equipment rate (less operator)	Nuna 2012 Equipment Rates
SB. 02	Excavator (CAT 330 CL)	92.5	hr	50 % hourly equipment rate (less operator)	Nuna 2012 Equipment Rates
SB. 03	Loader (CAT 966 F)	41.15	hr	50 % hourly equipment rate (less operator)	Nuna 2012 Equipment Rates
SB. 04	Skidder (CAT 242B)	40.05	hr	50 % hourly equipment rate (less operator)	Nuna 2012 Equipment Rates

Table 5. Task Unit Rates

Cost Code	Item	Unit	Productivity (Unit/hr.)	Unit Rates				Labour						Equipment									Note / Source
				Total Unit Cost	Material Unit Rate	Labour Unit Rate	Equipment Unit Rate	$ 56.96 General Labour	$ 85.26 Tradesman - Electrical	$ 85.26 Tradesman - Plumber	$ 130.00 Engineer/ Technician	$ 65.81 Truck Drivers	$ 71.32 Heavy Equipment Operator	$ 166.50 Dozer - CAT D7	$ 185.00 Excavator - Cat 330	$ 82.30 Loader - CAT 966	$ 80 Skidder CAT 242	$138.70 Truck - CAT 735	$2,100.00 Helicopter	$ 296.34 Drill	$ 3.56 Drum crusher	$ 11.00 Power washer	$ 5.26 Welding Equipment	
Decommissioning																							
C.1.01	Decommission and remove all heating fuel tanks and place into lined facility	each	4	$ 47.68	$ -	$ 37.40	$ 10.29	2					0.5			0.5								Disconnect and remove all fuel drums and disconnect all Tidy Tanks from all structures
C.1.02	Decommission above ground storage tanks	each	0.5	$ 398.36	$ -	$ 398.36	$ -	2	1															Disconnect all fuel lines and electrical parts
C.1.03	Decommission potable water supply	each	0.25	$ 1,063.54	$ -	$ 981.24	$ 82.30	1	1	1			0.25			0.25								Disconnect all electrical and plumbing (intake and distribution)
C.1.04	Decommission waste incinerator	each	0.167	$ 913.95	$ -	$ 790.50	$ 123.45	2					0.25			0.25								Disconnect and remove fuel storage
C.1.05	Decommission Main Camp Facility electricity	each	0.25	$ 568.88	$ -	$ 568.88	$ -	1	1															De-energise main electrical board, disconnect auxiliary power (if exists)
C.1.06	Decommission electrical generators	each	0.46	$ 599.98	$ -	$ 510.52	$ 89.46	2	1				0.5			0.5								De-energise main breaker board, disconnect external fuel tanks (if needed) / loader used for lifting; source - RSMeans (260505252100)
C.1.07	Dismantle Satellite/Communication Equipment	each	0.5	$ 313.10	$ -	$ 313.10	$ -	2	0.5															source - SRK estimate
C.1.08	Prep portable trailers for moving (remove cladding, etc.)	each	0.3	$ 743.07	$ -	$ 619.62	$ 123.45	3					0.5			0.5								
C.1.09	Decommission Airstrip - Place large X's at each end of strip	each	0.5	$ 277.84	$ 50.00	$ 227.84	$ -	2																Assumed material cost for a high density plastic, nails and sandbags.
Decontamination																							
C.2.01	Collect hazardous chemical waste and place in suitable containers	m^3	0.17	$ 1,947.00	$ -	$ 1,453.20	$ 493.80	3					1			1								Includes all chemicals on site / jm_Estimate
C.2.02	Drain and power-wash heating fuel tanks (Tidy Tanks)	each	6	$ 18.99	$ -	$ 18.99	$ -	2																Drain fuel from tanks and wash exterior with hot water (collect water for treatment)
C.2.03	Drain above ground fuel storage tank	each	0.5	$ 227.84	$ -	$ 227.84	$ -	2																Drain fuel /source - SRK estimate
C.2.04	Pressure wash above ground fuel tank	each	0.5	$ 249.84	$ -	$ 227.84	$ 22.00	2														1		
C.2.05	Drain and power-wash empty fuel drums	each	12	$ 16.35	$ -	$ 15.44	$ 0.92	2					1									1		Drain fuel and triple-rinse drum (collect water for treatment)
C.2.06	Flush sewage treatment unit and collect sewage sludge	each	0.4	$ 504.33	$ -	$ 373.95	$ 130.38	2					0.5			0.5						1		Flush treatment unit with water (collect water for treatment)/source - SRK estimate
C.2.07	Empty incinerator and collect ashes	m^3	0.25	$ 535.08	$ -	$ 370.48	$ 164.60	1					0.5			0.5								Place ashes and unburned contents into containers / see C.6.04
C.2.08	Operate oil/water separator	each	4	$ 45.47	$ -	$ 42.72	$ 2.75	3														1		Siphon the water than drain the oil - 15 minutes per 55 gal. drum
C.2.09	Empty soil from 45 gallon drums	each	4	$ 92.56	$ -	$ 46.31	$ 46.25	2					1		1									
Demolition																							
C.3.01	Crush empty fuel drums	each	20	$ 13.56	$ -	$ 9.26	$ 4.29	2					1			1					1			Same as C.4.01
C.3.02	Cut Tank Farm geomembrane to manageable size	sq. m	80	$ 2.14	$ -	$ 2.14	$ -	3																source - SRK estimate
C.3.03	Remove intake hoses and cut to manageable size	Lm	100	$ 1.96	$ -	$ 1.50	$ 0.46	2					0.5			0.5							1	source - SRK estimate
C.3.04	Dismantle pollution control berm	each	0.50	$ 227.84	$ -	$ 227.84	$ -	2																
C.3.05	Demolish office buildings/ shop structures/ living quarters	m^3	53	$ 10.61	$ -	$ 5.92	$ 4.69	3					2	1		1								Demolish empty wood structures (offices, shacks, etc.)/ source - RSMeans
C.3.06	Demolish helipads/ float plane dock	m^3	75	$ 2.81	$ -	$ 1.71	$ 1.10	1					1			1								Demolish wood structure / source - SRK estimate
C.3.07	Demolish Above ground storage tanks	m^3	5	$ 86.49	$ -	$ 48.44	$ 38.05	3					1		1								1	
C.3.08	Dismantle Old Equipment (torch)	each	0.5	$ 352.28	$ -	$ 341.76	$ 10.52	3															1	
C.3.09	Cut of tops of drill casings	each	2	$ 31.11	$ -	$ 28.48	$ 2.63	1															1	
C.3.10	Clean up debris from site	m^2	2529	$ 0.13	$ -	$ 0.10	$ 0.03	3					1			1								source - SRK estimate
C.3.11	Dismantle radio tower	each	0.04	$ 14,052.00	$ -	$ 9,612.00	$ 4,440.00	2	1		1		1		1									source - SRK estimate
Material Relocations																							
C.4.01	Load demolition debris/solid waste in containers	m^3	48	$ 8.16	$ -	$ 2.97	$ 5.18						2	1		1								source - SRK calculated from first principles
C.4.02	Empty Seacan of debris at the landfill	each	5.7	$ 86.55	$ -	$ 24.98	$ 61.57						2	1	1									
C.4.03	Haul materials to Doris Camp in 20 ft. container (33.2 m^3/container)	m^3	3.31	$ 71.92	$ -	$ 21.57	$ 50.35						1	1										source - calculated from first principles
C.4.04	Haul waste to Roberts Bay jetty in 20 ft. container (33.2 m^3/container)	m^3	3.14	$ 75.78	$ -	$ 22.73	$ 53.06						1	1										source - calculated from first principles
C.4.05	Ship demolition waste from Roberts Bay to Hay River	m^3	1	$ -									0											
C.4.06	Haul one skid to Doris Camp	each	0.07	$ 3,342.69	$ -	$ 1,002.44	$ 2,340.25						1	1										
C.4.07	Load reusable items on skids	each	3	$ 123.41	$ -	$ 61.75	$ 61.67	2					1		1									
Earth works																							
C.5.01	Install HDPE Liner	m^2	175	$ 31.70	$ 28.93	$ 1.71	$ 1.06	4					1		1									
C.5.02	Load, haul, dump, place: 1 truck with <0.5 km haul distance	m^3	40	$ 17.47	$ -	$ 5.21	$ 12.26					1	2	1	1			1						
C.5.03	Load, haul, dump, place: 1 truck with <1.0 km haul distance	m^3	30	$ 23.29	$ -	$ 6.95	$ 16.34					1	2	1	1			1						
C.5.04	Excavate: Spoil locally, no trucks	m^3	100	$ 2.56	$ -	$ 0.71	$ 1.85						1		1									
C.5.05	Regrade surface - rough grading, D7	m^2	100	$ 2.38	$ -	$ 0.71	$ 1.67						1	1										source - RSMeans
C.5.06	Reslope Stockpiles - D7	m^3	75	$ 3.17	$ -	$ 0.95	$ 2.22						1	1										
C.5.07	Relocate core box pallet (<0.5 km)	ea.	6	$ 35.10	$ -	$ 21.38	$ 13.72	1					1			1								
C.5.08	Install soil stabilization measures (straw/coconut matting)	m^2	269	$ 4.04	$ 1.79	$ 1.27	$ 0.99	3.5					2		1		1							source - RSMeans
C.5.09	Drill, blast Quarry	m^3	100	$ 27.27	$ 21.38	$ 2.93	$ 2.96	1.5			0.5		2							1				
C.5.10	Track pack using loaded rock truck	m^2	100	$ 2.05		$ 0.66	$ 1.39					1						1						source - SRKjm estimate
C.5.11	Scaling (loose rock)	hr.	1	$ 256.32	$ -	$ 71.32	$ 185.00						1		1									
C.5.12	Load, haul, dump place: 2 trucks with <1.0km haul distance	m^3	75	$ 12.04	$ -	$ 3.66	$ 8.39					2	2	1	1			2						
C.5.13	Seeding/Fertilizing: By hand, high application rate	m^2	320	$ 0.77	$ 0.24	$ 0.53	$ -	3					0											
C.5.14	Summer identification of low-lying areas	day	0.08	$ 6,543.52	$ 100.00	$ 2,243.52	$ 4,200.00	1			1								0.17					
C.5.15	Remove culvert and create swale	lm	5	$ 87.05	$ -	$ 50.05	$ 37.00	2			0.5		1		1									
Other																								
C.6.01	Sample HC contaminated soils / confirmatory samples	each	2	$ 93.48	$ -	$ 93.48	$ -	1			1													Surface grab sample/ hand auger / Source - SRK estimate
C.6.02	Band together core pallets	each	12	$ 9.49	$ -	$ 9.49	$ -	2			0		0			0								
C.6.03	Construction of Vent Raise Seal	LS	0.042	$ 12,064.56	$ 3,000.00	$ 8,076.96	$ 987.60	3			1		0.5			0.5								$14,000 LS based on project experience; material cost estimated to bring total to $14k; estimated 2 day task duration

Table 6. Relocation Unit Rates

Hauling Distances			
Boston to Doris	61	km	One Way
Boston to Roberts Bay	64.4	km	One-Way

C.4.03 - Productivity of hauling bulk materials from Boston on winter road to Doris			
By Skid - SnowCAT (equivalent to D7)			Note: Cost of winter road not included
Equipment Cost	$ 166.50	per hr.	Includes fuel
Labour Cost	$ 71.32	per hr.	
Average speed	9	km/hr.	Sleds assumed as being available on site
Hauling capacity	2	skids	One container per skid
Cargo capacity	33.2	m^3	Standard 20 ft. container
Space utilization ratio	0.7		
Load	46.48	m^3	Cargo Capacity x # of Containers x Space Utilization Ratio
Distance:	61	km	
Time Required 1 round trip:	**14.06**	**hrs.**	**Includes 0.5hr unloading time**
Productivity:	**3.31**	**m^3/ hr.**	

C.4.04 - Productivity of hauling bulk materials from Boston on winter road to Roberts Bay			
By Skid - SnowCAT (equivalent to D7)			Note: Cost of winter road not included
Equipment Cost	$ 166.50	per hr.	Includes fuel
Labour Cost	$ 71.32	per hr.	
Average speed	9	km/hr.	Sleds assumed as being available on site
Hauling capacity	2	skids	One container per skid
Cargo capacity	33.2	m^3	Standard 20 ft. container
Space utilization ratio	0.7		
Load	46.48	m^3	Cargo capacity x # of Containers x Space Utilization Ratio
Distance:	64.4	km	
Time Required 1 round trip:	**14.81**	**hrs.**	Includes 0.5hr unloading time
Productivity:	**3.14**	**m^3/ hr.**	

Table 7. Structures

Demolition Bulking Factors	
Tents - Empty	1.3
Wood Structures - Empty	1.5
Wood Structures - w/ Interior Wall Allowance	2
Steel Structures - Empty	1.5
Steel Structures - w/ Interior Wall Allowance	2
Mechanical Equipment	1.1
Liners	3
Pipelines	3

Structure Volumes

Area	Structure	Quantity	Length (m)	Width/Dia. (m)	Footprint Area (m)	Avg Height (m)	Wall thickness (m)	Floor Thickness (m)	Roof Length (m)	Roof Thickness (m)	Wall Volume (m^3)	Floor Volume (m^3)	Roof Volume (m^3)	Total Volume (m^3)	Loose Volume (m^3)	Source
Accommodation Complex	Recreation Tent	1	5.1	4.5	23.0	2.5	0.01	0.3	6	0.05	0.48	6.9	1.5	9	**11.56**	Foot Print AutoCAD, height thickness est. from photo
	Site Office	1	12.2	5.1	62.2	2.5	0.15	0.3	5.1	0.3	13.0	18.7	18.7	50	**100.61**	Foot Print AutoCAD, height thickness est. from photo
	Geotech Tent	1	7.5	4.4	33.0	2.5	0.01	0.3	6	0.05	0.6	9.9	2.3	13	**16.57**	Foot Print AutoCAD, height thickness est. from photo
	Core Processing Facility	1	30	7.85	235.5	2.75	0.15	0.3	7.5	0.3	31.2	70.7	67.5	169	**220.19**	Foot Print AutoCAD, height thickness est. from photo
	Core Shack	1	21	5	105.0	2.75	0.15	0.3	6	0.3	21.5	31.5	37.8	91	**181.50**	Foot Print AutoCAD, height thickness est. from photo
	Core Splitter	1	2.6	3.75	9.8	2.5	0.15	0.3	4	0.3	4.8	2.9	3.1	11	**16.21**	Foot Print AutoCAD, height thickness est. from photo
	Muster Station	1	10.4	4.7	48.9	2.75	0.15	0.3	5.5	0.3	12.5	14.7	17.2	44	**66.42**	Foot Print AutoCAD, height thickness est. from photo
	Heating systems liner	2	4	4	16.0			0.05			0.0	0.8	0.0	2	**4.80**	
Maintenance Shop Complex	Maintenance Shop	1	18	12.2	219.6	0	0.05	0	19.2	0.05	0.0	0.0	17.2	17	**25.87**	Foot Print AutoCAD, height thickness est. from photo
	Shop Sheds (survival, elec. Etc.)	1	23	3.75	86.3	2.5	0.1	0.3	3.75	0.1	13.4	25.9	8.6	48	**71.81**	Foot Print AutoCAD, height thickness est. from photo
	Powerhouse	1	12.2	5	61.0	2.5	0.1	0.3	6	0.3	8.6	18.3	22.0	49	**97.72**	Foot Print AutoCAD, height thickness est. from photo
	Transformer Building	1	9	4.54	40.9	2.5	0.1	0.3	5	0.3	6.8	12.3	13.5	33	**48.79**	Foot Print AutoCAD, height thickness est. from photo
Crusher	Crusher Enclosure	1	36.5	12.8	467.2	0	0.01	0	20.1	0.05	0.0	0.0	36.7	37	**55.04**	Foot Print AutoCAD, height thickness est. from photo
	Hopper/Crusher Parts	1	4	2	8.0	1.5	1				18.0	0.0	0.0	18	**19.80**	Estimated
Water Treatment	Water Intake to Portal & Camp	1	607	0.05	30.4	0.05	1				60.7	0.0	0.0	61	**182.21**	Lengths from ACAD
	Sewage Supply Pipelines	1	489	0.05	24.5	0.05	1				48.9	0.0	0.0	49	**146.72**	Lengths from ACAD
	Old Sewage Treatment Bldg.	1	5.5	6.3	34.7	4	0.15	0.3	7.5	0.3	14.2	10.4	12.4	37	**55.40**	Foot Print AutoCAD, height thickness est. from photo
	New Treatment System (5)	5	12	2.5	30.0	2.5	0.15	0.3	2.5	0.15	10.9	9.0	4.5	122	**182.81**	Footprint: ACAD
Helipads	Helipads (3)	3	4.6	4.6	21.2	0	0	0.5	0	0	0.0	10.6	0.0	32	**47.61**	Foot Print AutoCAD, height thickness est. from photo
Docks	Spyder Lake	1	4	3	12.0			0.5			0.0	6.0	0.0	6	**12.00**	Footprint: ACAD
	Stickleback Lake Dock	1	4	3	12.0			0.5			0.0	6.0	0.0	6	**12.00**	Footprint: ACAD
	Stickleback boardwalk	1	133	2.5	332.5	0	0	0.2	0	0	0.0	66.5	0.0	67	**133.00**	Foot Print AutoCAD, height thickness est. from photo
	Bridge E of Stickleback	1	10	5	50.0	0	0	0.5	0	0	0.0	25.0	0.0	25	**37.50**	Made up; have no info
Incinerator	Incinerator	1	1.5	2	3.0	0	0	1.5	0.0	0	0.0	4.5	0.0	5	**6.75**	Foot Print AutoCAD, height thickness est. from photo
Mobile Equipment	Miscellaneous Eq.	5	1.5	2	3.0	0	0	1.5	0.0	0	0.0	4.5	0.0	23	**33.75**	
Primary Tank Farm	Large Above Ground Tanks	6		4.5	0.0	5	0.05	0.05		0.05	2.3	0.0	0.0	14	**20.25**	Foot Print AutoCAD, height thickness est. from photo
	Medium Above Ground Tanks	2		3	0.0	5	0.05	0.05		0.05	1.5	0.0	0.0	3	**4.50**	Foot Print AutoCAD, height thickness est. from photo
	Heating System Tanks	7		1	0.0	5	0.05	0.05		0.05	0.5	0.0	0.0	4	**5.25**	Quantity breakdown shown below, size estimated
	Containment Liner	1	33	25	825.0			0.005			0.0	4.1	0.0	4	**12.38**	ACAD
Power Plant Containment	Green Storage Tank	2	2.5	1.5	3.8	1.5					0.0	0.0	0.0	0	**0.00**	
	Containment Liner	1	4	3	12.0			0.005			0.0	0.1	0.0	0	**0.18**	Estimated
Settling Pond #1	Containment Liner	1	20	20	400.0			0.005			0.0	2.0	0.0	2	**6.00**	Footprint: ACAD
Settling Pond #2	Solid Waste				0.0						0.0	0.0	0.0	0	**0.00**	Estimated from photo
Soil Treatment Facility	45 gallon drums	100		0.6		0.15					0.042	0.0	0.0	4	**6.36**	Estimated from photo
	Containment Liner	1	16	23	368.0			0.005			0.0	1.8	0.0	2	**5.52**	
Drill Cutting Settling Pond	Geotextile or liner	1	30	20	600.0			0.005			0.0	3.0	0.0	3	**4.50**	
Drill Sites	Top of Casing	545	0.9	0.09	0.1						0.01	0.0	0.0	3	**9.13**	
Core Storage Road	Culvert	1	6	0.3	1.8			0.15			0.0	0.3	0.0	0	**0.27**	Assumed crushed to 1/2 its volume
Mine Openings	Portal Fence	1	61.5	0	0.0	1.2	0.01				1.5	0.0	0.0	1	**2.21**	Estimated from photo
	Vent Raise enclosure	1	5	5	25.0	2.5	0.1	0.15	5	0.15	5.0	3.8	3.8	13	**18.75**	Estimated from photo
Other structures	Other (V-notch weir, sampling points, thermistor housing boxes, other sheds)	1	20	4	80.0	2.5	0.1	0.3	4	0.1	12.0	24.0	8.0	44	**66.00**	Based on site photos, assumed areas
TOTAL:															**1,947.9**	

Demolition Preparation

Area	Structure	# of Units	Decommission			Heating Tanks	Hazardous Material Vol Estimate (L)	Special Item	Special Item Description	Source
			Electrical	Heating System	Plumbing System					
Accommodation Complex	Recreation Tent	1				1	0			Estimated from aerial photo
	Site Office	1				0	1			Estimated from aerial photo
	Geotech Tent	1				1	10			Estimated from aerial photo
	Core Shack/Splitter	1				2	10			Estimated from aerial photo
	Muster Station	1				1	4			Estimated from aerial photo
	Portable Trailers	12	1	1	1	0	25			Estimated from aerial photo
Maintenance Shop Compl.	Maintenance Shop	1	0	0	0	0	60			Estimated from aerial photo
	Shop sheds	4	1			1	25			Estimated from aerial photo
	Powerhouse	1	1			0	50			
	Transformer Building	1	1			0	100			
Crusher	Crusher Enclosure	1	0	0	0	1	20			
Water Treatment	New Facility	5	1	0	0	0	25	1	Sludge/Solid Waste	Estimated
	RBC	1					25	1	Sludge/Solid Waste	Estimated
Incinerator	Incinerator	1	0	0	0	0	0	10	Ashes	Ashes in Liters, estimates
Mobile Equipment	Misc. Equipment on site	5	0	0	0	0	60	10	Residual Fuel (in each)	Estimated from aerial photo
Primary Tank Farm	Above Ground Tanks	8					25	40	Residual Fuel (in each)	Fuel in Liters, estimated
	Heating System Tanks	7					25	10	Residual Fuel (in each)	Fuel in Liters, estimated
Power Plant Containment	Green Storage Tanks	2					10	5	Residual Fuel (in each)	Fuel in Liters, estimated
Soil Treatment Facility	Empty 45 gal drums	100						0.5	Residual Fuel (in each)	Fuel in Liters, estimated
Core Boxes	Total box pallets	520								AutoCAD
	Box pallets located on tundra	400								Estimated based on photos + contingency
TOTAL:						**7**	**475**			

Table 8. Reclamation Areas

Reclamation Areas

Work Area	Location	Total Area (m^2)	Area Sacrificed (m^2)	Area Regraded (m^2)	Area Requiring Fill (m^2)	Cocoa-matting Area (m^2)	Total Area (m^2)	Source/Comment
Camp Structures	Old Water Treatment Foundation Pad	460		460				ACAD/aerial site photo
	Helipads	150		150				ACAD/aerial site photo
Camp Surface Infrastructure	Camp Complex Foundation Pad	29,953	29,953	2,995			29,953	Excludes landfarm/core storage areas; assumed 10% requires regrading
	Road to Spyder Lake	773	773	773		0	0	ACAD
	Road to Airstrip	1,763	1,763	1,763				ACAD
	Airstrip	10,444	10,444	5,222				ACAD; assumed 50% required regrading
	Core Storage Road	142	142	142				ACAD
	Drill Road	306	306	306				ACAD; assumed 50% required regrading
Other Areas	Permafrost Remediation Areas	11,184			559	559	11,184	ACAD, assumed 5% required 0.3m fill in low areas, 5% required matting
	Vegetation Die-Back - Drill Road	17,795			890	890	17,795	ACAD, assumed 5% required 0.3m fill in low areas, 5% required matting
	Vegetation Die-Back - Core Storage Road	990			495	50	990	ACAD, assumed 50% required 0.3m fill in low areas, 5% required matting
	Vegetation Die-Back - Grey Water Dis.	5,398			270	270	5,398	ACAD, assumed 5% required 0.3m fill in low areas, 5% required matting
	Drill Sites	9,000			9,000	450	9,000	9 site included each 1000 sq.m.
	Boston Ore Stockpiles	6,077	6,077	3,039			6,077	ACAD; assumed 50% required regrading

Earthwork Volumes/Quantities

Bulking Factors	
Soil/Rock Pad	1.2
Cover shrinkage factor	1.1

Work Area	Item	Qnty	Length (m)	Width (m)	Height (m)	Side Slope (x:1)	Area (m^2)	In-situ Volume (m^3)	Loose Volume (m^3)	Source / Comments
Core Storage Road	Excavate Culvert	1	5.5	0.5	0.9	1	1.26	7		
Mine Openings	Backfill Decline	1	18	12	3			324	**389**	ACAD estimated
Primary Tank Farm	Excavate Bedding Material				0.5		676	338	**406**	
	Regrade area						810			ACAD estimated
Power Plant Fuel Containment	Excavate Bedding Material				0.5		100	50	**60**	Estimated
	Regrade area						125			Estimated
Settlement Pond #1	Excavate Settled Material		16	9	0.5		144	72	**79**	ACAD estimated
	Regrade area						750			ACAD estimated
Settlement Pond #2	Excavate Settled Material		12	9	0.5		108	54	**59**	ACAD estimated
	Regrade area						690			ACAD estimated
Soil Treatment Facility	Soils				0.5		300	150	**180**	ACAD estimated; assumed 1/2 passing
	Regrade area						440			ACAD estimated
Drill Cutting Settling Pond	Cutting volume				0.5		560	280	**336**	ACAD/aerial site photo
	Regrade area						930			ACAD estimated
Ore Stockpiles	Original stockpile footprint				1.7		6077	10331	**12397**	ACAD estimated. Volume of ore material from SRK 2008 Boston annual inspection (27,000 tonnes) and assuming a bulk density of 2 tonnes/m^3
	Consolidated Stockpile foot print				6.7		2026	13500	**16200**	Entire volume (13500 m^3) consolidated to 1/3 of existing footprint.
	Relocated Volume (used for construction)							3169	**3803**	scraped up from pads and airstrip (estimate by SRK)
	Relocated volume (consolidation of piles)							6887	**8265**	pushed into the large pile
	Cover Volume				0.3		2228	668	**802**	
	Liner Area						2330			Liner area increased by 15% to account for wastage and conversion between 3D and 2D projection.
Landfill Closure	Bedding (crushed rock) (0.3m on each side of liner)				0.6		700	420	**504**	
	Liner						805			
	Run-of-quarry cover				0.5		700	350	**420**	

Appendix C: Detailed Comparison between SRK Model and RECLAIM

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Memo

To:	Chris Hanks	**Date:**	December 31, 2012
Company:	Hope Bay Mining Limited	**From:**	Iozsef Miskolczi Tom Sharp
Copy to:		**Project #:**	1CH008.069
Subject:	Hope Bay Project - Comparison Between RECLAIM and SRK Cost Estimating Models NWB Licenses 2AM-DOH0713, 2BB-BOS1217, and 2BE-HOP1222		

1 Introduction

The Hope Bay Project is an advanced exploration site, including the partially constructed Doris North mine, which is owned by Hope Bay Mining Limited (HBML) in Nunavut. In 2012, the site was placed into care and maintenance. The water licences (2AM-DOH0713 (NWB 2007), 2BB-BOS1217 (NWB 2012a), and 2BE-HOP1222 (NWB 2012b))and project certificate have conditions requiring HBML to prepare closure plans that include estimated closure costs. HBML retained SRK Consulting (Canada) Inc. to update the liability estimates for the property.

SRK has updated the cost estimates associated with the closure plans that were submitted to the Nunavut Water Board (SRK 2012a, 2012b, 2012c). These cost estimates were prepared using a spreadsheet model developed by SRK for estimating closure costs at mines in northern Canada.

Aboriginal Affairs and Northern Development Canada (AANDC) requires closure cost estimates to be prepared using the RECLAIM 6.1 spreadsheet model.

The purpose of this memorandum is to present the cost estimation method used by SRK and to show that this method is similar to that used in the RECLAIM 6.1 model.

2 Closure Cost Estimate Models

2.1 RECLAIM 6.1 Model

The RECLAIM model spreadsheet was originally developed by SRK in 1992 and has subsequently been modified by Brodie Consulting. The model has pre-set worksheets that can be expanded to describe a specific project.

The model template includes a default list of unit costs for most tasks and materials used in closure work, along with typical labour and equipment rates. Low and high unit rates are suggested. The default unit rates in RECLAIM 6.1 were updated in May 2011, but known unit rates can be used instead of the default rates. Some indirect costs (project management and engineering) are estimated as a user-specified percentage of direct costs. Mobilization and demobilization costs are calculated based on unit rates.

Costs for the closure of various facilities are provided on a summary sheet. This sheet splits land and water into separate liability components as required by permits and licences (NIRB 2006, NWB 2007, and NWB 2012a, 2012b).

2.2 SRK Cost Estimation Model

SRK uses a cost spreadsheet model similar to RECLAIM to estimate closure costs. Closure plans submitted to the Nunavut Water Board (NWB) included cost estimates that were initially prepared using the SRK model (SRK 2012a, 2012b, 2012c). Recently, these estimates were updated to account for changes in quantities resulting from work performed over the 2012 season. Equipment mobilization costs were also revised.

Unit rates (e.g., equipment, labour, materials, supplies, etc.), task costs (e.g., individual construction or closure activities), and quantities are used in the closure cost estimation. These costs are presented on separate worksheets.

Most cost estimating occurs on a single cost estimate sheet that contains calculations for all detailed tasks by facility or closure component. If more complicated cost calculations are needed, a separate worksheet is used and linked to the cost estimate sheet.

3 Basis of SRK Cost Estimate

3.1 Quantities

Material quantities were estimated by standard engineering calculations based on topographic maps, as-built surveys, and aerial photographs. The details of the quantity estimates are provided in separate worksheets.

3.2 Unit Costs

3.2.1 Equipment Rates

Equipment rates are based on actual 2012 contractor rates obtained from a contractor familiar with this type of work. The rates included ownership, maintenance, overhead and profit, excluding maintenance labour. Maintenance labour, overhead and profit were included in line items elsewhere in the estimate.

3.2.2 Labour Rates

2012 Labour rates were also provided by the contractor and included overhead and profit. The labour rates did not include the costs of camp accommodation, but these were included elsewhere as an indirect cost.

3.2.3 Material Costs

Actual material costs were obtained from the following sources:

- Specific vendor quotes;
- Specific costs from third party consultants;
- Cost Mine 2011;
- Environmental Remediation Cost Data–Unit Price (Means 2005); and
- Recent experience on other projects.

Older material quotes were adjusted to 2012 dollars by indexing the cost by 5% on a yearly basis.

Material costs were factored up by 15% to include freight and shipping costs to site.

3.2.4 Task Unit Rates and Costs

The Task Unit Rate worksheet calculates the cost per unit based on the labour, equipment, and materials required to complete the task. The productivity for each task was obtained from the following sources:

- Equipment specifications obtained from manufacturer's data—in this case the Caterpillar Handbook;
- Environmental Remediation Cost Data–Unit Price (Means 2005); and
- Recent experience on other projects.

The calculations used to estimate unit rates for each task are summarized below:

- The equipment cost ($/unit) is calculated as the sum of equipment hourly rates divided by task productivity (unit/hr).
- The labour cost ($/unit) is calculated as the sum of labourer and operator rates for each piece of equipment, divided by unit productivity (unit/hr).
- The material cost ($/unit) is calculated as the sum of the material unit rate multiplied by the material multiplier factor (material quantity per task unit).
- The total unit rate is equal to the sum of equipment, labour, and material costs.

3.2.5 Relocation Unit Costs

Relocation unit costs are for the transport of materials to Roberts Bay over winter or all-weather roads. The equipment chosen for relocation matches the equipment used during the construction phase. A SnowCAT pulling 20 foot cargo containers (Seacans) on skids was assumed for transport on winter roads. The skids and Seacans were assumed to be available onsite for use. Transport costs were calculated on a kilometre basis using an average travel speed of 9 km/hr and a cargo capacity of 33.2 m^3 for each Seacan.

Regular haul trucks or Seacans on trailers were assumed for all-weather road transport. Trailers were assumed to be available onsite. The tractor head would be mobilized from offsite.

Details for these calculations are provided in the Relocation Unit Cost worksheet. Costs for loading and unloading the Seacans are included elsewhere in the estimate.

3.3 Indirect Costs

Indirect costs are defined as any costs that cannot be directly associated with individual tasks.

Many of indirect costs depend on project duration. Therefore, the project duration was estimated to be the summation of the individual task quantities (units) divided by the task productivity (units/hr). The work was assumed to occur over a 10 hour work day.

3.3.1 Mobilization and Demobilization

Mobilization and demobilization costs were included as a lump sum in the cost estimate. Details for these costs are provided in the MobDemob worksheet.

The following assumptions were made for estimating mobilization and demobilization costs:

- Mobilized equipment was assumed to originate in Edmonton, AB.;
- Equipment was hauled by truck to Hay River, NT, and shipped by barge to Roberts Bay, NU; and
- A lump sum cost was included for the trucking, while the barging costs were calculated based on the footprint area for each piece of equipment.

Standby costs were also included. Standby costs cover time equipment was idle waiting for winter road construction required for access to the Boston and Patch Lake areas. It also covers time waiting for demobilization by the sealift after closure was completed. Sealift is assumed to occur once a year in September.

3.3.2 Winter Road Construction

A 59 km winter road between Boston Camp and Doris Camp is required. Winter road costs were estimated at $14,500 per km based on communications with an ice road contractor in 2009. Costs were updated by 15% to reflect 2012 costs and include road construction and maintenance for a period of two months.

3.3.3 General and Administration Costs

Labour benefits (e.g., overtime, travel allowance, worker compensation, etc.) were included in the labour unit costs.

Travel allowance of $750 per person per flight or $10,000 per charter flight (for crews larger than 12) was included in the estimate.

Camp costs were included at a rate of $150 per person per day in addition to a camp management rate of $677 per day, for the duration of the project. Camp rental of $400,000 per year was also included, based on supplier quotes for a 20-man, self-sufficient camp.

3.3.4 Field Support

It was assumed that a supervisor would be onsite throughout the duration of the project. An allowance for equipment maintenance support was included. A mechanic was assumed to be onsite for 10% of the project.

Helicopter support for travel between Doris Camp and Boston Camp was assumed to be required for six hours per day (four trips) for the duration of the project at a rate of $2,000 per hour. A helicopter would also be used for three days during the Doris Mountain demolition work.

3.3.5 Other

Contractor profit was included in the equipment and labour unit costs. Freight costs of 15% of the material costs were included in the material unit rates.

3.3.6 Engineering and Consultants Services

The costs associated with site visits, sample analysis, and reporting were included in this category. An engineering design cost was included for the ore stockpile covers and the hydrocarbon soils remediation.

3.3.7 Contingency

A contingency of 20% of direct costs was added to the estimate. This contingency was not applied to the cost of shipping and disposing of the demolition waste offsite, because these costs were known.

3.3.8 Post-closure Monitoring

Post-closure monitoring and reporting costs were assumed to be $40,000 per year for five years.

4 Model Comparison

This section compares the basis of the RECLAIM 6.1 and SRK models. The summary sheets for both methods are similar. The SRK summary sheet is organized such that the closure components were grouped by facility type, similar to the RECLAIM model. Table 1 compares how closure costs are summarized in the RECLAIM 6.1 and SRK spreadsheets.

Table 1: Table of concordance for the RECLAIM 6.1 and SRK cost estimate models for Hope Bay Closure.

RECLAIM 6.1	SRK Cost Estimate
Direct Costs	
Open Pit	N/A
Underground Mine	Portals/Adits
Tailings	Tailings Storage Facility
Rock Pile	Dumps, Stockpiles, Landfills
Buildings and Equipment	Transportation Infrastructure Borrow Areas Non-Process Ponds and Reservoirs Drill Sites/Drill Hole Abandonment Drainage/Diversion Channels Facilities Demolition Hydrocarbon Soils Remediation Off-site Shipping for Disposal Off-site Disposal Fees
Chemicals and Soil Management	Hydrocarbon Impacted Soil Remediation
Post-closure Monitoring	Post-closure Monitoring
Indirect Costs	
Mobilization/Demobilization	Mobilization and Demobilization
Project Management	General and Administration Costs Field Support
Engineering	Engineering and Consultant Services
Contingency	Contingency
Market Price Factor Adjustment	Not used

5 Conclusion

In conclusion, the methods used by RECLAIM 6.1 and SRK models to estimate costs are similar. The primary difference in the methods lies in the customization of the SRK model towards the specific project as opposed to the more generic RECLAIM approach. This customization includes developing site specific unit rates which is significantly more defensible that selecting unit rates from a pre-defined picklist as offered by RECLAIM. Should a user choose to use his own unit rates as offered in RECLAIM, there is no backup required for those user selected rates. SRK's approach bridges this shortcoming by providing complete and transparent backup to the entire cost estimating process. Because of this, the SRK cost estimate is, at minimum, an adequate alternative to the RECLAIM 6.1 estimate.

6 References

NIRB 2006. Nunavut Impact Review Board. Doris North Gold Mine Project Certificate. Issued to Miramar Hope Bay Limited. September 15, 2006.

NWB 2007. Nunavut Water Board Water Licence No. 2AM-DOH0713 Type "A". Granted to Hope Bay Mining Ltd. September 19, 2007.

NWB 2012a. Nunavut Water Board Water Licence No. 2BB-BOS1217. Granted to Hope Bay Mining Ltd. August 2, 2012.

NWB 2012b. Nunavut Water Board Water Licence No. 2BE-HOP1222. Granted to Hope Bay Mining Ltd. June 30, 2012.

[Means] R.S. Means Company, Inc. 2005. Environmental Remediation Cost Data–Unit Price. 11th Annual Edition.

SRK 2012a. SRK Consulting (Canada) Inc. June 2012. Hope Bay Project Boston Camp Revised Interim Closure Plan. Report prepared for Hope Bay Mining Limited. SRK Project # 1CH008.065.

SRK 2012b. SRK Consulting (Canada) Inc. June 2012. Hope Bay Project Windy Camp and Patch Lake Facility Final Reclamation Plan. Report prepared for Hope Bay Mining Limited. SRK Project # 1CH008.065.

SRK 2012c. SRK Consulting (Canada) Inc. August 2012. Doris North Closure and Reclamation Plan. Report prepared for Hope Bay Mining Limited. SRK Project # 1CH008.065.

Regards

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