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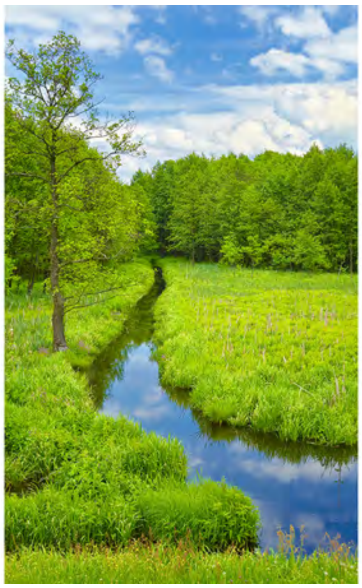
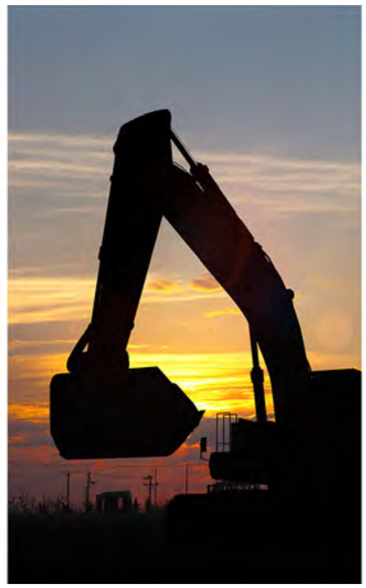


Report

Soil and Groundwater Management Plan

Iqaluit International Airport Improvement
Project Iqaluit, Nunavut

Prepared for: Arctic Infrastructure Partners (AIP)

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Partners in Sustainability

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List of Acronyms

AIP	Arctic Infrastructure Partners
BTEX	Benzene, toluene, ethylbenzene, and xylenes
CCME	Canadian Council of Ministers of the Environment
COC	Contaminant of Concern
CRA	Conestoga-Rovers & Associates
EPD	Environment Protection Division (Government of Nunavut)
FTA	Fire Training Area
g	grams
GN	Government of Nunavut
GNWT	Government of Northwest Territories
HDPE	High-density polyethylene
LTU	Land Treatment Unit
m	Metre
m^2	Square Metre
m^3	Cubic Metre
mm	Millimetre
mbgs	Metres Below Ground Surface
MOE	Ministry of the Environment (Ontario)
NWB	Nunavut Water Board
O&G	Oil and Grease
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PHC	Petroleum Hydrocarbon
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RBC	Risk-Based Concentration
RFP	Request for Proposal
SQG	Soil Quality Guidelines
TC	Transport Canada
VOC	Volatile Organic Compound

Section 1.0 Introduction

Conestoga-Rovers & Associates (CRA) has prepared this Soil and Groundwater Management Work Plan (Work Plan) for the Environmental Protection Department (EPD), Department of Environment, Government of Nunavut (GN) on behalf of Arctic Infrastructure Partners (AIP). AIP is a consortium comprised of the following entities: Bouygues Building Canada, InfraRed Capital Partners, Winnipeg Airports Authority and ColasCanada, through its subsidiary, Sintra Inc. (the Consortium). The Consortium was retained by the GN to construct a new Air Terminal Building, a new Combined Services Building and substantial improvements to the runways, taxiways and aprons (including construction of a new taxiway and expansion/alterations to all of the aprons) and construction of groundside infrastructure including access roads and parking lots, utilities, etc. at the Iqaluit International Airport in Iqaluit, Nunavut (Site). A Site Location Map is provided as Figure 1. The Project is scheduled to commence in 2014. CRA was retained in July 2013 by AIP to complete an environmental investigation of the areas included in the Project.

This Work Plan provides a summary of the environmental investigations that CRA completed in the areas of the Project in July 2013. In accordance with the Department of Environment's Environmental Guideline document for Contaminated Site Remediation (Department of Environment 2009), a property owner is required to notify the EPD upon discovery of soil or groundwater contamination. This document serves as notification of the July 2013 data obtained for the Site.

This Work Plan also provides the EPD with the scope and methods to handle, manage, process, transport, dispose of or otherwise address the environmental impacts identified in the areas of the Project. This Work Plan will focus on managing the environmental contamination located within the areas of the Project. CRA did not investigate areas outside of the scope of the Project, per AIP's direction. CRA understands that the Project activities commenced in June 2014.

Section 2.0 Remedial Objectives/Applicable Guidelines

The remedial objectives for the Project are as follows:

- To prevent exposure to impacted soil containing contaminants of concern (COCs) at concentrations greater than applicable CCME or Site specific risk-based concentrations (RBCs)
- To prevent exposure to groundwater on and off Site containing COCs at concentrations greater than applicable guidelines or Site specific RBCs

- Mitigate the potential for the volatilization of COCs in soil and groundwater to indoor air of future on-Site buildings

CRA used the following guidelines to assess soil and groundwater concentrations detected during the field activities completed at the Site in July 2013.

Applicable Soil Standards for the Site:

1. Canadian Council of Ministers of the Environment (CCME) Tier 1 Industrial Guidelines: As presented in "Canadian Environmental Quality Guidelines Summary Tables, Soil Quality Guidelines for the Protection of Environmental and Human Health, Industrial Land Use", dated 1999, updated 2011 (CCME, 2011). CCME has recently updated their Soil Quality Guidelines (SQGs) for some polycyclic aromatic hydrocarbons (PAHs), as presented in "Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health- Polycyclic Aromatic Hydrocarbons 2010" (CCME, 2010). CCME Tier 1 Industrial Guidelines were used to determine if soil impacts are present at the Site.
2. Environment Protection Division (EPD) of the Department of Environment of the GN Tier 1 Criteria for petroleum hydrocarbon carbon (PHC) impacts in Surface Soil: As presented in the "Environmental Guideline for Contaminated Site Remediation", Department of Environment, Government of Nunavut, dated April 1999, updated January 2002 and March 2009. The EPD developed this guidance document with reference to the CCME document "Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil", dated 2001, updated in 2008. The PHC standards are consistent between the two guidance documents. The surface soil depth relates to any soil sample collected less than 1.5 metres below ground surface (mbgs). The GN Tier 1 Criteria were used to determine if soil impacts are present at the Site.

Based on CRA's field observations, the coarse-textured soil standards shall apply across the Site.

Groundwater standards used for comparison purposes:

1. CCME Water Quality Guidelines: As presented in "Canadian Environmental Quality Guidelines Summary Tables, Water Quality Guidelines for the Protection of Aquatic Life, Freshwater", dated 1991, updated 2012 (CCME, 2012). CCME does not have any guidelines for groundwater. CRA has used the short and long term guidelines for comparison purposes, and as an initial screening of the groundwater data. The CCME Water Quality Guidelines for the Protection of Aquatic Life were developed using freshwater toxicity data, which are conservative for a groundwater condition. The freshwater toxicity data do not take into account a dilution factor (i.e., groundwater

entering into a freshwater body), and as such, CRA developed RBCs for the groundwater at the Site. The development of the RBCs is discussed further below.

2. Ontario's Ministry of the Environment (MOE) Table 3 Standards: As presented in "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Ontario Environmental Protection Act, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition", dated April 15, 2011, (MOE, 2011). MOE Table 3 Standards for industrial/commercial/community property use for coarse-textured soil were applied. In the absence of CCME Water Quality Guidelines for groundwater conditions, CRA used the MOE standards for comparison purposes.

The CCME Water Quality Guidelines were developed to be protective of ecological and human receptors for a fresh water environment, and are conservative when applied to a groundwater condition. CRA used the CCME guidelines as an initial and general screening of the groundwater data.

CRA used the MOE standards for full depth generic site condition standards in a non-potable groundwater condition for comparison purposes. The MOE standards are protective of ecological and human receptors and are applicable to sites in Ontario that are undergoing site remediation with an objective to achieve clean closure in accordance with the MOE generic standards.

CRA understands that the objective of the Project is to manage the impacted soil and groundwater identified in July 2013 and likely to be encountered during the Project works and not to achieve Site clean-up. Based on this objective, CRA conducted a risk evaluation to determine if the soil and groundwater concentrations present pose an unacceptable risk to Site-specific receptors. CRA identified/calculated Site specific RBCs based on the following potential exposure pathways:

- Commercial worker direct contact (incidental ingestion and dermal contact) with soil
- Commercial worker inhalation of vapours (indoor air) from soil and groundwater
- Construction/utility worker direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil and groundwater
- Trespasser direct contact (incidental ingestion, dermal contact, and ambient air inhalation) with soil
- Plants and soil organisms direct contact with soil and groundwater

CRA provided a letter summarizing the development of the RBCs for soil and groundwater to EPD under separate cover for review and concurrence.

Section 3.0 Nature and Extent of Pre-Existing Environmental Contamination

During the July 2013 investigations, CRA collected 36 soil samples and two grab groundwater samples for analyses of volatile organic compounds (VOCs) (including benzene, toluene, ethylbenzene and xylenes [BTEX]), PAHs, metals, PHC F1-F4, polychlorinated biphenyls (PCBs) and general chemistry parameters. It is important to note that groundwater was only encountered in two test pits (TP6 and TP12).

The soil analytical data compared to the CCME Tier 1 Guidelines, the EPD Tier 1 Criteria for PHCs in surface soils, and the Site-specific RBCs are provided in Table 1. The groundwater analytical data compared to the CCME Water Quality Guidelines for the protection of freshwater aquatic life, the MOE Table 3 Standards, and the Site-specific RBCs are provided in Table 2. The locations of the soil and groundwater exceedances identified in July 2013 are provided on Figure 2.

Based on the July 2013 data, CRA identified areas where environmental contamination will be encountered during the implementation of the proposed Project works. AIP completed pre-construction verification and delineation sampling in June 2014 and verified the extent of impacts within the limits of the Project. AIP will provide EPD with the results of the pre-construction verification and delineation sampling under separate cover. The areas where environmental contamination will be encountered during the implementation of the proposed Project works are described as follows:

- **Drum Cache 1** – Approximately 300, 205-litre drums and a 50,000-litre tank are currently staged in this area. The soil sample collected immediately underlying an area of tar product (TP32 - 0.15 mbgs) contains concentrations of ethylbenzene one order of magnitude greater than the CCME guideline. The pre-construction verification and delineation sampling confirmed that the impacts in this area are to a maximum depth of 0.2 mbgs, and covers an approximate area of 860 square metres (m^2).
- **Land Treatment Units (LTUs) and underlying soil** - Soil samples collected from the former Fire Training Area (FTA) where 3 active landfarms are located (LTU1, LTU2, and LTU4) contain concentrations of PHC F2 and F3 greater than the EPD criteria. Based on the pre-construction verification and delineation sampling data, AIP confirmed that there is no soil impacts in the vicinity of TP24; however, AIP will excavate approximately 450 cubic metres (m^3) of soil in this area to be conservative.
- **Arsenic-impacted soil adjacent to runway** - The soil sample collected from 0.8 mbgs at test pit TP15 located adjacent to the runway contained concentrations of arsenic greater than the CCME guideline. As part of the pre-construction verification and delineation sampling, four test pits were advanced surrounding TP15. Arsenic was not detected in any of the soil

samples collected from these four test pits at concentrations greater than the applicable standards; however, AIP will excavate approximately 260 m^3 of soil in this area to be conservative.

- **PAH-impacted groundwater** – The grab groundwater sample collected from test pit TP06 in July 2013 contained concentrations of PAH parameters greater than the MOE Table 3 Standards. Groundwater was encountered during the excavation of test pit TP06 at approximately 1.1 mbgs. As part of the pre-construction verification and delineation sampling, six additional test trenches (25 m in length) were advanced and groundwater samples were collected from each test trench. Four of the six groundwater samples contained PAH concentrations greater than the applicable groundwater standards.
- **Chromium-impacted soil adjacent to Taxiway G –** The layout of Taxiway G was modified following the July 2013 sampling program. AIP completed pre-construction verification and delineation sampling in the area of the Taxiway G re-alignment in June 2014. CRA understands that chromium was detected in the soil samples collected from this area at concentrations greater than the applicable soil standards. AIP will provide EPD with the soil results and proposed remedial approach for this area under separate cover.

CRA identified environmentally acceptable and practical remedial options for each of the above-noted areas requiring management. A description of the remedial options contemplated and recommendation of the preferred remedial option was provided to AIP, and is provided below. The following sections identify the selected and alternative remedial options for each area, and the conceptual design of the selected remedial option.

Section 4.0 Conceptual Remedial Design

4.1 Description of the Selected Remedial Options

CRA contemplated remedial options for each of the four areas of environmental contamination and identified the recommended remedial option for each area. As noted above, the remedial option for Taxiway G will be provided to EPD under separate cover by AIP. This section provides the conceptual design for the selected remedial options for the areas of impact identified during the July 2013 sampling.

The following remedial options were identified as the recommended alternative to manage the environmental contamination present within the identified areas:

- Pre-construction verification and delineation sampling within the limits of the Project works to confirm the extent of environmental contamination that will be encountered and require management during the Project works. As noted above, AIP completed the pre-construction verification and delineation sampling in June 2014. The results of the pre-construction sampling will be provided to EPD by AIP under separate cover.

- Construction of an on-Site waste containment cell to securely store drums, tanks, tar product, and impacted soil.
- Excavation of impacted soils for placement in the on-Site waste containment cell or for use within secure areas of the Project works.
- Development and application of RBCs to validate the acceptable use of arsenic and PHC-impacted soil within secure areas of the Project works.
- Development and application of RBCs to validate the acceptability of ground discharge of treated PAH-impacted groundwater.
- Installation of monitoring wells downgradient of areas where soil have been excavated.

The scope of work to be followed during the construction of the waste containment cell, excavation of impacted soil, use of impacted soil within the Project works, and the pre-construction verification and delineation sampling completed by AIP in June 2014 is described below.

4.1.1 Pre-Construction Verification and Delineation Sampling

Pre-construction verification and delineation sampling was conducted in June 2014 prior to commencing the Project works to confirm the horizontal and vertical extent of environmental contamination requiring management within the limits of the Project works. AIP advanced test pits between the limits of the environmental contamination encountered in July 2013 and the limits of the Project works. Exact number of test pits was determined based on observations made in the field and the limits demarcated by AIP.

Soil and groundwater (if encountered) samples were collected from the test pits for chemical analysis of the COCs identified for that area. Field duplicate samples will be collected for quality assurance/quality control (QA/QC).

The observations made during the test pitting and sampling activities and the analytical results for the soil and groundwater samples collected during this exercise were used to refine the volume of waste material that needs to be managed prior to or during the Project works, see Section 3.0 for additional details.

4.1.2 Construction of On-Site Waste Containment Cell

The on-Site waste containment cell is to be constructed to contain various waste materials encountered during the Project works, which are anticipated to include:

- Steel drums, a steel tank, tar product, and ethylbenzene-impacted soil from the drum cache area
- PHC-impacted soil from the former FTA
- Arsenic-impacted soil from an area adjacent to the runway

The cell footprint is currently proposed to be approximately 900 m^2 and will have a waste disposal capacity of approximately 1,200 m^3. The current footprint of the cell is based on CRA's estimated volumes of waste material (based on the July 2013 data) proposed to be placed within the cell, with approximately 50 percent contingency built in to the design. Any groundwater encountered in test pits advanced surrounding the area of the containment cell will be managed in accordance with the protocols prescribed in Section 4.2. If the pre-construction verification and delineation sampling program completed by AIP indicates a substantive change in the estimated volume of waste material to be placed in the cell, AIP will revise the cell dimensions accordingly. Plan and cross-sectional views are provided on Figure 3.

The base of the cell will be constructed at a depth of 1 mbgs with 1H:1V side slopes and a flat base. Sand and gravel perimeter berms are to be constructed at an approximate height of 0.5 m above existing ground surface around the perimeter of the cell to minimize surface water infiltration. The excavation will be completed to smooth even lines prior to construction of the cell liner system. Due to the anticipated coarse-grained nature of the underlying soil in the vicinity of the cell, the following liner system is proposed for the base of the cell to mitigate contaminant migration from the waste materials to the underlying soil (from bottom to top):

- 540 g/m^2 non-woven geotextile
- 1.5-millimere (mm) high-density polyethylene (HDPE) geomembrane
- 540 g/m^2 non-woven geotextile
- 150 mm thick layer of on-Site sand and gravel

A schematic of the liner system is presented on Figure 4. The liner system will be installed along the entire base of the cell and extend up the 1:1 side slopes. The non-woven geotextiles and HDPE geomembrane components of the liner system will extend 1 m laterally into the perimeter granular berms and maintain a minimum of 0.3 m of cover, as shown on Figure 4.

Due to the variety of waste streams anticipated, CRA recommends that waste materials are placed in the following sequence (from bottom to top):

1. Minimum 0.3-m thick layer of impacted soil at the base of the cell to protect the underlying HDPE geomembrane (as noted in the liner system).
2. Drums and steel tank will be placed simultaneously with ethylbenzene impacted soil from the drum cache area to minimize void spaces between drums, ultimately minimizing settlement of the waste within the cell. The steel tank is to be crushed prior to disposal.
3. Other waste materials.
4. A 0.3-m thick layer of impacted soil shall be placed above waste materials, beneath the cover system, to protect the overlying HDPE geomembrane to be discussed below.

Following the disposal of all necessary waste materials, a cover system is to be constructed. The primary purpose of the cover system is to minimize the amount of leachate generated in the cell by minimizing the amount of water infiltration into the waste materials. The final cover system shall consist of the following components (top to bottom):

- 0.3 m thick layer of non-impacted on-Site sand and gravel
- 540 g/m^2 non-woven geotextile
- 1.5 mm HDPE geomembrane
- 0.3 m thick layer of impacted soil

A schematic of the cover system is presented on Figure 4. The non-woven geotextile and HDPE geomembrane within the cover system shall extend 1 m laterally into the perimeter berms and a minimum of 0.3 m of cover shall be maintained, as shown on Figure 4. The cover system shall be constructed such that a high centre point is to be maintained to achieve positive drainage off of the cell cover. The final slope of the cover will be determined in the field based on the quantity and placement of the wastes in the cell.

In order to monitor the level of leachate/water within the waste containment cell, three 100-mm (4-inch) diameter polyvinyl chloride (PVC) standpipes shall be installed. The locations of the standpipes are shown on Figure 3. The standpipes are to be installed as filling progresses and will consist of a slotted section at the base of the PVC standpipe to facilitate leachate/water collection. The slotted section can consist of a No. 10 slot well screen or it may be hand slotted. A sandpack consisting of No. 2 sand shall be placed around the slotting section.. Pressure fit caps or j-plugs are to be installed in the top of the standpipes. The standpipes will facilitate the removal of leachate from the cell in the future, if required.

In the event that there is significant leachate accumulation in the waste containment cell, AIP will remove the leachate via the standpipes. The leachate shall be stored in drums and temporarily staged in a secure area on Site pending characterization of the leachate. AIP will collect a sample of the leachate for chemical analysis of BTEX, PAH and PHC F1-F4. Pending the results of the analysis, AIP will determine if on-Site treatment of the leachate in the mobile treatment unit is suitable or if off-Site disposal is required.

A sign shall be erected adjacent to the containment cell indicating the presence of the cell and shall read as follows "Lined Solid Waste Containment Cell, Excavation in this Area Prohibited".

4.1.3 Excavation of Impacted Soils

Based on the July 2013 data, an estimated 4,950 m^3 of impacted soil will be excavated prior to or during the Project works. The estimated quantity of impacted soil for each area is provided in Table 3.

The estimated quantities for the PHC-impacted soil, arsenic-impacted soil, and surficial soil located within the drum cache area are based on the analytical results collected from single test pits advanced in these areas and from single soil samples collected from the existing LTUs. CRA has conservatively assumed that the top 0.15 m of soil located within the drum cache area (an area approximately 30 m by 30 m) and the top 0.15 m of soil underlying existing LTU1 and LTU2 are impacted and will be excavated. These soil volumes will be refined based on the results of the pre-construction verification and delineation sampling to be completed in June 2014 (once the pre-construction sampling and verification sampling report is finalized by AIP).

Based on the test pitting activities and analytical results obtained during the July 2013 work, the maximum depth of excavation to remove impacted soils is anticipated to be 1 mbgs. The approximated limits of excavation for each area are shown on Figure 5.

To the extent possible, impacted soil will be excavated and transported directly to either the waste containment cell or the designated location on Site where it will be used as common fill as part of the Project works. If soil stockpiling is required, impacted soil will be placed in windrows or small stockpiles and in areas away from the airport runways and taxiways. The polyethylene sheeting shall be underlain by non-woven geotextile and placed in an area that is flat and void of rocks or other objects that may puncture the polyethylene sheeting. The soil shall be covered daily with polyethylene sheeting. The polyethylene sheeting shall be secured with ultra-violet (UV) resistant sandbags (or an approved alternative, i.e., tires, etc.), and placed on top of the windrow/stockpile (i.e., at edges, on side slopes and across crest). The polyethylene sheeting will be keyed into the surrounding soils in order to secure it the soil. The windrow/stockpile and the areas surrounding the windrow shall promote positive drainage in order to eliminate the potential for surface run-off to accumulate around the piles. The polyethylene sheeting shall be inspected on a routine basis to ensure that the polyethylene sheeting and soil remain secure and dry. A detail specifying secure stockpile construction is provided on Figure 4.

4.1.4 Use of Impacted Soils in Project Works

Arsenic and PHC-impacted soil are present within the areas of the Project works and will be managed prior to or during the subsurface activities proposed for these areas. CRA understands that a large volume of fill (approximately 10,000 m^3) is required in areas of the Project works as fill material. Soil with concentrations greater than the RBCs will either be covered with a minimum of 1.0 m of clean material (aggregate or soil) or with a paved asphalt surface. The cut/fill balance of the Project is shown on Figure 2. Based on the July 2013 data, CRA estimated the following soil volumes, there is approximately 100 m^3 of arsenic-impacted soil located adjacent to the runway and approximately 4,950 m^3 of PHC-impacted soil located within the former FTA (see Table 3). These volumes will be refined once the pre-construction verification and delineation data report is finalized by AIP.

CRA developed RBCs for arsenic and PHC concentrations in soil to validate the acceptable use of arsenic and PHC-impacted soil within secure areas of the Project works. As noted in the technical memorandum (provided to EDP under separate cover), the arsenic and PHC-impacted soil can be used within secure areas of the Project works with application of the following risk management measures.

Stockpiling

During excavation of impacted soil, AIP will endeavor to place the impacted soil directly into fill areas of the Project in order to prevent double handling and stockpiling of the impacted soils, which would minimize the exposure to workers and the environment. Due to construction activities, the excavated soil may be required to be temporarily stockpiled pending future re-use in the Project works. Excavated impacted soils will be placed in a designated area located away from publicly accessible areas, other than those impacted soils that will be stockpiled for a temporary time period (less than 48 hours). As discussed in Section 4.1.3, stockpiled impacted soils will be placed on polyethylene sheeting underlain by non-woven geotextile and covered daily with polyethylene sheeting to prevent impact to storm water runoff, prevent leaching of contaminants to the subsurface, and for dust control. The polyethylene sheeting will be weighted down at the edges and inspected regularly to confirm its integrity. It is also recommended that fencing be placed around the impacted soil stockpiles and signs put up to prevent direct contact to humans and wildlife. Further details regarding the stockpile/windrow construction are provided in Section 4.1.3.

Soil Cover

The concentrations of arsenic and PHCs detected in the soil samples collected from test pit TP15 and from the former FTA, respectively, exceeded the pathway specific RBCs for commercial workers and ecological receptors for direct contact with soil. As a result, soil excavated from these areas can be reused in the Project works as long as they are maintained under a clean cover. This clean cover will consist of a hard cap, such as asphalt or concrete (i.e., taxi pavement or runways) or a 1 m thick clean fill cap (soil or aggregate).

Based on discussions with AIP regarding the construction sequence of the Project works, CRA understands that there may be a period of time when the arsenic and PHC-impacted soil is placed as common fill without a clean cover (soil, aggregate, or asphalt). These areas will be managed in the interim to prevent direct contact to humans and wildlife and to prevent the generation of impacted surface water and leaching of the contaminants into the ground surface. Fencing, or some type of barrier system will be installed surrounding the perimeter of the uncovered impacted soil areas, and the soil will be secured beneath polyethylene sheeting as an interim measure. The polyethylene sheeting will be weighted down at the edges and inspected regularly to confirm its integrity.

Inhalation of Vapours (Indoor Air)

The concentration of PHC F2 fraction detected in the soil sample collected from LTU1 exceeded the pathway specific RBC for the commercial worker inhalation of vapours via indoor air. As a result, soil excavated from LTU1 cannot be used as fill under a building or within 30 m of any building.

4.1.5 Installation of Monitoring Wells

During the July 2013 investigative activities at the Site, groundwater was observed in 2 of 32 test pits advanced at the Site. This indicates that the groundwater is not continuous at the Site, and there is a low risk of soil and groundwater impacts migrating off Site via groundwater transport. Additionally, the risk management measures (RMMs) required to be adhered to when using the impacted soil throughout the works reduces the potential for soil and groundwater impacts to migrate off Site.

As a conservative measure, monitoring wells will be installed downgradient of where impacted soils have been excavated. It should be noted that there is not a continuous groundwater table at the Site, so monitoring wells may be dry at the time of installation or become dry seasonally. The proposed monitoring well locations are shown on Figure 2.

In the event that groundwater samples collected from the monitoring wells contain concentrations of contaminants greater than the applicable standards, then additional wells may be installed further downgradient and potentially off Site, if deemed necessary. Installation of off-Site monitoring wells will be contingent on obtaining access to the proposed drilling areas.

It is important to note that there is perched groundwater in two areas at the Site (as observed in TP6 and TP12 during CRA's sampling in July 2013), which indicates that groundwater collected from off-Site wells may not be representative of groundwater migrating from the excavated areas, and may in fact be localized around the monitoring well, which would not be indicative of Site conditions.

4.2 Management of Water During Project

Groundwater was only encountered at two test pit locations during the July 2013 sampling event and as such it is not anticipated that a substantive quantity of groundwater will be encountered during the Project works. However, if groundwater is encountered in areas of the Project works where known soil contamination is present, the groundwater will be containerized and staged in a secure area on Site pending characterization. Samples will be collected from the containerized groundwater for analysis of the COCs present in soil in that area of the Project works. Based on the analytical results, clean groundwater (groundwater not containing any level of contamination) will be discharged to the ground surface in accordance with the protocols discussed in Section 5.4. Impacted groundwater will either be treated in the mobile on-Site treatment unit or disposed of off-Site if the concentrations are too high to be managed by the on-Site treatment unit.

Section 5.0 Application of Remedial Options to Areas Requiring Management

This section provides details on how the selected option will be implemented for each area. This section also provides a description of an alternative remedial option for the drum cache area and for the PHC-impacted soil located within the former FTA.

5.1 Drum Cache – Selected Option

There are three waste streams that need to be managed within this area: 300, 205-litre drums and a 50,000-litre tank containing varying amounts of tar product, tar product released to the ground surface, and surficial soil impacted with volatile organic compounds (ethylbenzene). If the 50,000-litre tank has residual liquid inside (not of a viscous nature), the liquid will be containerized in drums and staged on Site in a secure area pending characterization. The liquid will be sampled for BTEX, PAHs and PHC F1-F4 analyses. Pending the results of the analysis, AIP will determine if on-Site treatment of the impacted water in the mobile treatment unit is suitable or if off-Site disposal is required.

The selected remedial option for all three waste streams includes construction of an on-Site waste containment cell, excavation of the waste streams from their current location in the drum cache, and placement in the waste containment cell. Construction of the waste containment cell and excavation of impacted soil is discussed in Section 4.1.2.

Based on the quantity of drums present and the size of the tank, they will require approximately 175 m^3 of air space in the waste containment cell. The drums will be removed from their current location and placed as is in the waste containment cell. As some of the drums are punctured, care will be taken during the relocation of the drums from the drum cache into the waste containment cell to avoid the release of tar product. The drums will be placed directly into the waste containment cell on their side. If this is not possible and they will be staged temporarily before being placed in the waste containment cell, they will be staged on a non-woven geotextile overlain with polyethylene sheeting to prevent contaminating the surrounding surficial soils.

Based on the size of the tank it will need to be crushed prior to placement in the waste containment cell. The tar product will remain in the drums/tank during this process. The tar product present on the ground surface will be excavated and transported directly to the waste containment cell.

The top 0.15 m of soil within the drum cache area (an area approximately 30 m by 30 m) will be excavated and transported directly to the waste containment cell and co-disposed of with the drums and tank to fill the void spaces. The estimated limits of the surficial excavation within the drum cache area are shown on Figure 5. The limits of excavation will be updated based on the pre-construction verification and delineation sample results. Soil samples collected from this area during the pre-construction verification and delineation sampling will be analyzed for BTEX, PHCs, and PAHs.

AIP will obtain a Water Licence from the Nunavut Water Board (NWB) or amend and transfer the existing Water Licence currently held by Transport Canada (TC) for the Site prior to the excavation and management of impacted soil in the drum cache area.

5.1.1 Alternative Remedial Option for Drum Cache Area

An alternative remedial option to manage the three waste streams from the drum cache area includes off-Site shipment and disposal of the waste streams at licensed disposal facilities. CRA understands that Nunavut does not maintain a licensed disposal facility for these waste streams and that out-of-territory disposal is required. CRA has identified approved disposal facilities in Ontario, New Brunswick and Quebec. Should GN select this alternative remedial option, the transportation and disposal of these waste streams will be coordinated.

The asphalt in the drums and the ethylbenzene-impact soil are not classified as dangerous goods under the Transportation of Dangerous Good Regulation, and as such, the Site does not require a hazardous waste[1] generator number with the Department of Environment. All waste streams shipped off Site will be accompanied by a waste manifest form.

The drums, tank and ethylbenzene-impacted soil will be removed from their existing locations and securely containerized prior to shipment off Site. A skid steer with a drum handler will be used to move and place the drums on pallets or equivalent shipping container with spill containment for transportation off Site. An excavator will be used to move the steel tank as a whole and place it on pallets/skids, or an appropriate equivalent. Depending on the integrity of the tank, the tank may be broken into large pieces for transportation. The ethylbenzene-impacted soil will be excavated and placed into soil bags for transportation. Soil bags can be transported by the forklift. As noted above, as some of the drums are punctured, care will be taken during the relocation of the drums from the drum cache area to the transportation equipment. The drums will be placed directly into the transportation equipment. If this is not possible and temporary staging is required, the drums will be staged on a non-woven geotextile overlain by polyethylene sheeting to prevent contaminating the surrounding surficial soils.

The top 0.15 m of soil within the drum cache area (an area to be refined based on the pre-construction verification sampling) will be excavated and transported directly to the shipping container. The estimated limits of the surficial excavation within the drum cache area are shown on Figure 5. The limits of excavation will be confirmed during the pre-construction verification and delineation sampling activities. If the soil cannot be placed directly into the shipping containers and temporary staging is required, the drums will be staged on a non-woven geotextile overlain by polyethylene sheeting to prevent contaminating the surrounding surficial soils.

AIP will obtain a Water Licence from the NWB or amend and transfer the existing Water Licence currently held by TC for the Site prior to the excavation and management of impacted soil in the drum cache area.

[1] Hazardous waste is defined as a contaminant that is a dangerous good and is no longer wanted or is unusable for its original intended purpose and is intended for storage, recycling, treatment or disposal (Environmental Guideline for the General Management of Hazardous Waste, Department of Environment, GN).

5.2 LTUS and Underlying Soil

Three LTUs containing PHC-impacted soil (LTU1, LTU2, and LTU4) are located within the former FTA. Based on the July 2013 data, CRA estimated that there is approximately 4,950 m^3 of PHC-impacted soil located in this area that needs to be managed. The exact volume to be removed in this area will be refined by the pre-construction and verification sampling data. AIP has estimated that approximately 450 m^3 of impacted soil requires management based on the June 2014 data.

The selected remedial option for the PHC-impacted soil includes the development of RBCs for PHC concentrations in soil to validate the use of the PHC-impacted soil in secure areas of the Project works. Through the development of the RBCs, it was concluded that all PHC-impacted soil could be used as common fill in areas of the Project works where the soil will be covered with 1 m of clean cover (soil or aggregate), or an asphalt surface. Based on discussions with AIP, CRA understands that approximately 10,000 m^3 of fill is required in the Project works so all of the PHC-impacted soil can be used within the Project woks. The cut/fill balance of the Project is shown on Figure 2. The risk management measures that will be adhered to when using the PHC-impacted soil throughout the Project works are discussed in Section 4.1.4.

Impacted soil will be excavated from the LTUs and transported directly to its designated location in the Project works. If impacted soil will be stockpiled temporarily, the protocol discussed in Section 4.1.3 will be adhered to. The geosynthetic liners currently in place at the base of the LTUs will be removed and placed directly into the waste containment cell.

The top 0.15 m of soil underlying the impacted LTUs will be excavated and transported directly to the designated location in the Project works. The estimated limits of the surficial excavation within these areas are shown on Figure 5.

Based on the depth of impact identified in test pit TP24 in July 2013, CRA has assumed that an excavation approximately 10 m by 10 m and 1 m deep will be required to remove the PHC-impacted soil from this area. The June 2014 pre-construction sampling data will refine the area that requires excavation. The soil will be excavated and transported directly to the designated location in the Project works. The estimated excavation limits within this area are shown on Figure 5. The limits of excavation will be confirmed during the pre-construction verification and delineation sampling activities.

If the Project works change and there is a surplus of PHC-impacted soil that cannot be used as common fill, the surplus soil will be excavated and placed directly into the waste containment cell in accordance with the procedures discussed in Section 4.1.2.

Application of the RBCs in the Project works is pending receipt of EPD's concurrence on the development of the RBCs.

AIP will obtain a Water Licence from the NWB or amend and transfer the existing Water Licence currently held by TC for the Site prior to the excavation and management of impacted soil in the drum cache area.

5.2.1 Alternative Remedial Option for LTUS and Underlying Soil

An alternative remedial option for the PHC-impacted soil includes placement of the soil in the on-Site waste containment cell. To accommodate the additional waste volume, the cell footprint will increase to 5,625 m^2 and the waste disposal capacity will increase to 7,700 m^3. The footprint of the cell is based on CRA's current estimated volumes of waste material proposed to be placed within the cell (based on the July 2013 data) under this alternative remedial option, with approximately 50 percent contingency built into the design. The construction procedures and sequences for construction of the waste containment cell will not differ from those presented in Section 4.1.2., aside from the size of the cell.

Impacted soil will be excavated from LTU1 and LTU2 and transported directly to the waste containment cell. If impacted soil will be stockpiled temporarily, the protocol discussed in Section 4.1.3 will be adhered to. The geosynthetic liners currently in place at the base of LTU1 and LTU2 will be removed and placed directly into the waste containment cell.

The top 0.15 m of soil underlying LTU1 and LTU2 will be excavated and transported directly to the designated location in the Project works. The estimated limits of the surficial excavation within these areas are shown on Figure 5.

Based on the depth of impact identified in test pit TP24 in July 2013, CRA estimated an excavation approximately 10 m by 10 m and 1 m deep would have been required to remove the PHC-impacted soil from this area. The soil will be excavated and transported directly to the waste containment cell. The estimated excavation limits within this area are shown on Figure 5. This excavation area will be refined based on the pre-construction verification and delineation sampling completed by AIP in June 2014.

The limits of excavation within the former FTA will be confirmed during the pre-construction verification and delineation sampling activities.

AIP will obtain a Water Licence from the NWB or amend and transfer the existing Water Licence currently held by TC for the Site prior to the excavation and management of impacted soil in the LTUs and surrounding area.

5.3 Arsenic-Impacted Soil Adjacent to Runway

The soil sample collected from 0.8 mbgs at test pit TP15 located adjacent to the runway contained concentrations of arsenic greater than the CCME guideline. AIP completed additional soil sampling in the vicinity of TP15 and arsenic concentrations detected in the test pit soil samples were less than the applicable soil standards. AIP has estimated that approximately 260 m^3 will be removed from this area.

The selected remedial option for the arsenic-impacted soil includes the development of RBCs for arsenic concentrations in soil to validate the use of the arsenic-impacted soil in secure areas of the Project works. Through the development of the RBCs, it was concluded that all arsenic-impacted soil could be used as common fill in areas of the Project works where the soil will be covered with 1 m of clean cover (soil or aggregate), or an asphalt surface. Based on discussions with AIP, CRA understands that approximately 10,000 m^3 of fill is needed in areas of the Project works that will be covered, and as such all of the arsenic-impacted soil can be used in the Project works. The cut/fill balance of the Project is shown on Figure 2. The risk management measures that will be adhered to when using the arsenic-impacted soil throughout the Project works are discussed in Section 4.1.4.

The arsenic-impacted soil will be excavated and transported directly to the designated location in the Project works. The estimated excavation limits within this area based on the July 2013 data are shown on Figure 5. The limits of excavation will be refined by AIP based on the June 2014 data.

If the design of the Project works is revised and there is a surplus of arsenic-impacted soil that cannot be used as common fill, the surplus soil will be excavated and placed directly into the waste containment cell in accordance with the procedures discussed in Section 4.1.2.

Application of the RBCs in the Project works is pending receipt of EPD's concurrence on the development of the RBCs.

AIP will obtain a Water Licence from the NWB or amend and transfer the existing Water Licence currently held by TC for the Site prior to the excavation and management of arsenic-impacted soil adjacent to the runway.

5.4 PAH-Impacted Groundwater

The grab groundwater sample collected from test pit TP06 contained concentrations of PAH parameters greater than the MOE Table 3 groundwater standards. Groundwater was encountered during the excavation of test pit TP06 at approximately 1.1 mbgs. Based on information provided to CRA, excavations will be advanced to approximately 1.2 mbgs in this area during the Project works, as such, it is likely that PAH-impacted groundwater will be encountered and will be managed.

The selected remedial option was the development of RBCs for PAH concentrations in groundwater to validate the acceptability of the discharge of collected groundwater to the ground surface. A technical memorandum summarizing the development of groundwater RBCs was provided to EPD under separate cover. A comparison of the RBCs to the PAH concentrations detected in the groundwater sample collected from test pit TP06 is provided in Table 2. As shown in Table 2, two PAH parameters (benzo(a)anthracene and indeno(1,2,3-cd)pyrene) were detected in the grab groundwater sample at concentrations greater than the respective RBCs, and as such the groundwater collected during the Project works in the vicinity of test TP06 will be containerized and treated prior to ground discharge.

A granular activated carbon (GAC) system will be employed as the primary groundwater treatment system for the PAH-impacted groundwater encountered during the Project works. GAC is a carbon filtration technology that is widely used for the removal of organic compounds (chlorinated solvents, PCBs, PAHs, etc.). Similar to most PAHs, benzo(a)anthracene and indendo(1,2,3-cd)pyrene have a high degree of absorbability by carbon. The GAC system has been designed to treat the impacted groundwater such that effluent concentrations of PAHs are below the RBCs.

Groundwater collected in the excavation will be pumped to a storage container pending treatment. Water from the storage container will be directed through the cartridge filters and carbon filters prior to direct ground discharge. Based on the lack of groundwater encountered across the Site during the test pitting activities, and the presence of permafrost consistently across the Site, CRA does not anticipate that a significant volume of groundwater will be encountered during excavation activities. As such, the proposed treatment system does not include an equalization tank. If a large volume of groundwater is encountered throughout the works, the addition of an equalization tank or holding basins to attenuate peaks or surges to provide a fixed flow rate to the treatment system may be required.

An alternative to using a storage container or an equalization tank could be the use of holding basins. Holding basins can be constructed to manage groundwater from excavations or site works that does not meet the groundwater RBCs. Two holding basins will be constructed for the PAH-impacted groundwater. One basin will be used to allow sediments to settle out of the water, which will increase the efficiency of the treatment system. While one basin is settling, the water will be pumped out of the other basin and passed through the treatment unit. It is anticipated that the water will be allowed to settle for 1 to 2 days prior to treatment. The soil that settles to the bottom of the holding basin can be removed at the end of each construction season. AIP will containerise the soil and collect soil samples for chemical analysis for PAHs in order to determine the appropriate disposal options for the soil.

Soil that meets the applicable soil standards will be used as backfill in the excavation areas. Any soil that does not meet the applicable soil standards can be disposed of in the on-Site waste containment cell.

Two additional holding basins will be constructed to store treated water. Once one of the holding basins is full, AIP will collect a sample from the basin for chemical analysis of PAHs. Holding basins will not be filled greater than 85-percent of its capacity in order to accommodate for rain events while analytical results are pending. It is anticipated that the receipt of the analytical data will take 10 days following sample collection. The holding basins will be monitored daily to ensure that there is no risk of overflow. In the event that a holding basin is near capacity, water will be pumped to an untested holding basin, which is less than its 85-percent capacity.

Upon receiving analytical data that indicates that the water meets the groundwater RBCs, AIP will discharge the water to ground surface in the location approved in the Water Licence. CRA recommends that the discharge area be an area with vegetation to avoid soil erosion and away from public access areas. AIP will construct additional holding basins for both the PAH-impacted groundwater and treated water, as needed.

The holding basins will be constructed of compacted granular berms between 0.5 and 1 m high. The interior of the berms will be lined with an oil resistant HDPE geomembrane to hold the water. For ease of construction, the basin will be the width of a roll of the geomembrane, and as long as is needed to hold the desired volume, as determined by AIP. The geomembrane will not require any welding.

At the end of each construction period, AIP will fill all basins with treated water (50 percent of its holding capacity) to hold the liner in place during winter months. The holding basins will be inspected at the commencement of each construction season to ensure that the liners are still in place and provide a water tight seal for the basin. AIP will decommission the holding basins at the end of the Project.

A process flow diagram for the GAC system is shown on Figure 6 and consists of the following components:

Oil/Water Separator (Optional)

The oil/water separator (OWS) has been included as an optional item. Given that the samples were not analyzed for Oil and Grease (O&G), the presence of free oils in the groundwater is currently unknown; however, CRA did not observe the presence of a sheen on the groundwater and does not anticipate the presence of free oils in the groundwater. If future characterization of the influent groundwater identifies elevated levels of O&G, CRA recommends that an OWS be included in the treatment system for protection of the downstream carbon treatment units.

Influent groundwater will be conveyed from the storage container to the OWS for removal of free oils. Free oils will be collected and disposed of in the waste containment cell as necessary.

Cartridge Filtration

Cartridge filtration provides particulate removal prior to GAC filtration. The cartridge filters will be used to remove larger particles that might otherwise reduce the effectiveness of the carbon filters. It is anticipated that two cartridge filters (25 micron and 5 micron) will be used in series to filter the groundwater. Pressure monitoring shall be undertaken at the cartridges to determine the necessity for cartridge replacement.

GAC system

A GAC system will be used to remove the PAHs that may be found at levels above their respective RBCs in the influent groundwater. The GAC system will include multiple carbon units, operated in series such that flow can be directed from one filter to another as the carbon is spent to ensure continuous operation and consistent effluent quality. It will be necessary to monitor the effluent from each carbon unit throughout the duration of the groundwater treatment activities to ensure that the system is successfully reducing PAH concentrations below respective RBCs.

As discussed in Section 5.2, application of the RBCs in the Project works is pending receipt of EPD's concurrence on the development of the RBCs.

AIP will obtain a Water Licence from the NWB or amend and transfer the existing Water Licence currently held by TC for the Site prior to the discharge of the treated groundwater to the environment.

Prior to discharge of the treated water, AIP will collect samples of the treatment system effluent for PAH analysis. This data will be used to demonstrate that the treatment unit has effectively removed the PAH impacts from the groundwater. Treatment water will be held in the holding container or basins until analytical data are received. AIP understands that the Water Licence obtained for the Site will outline the sampling frequency required throughout the operation of the treatment unit. AIP will provide the analytical data of the treated water to the local Water Inspector of the Aboriginal Affairs and Northern Development Canada (AANDC) at least 24 hours prior to discharge of the water, unless otherwise noted in the Water Licence.

AIP understands that the AANDC Water Inspector has the authority to enforce the terms and conditions of the Water Licence.

Section 6.0 References

Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Canadian Council of Ministers of the Environment, 2001, Revised 2008

Canadian Drinking Water Quality Guidelines, Health Canada, 1996, 6th edition Canadian Environmental Quality Guidelines Summary Tables, Soil Quality Guidelines for the Protection of Environmental and Human Health, Canadian Council of Ministers of the Environment, 1991, Revised 2013

Canadian Environmental Quality Guidelines Summary Tables, Water Quality Guidelines for the Protection of Aquatic Life, Canadian Council of Ministers of the Environment, 1991, Revised 2012

Canadian Environmental Quality Guidelines Summary Tables, Soil Quality Guidelines for the Protection of Environmental and Human Health, Industrial Land Use", dated 1999, updated 2011 (CCME, 2011).

Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Polycyclic Aromatic Hydrocarbons (PAHS), Scientific Supporting Document, Canadian Council of Ministers of the Environment, 2010

Consolidated Transportation of Dangerous Goods Regulations (including Amendment SOR/2012-245), Transport Canada, Government of Canada

Environmental Guideline for Contaminated Site Remediation, Environment Protection Division, Department of Environment, Government of Nunavut, 1999, Updated 2012

Environmental Guideline for the General Management of Hazardous Waste, Department of Environment, Government of Nunavut, 1999, updated 2002 and 2010

Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories, NWT Water Board, 1992

Soil, Ground Water and Sediment Standards for Use Under PartXV.1 of the Ontario Environmental Protection Act, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition, Ministry of Environment, Ontario, April 15, 2011

All of Which is Respectfully Submitted,
CONESTOGA-ROVERS & ASSOCIATES

L. Shepherd

Lindsay Shepherd, P. Eng.

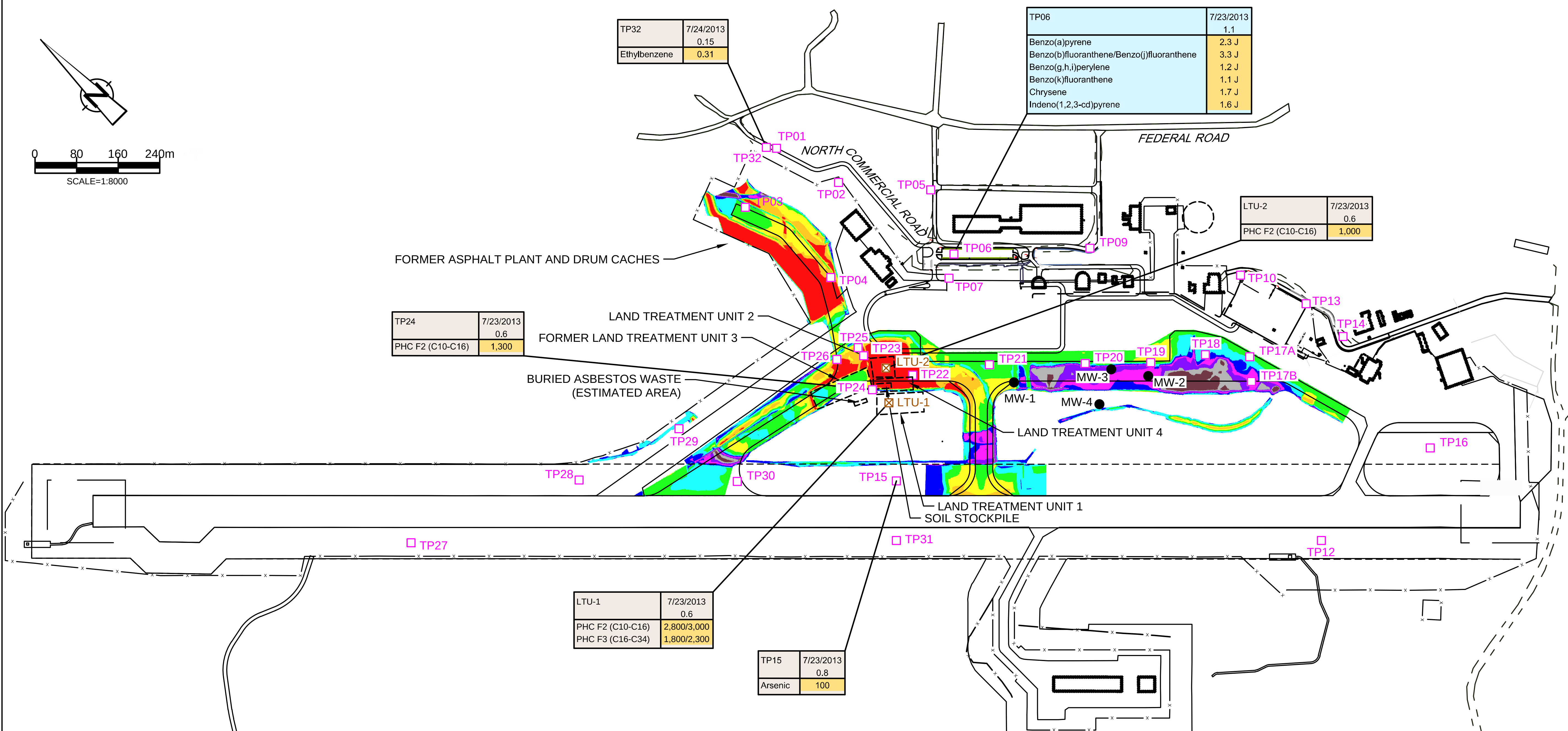
Source: © 2013 - TerraServer®; Basemap: ESRI Basemap and data, accessed 2013; Coordinate System: NAD 1983 UTM Zone 19N

figure 1

SITE LOCATION MAP
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut

CRA

082415-50(005)GIS-OT001 May 22, 2014



LEGEND

- 1 — TEST PIT LOCATION
- LTU-1 — LAND TREATMENT UNIT LOCATION
- MW-1 — MONITORING WELL LOCATION

TP32	7/23/2013 0.15
Ethylbenzene	0.31

- SAMPLE IDENTIFICATION
- SAMPLE DATE
- SAMPLE DEPTH (mBGS)
- CONCENTRATION
- PARAMETER
- EXCEEDANCE
- GROUNDWATER SAMPLE
- SOIL SAMPLE
- J — ANALYTE CONCENTRATION IS ESTIMATED

CRITERIA TABLE

PARAMETER	UNITS	SOIL STANDARDS	GROUNDWATER STANDARDS
Arsenic (1)	Õg/g	12	- -
Benzo(a)pyrene (3)	Õg/L	- -	0.81
Benzo(b)fluoranthene/Benzo(j)fluoranthene (3)	Õg/L	- -	0.75
Benzo(g,h,i)perylene (3)	Õg/L	- -	0.2
Benzo(k)fluoranthene (3)	Õg/L	- -	0.4
Chrysene (3)	Õg/L	- -	1
Ethylbenzene (1)	Õg/g	0.082	- -
Indeno(1,2,3-cd)pyrene (3)	Õg/L	- -	0.2
PHC F2 (C10-C16) (2)	Õg/g	260	- -
PHC F3 (C16-C34) (2)	Õg/g	1,700	- -

NOTES:

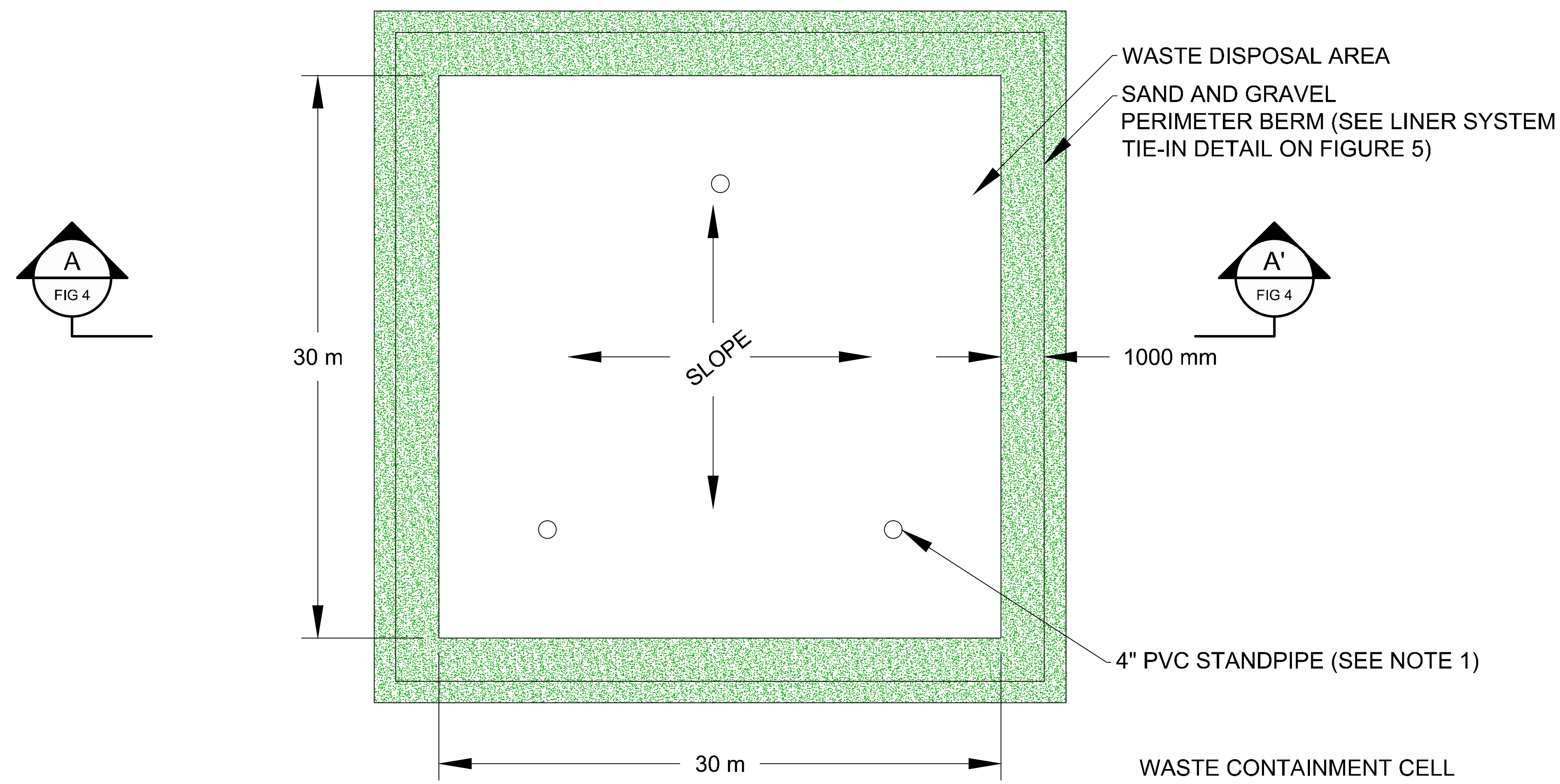
1. SOIL QUALITY GUIDELINES FOR THE PROTECTION OF ENVIRONMENT AND HUMAN HEALTH (TIER 1 INDUSTRIAL), CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT (1997, UPDATED 2011).
2. ENVIRONMENTAL GUIDELINE FOR CONTAMINATED SITE REMEDIATION (TIER 1 INDUSTRIAL FOR FOR COARSE-GRAINED SOIL), DEPARTMENT OF ENVIRONMENT, GOVERNMENT OF NUNAVUT (2009).
3. SOIL, GROUNDWATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE ENVIRONMENTAL PROTECTION ACT (ONTARIO MOE, 2011), TABLE 3: FULL DEPTH GENERIC SITE CONDITION STANDARDS IN A NON-POTABLE GROUNDWATER CONDITION.
4. APPROXIMATE DEPTH OF PROJECT WORKS, AS PROVIDED BY AIP.

Elevations Table (4)

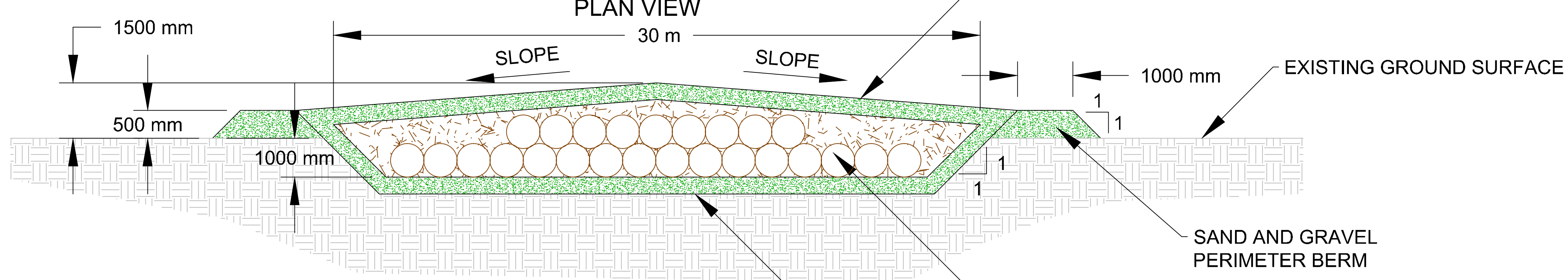
Range #	Minimum Elevation (m)	Maximum Elevation (m)	Area (m²)	Color
1	-99999.00	-2.00	25698.85	
2	-2.00	-1.50	12309.90	
3	-1.50	-1.00	24943.06	
4	-1.00	-0.50	43418.54	
5	-0.50	0.00	27316.19	
6	0.00	0.50	12847.53	
7	0.50	1.00	10264.66	
8	1.00	1.50	7629.15	
9	1.50	2.00	4940.87	
10	2.00	99999.00	4169.69	

figure 2

SOIL AND GROUNDWATER EXCEEDANCES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut



WASTE CONTAINMENT CELL
PLAN VIEW



WASTE CONTAINMENT CELL
CROSS-SECTION A-A'

NOTES:

1. 4" PVC STANDPIPES SHALL BE INSTALLED AS FILLING PROGRESSES. STANDPIPES SHALL CONTAIN 1 m SLOTTED SECTION AT THE BASE OF INSTALLATION. SLOTTED SECTION SHALL CONSIST OF NO. 10 SLOT WELL SCREEN OR HAND SLOTTED. A SANDPACK CONSISTING OF No. 2 SAND SHALL BE INSTALLED AROUND THE SLOTTED SECTION. STANDPIPES SHALL BE SEALED WITHIN COVER SYSTEM.

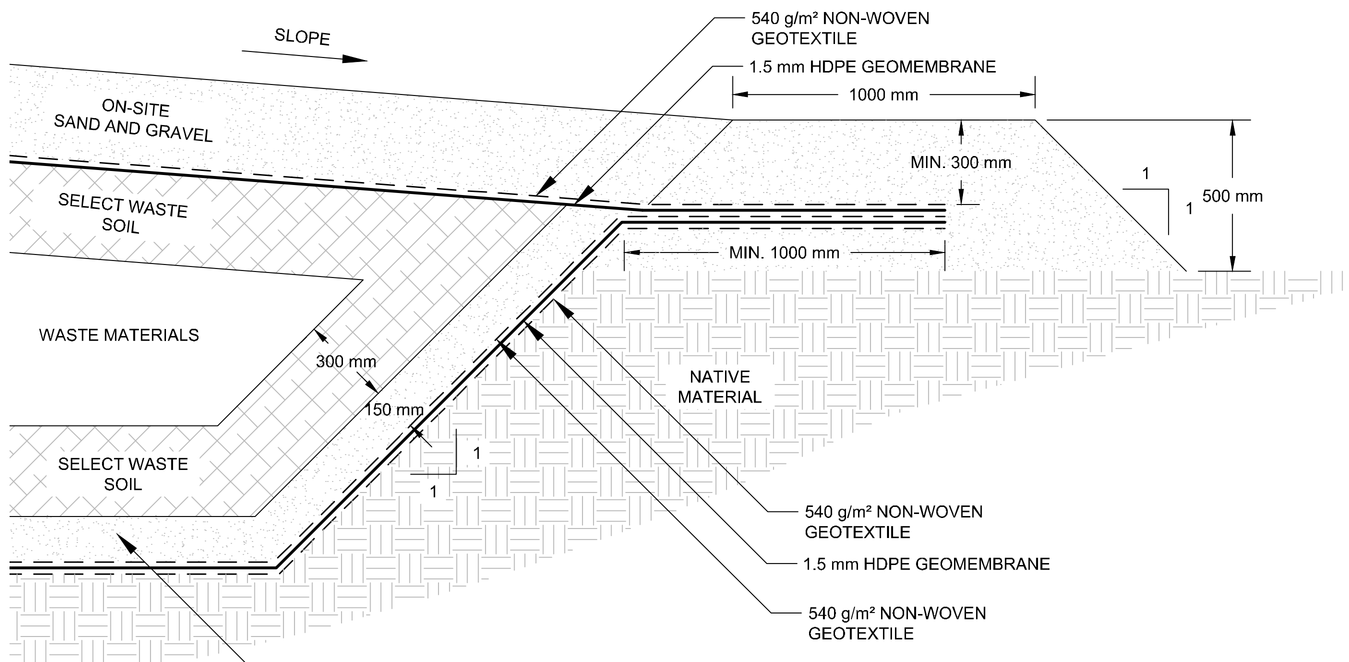
2. FINAL SLOPE TO BE DETERMINED IN THE FIELD BASED ON WASTE VOLUME PLACED IN CONTAINMENT CELL.

figure 3

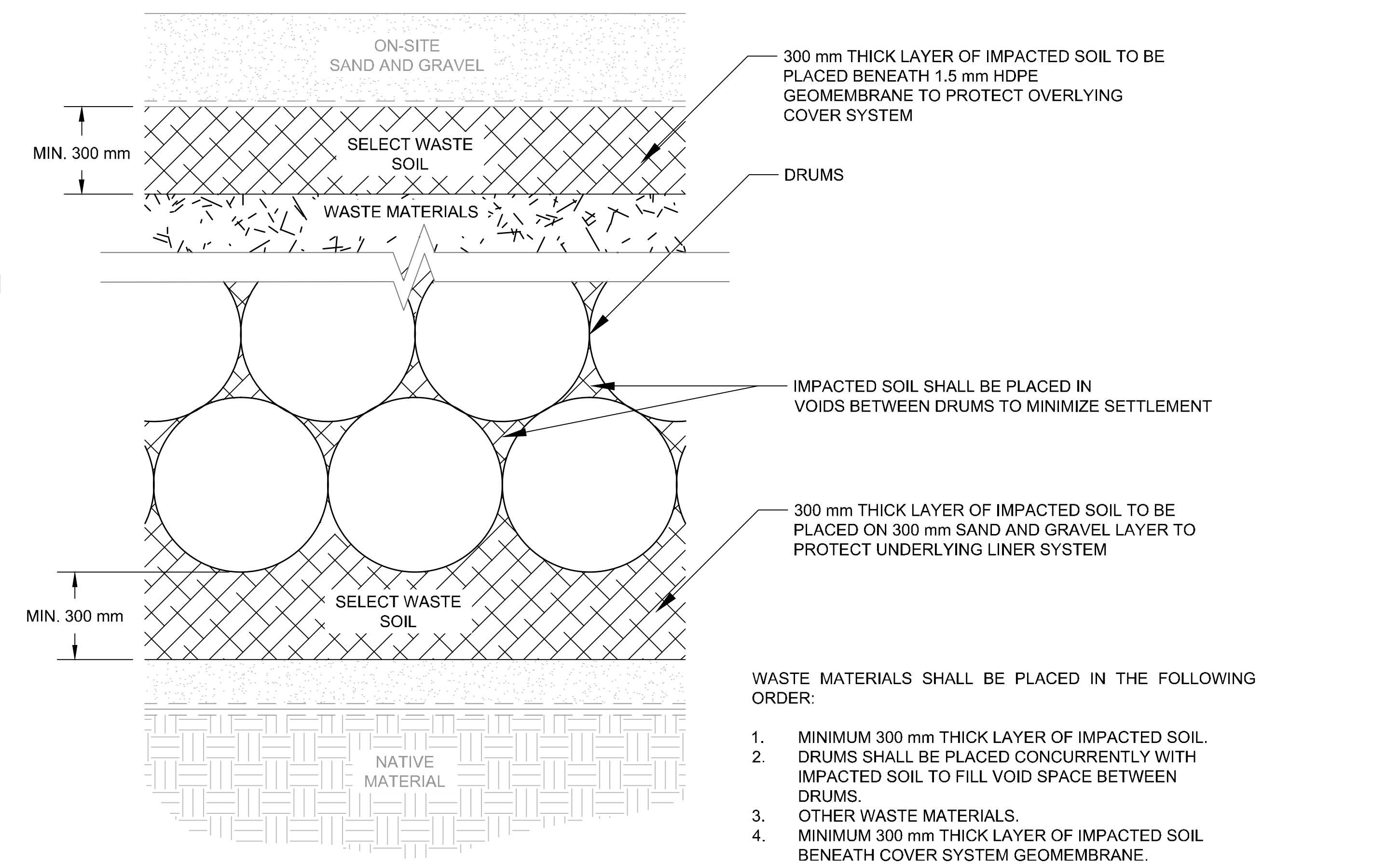
WASTE CONTAINMENT CELL
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut

CRA

82415-50(005)GN-WA002 JUN 23/2014



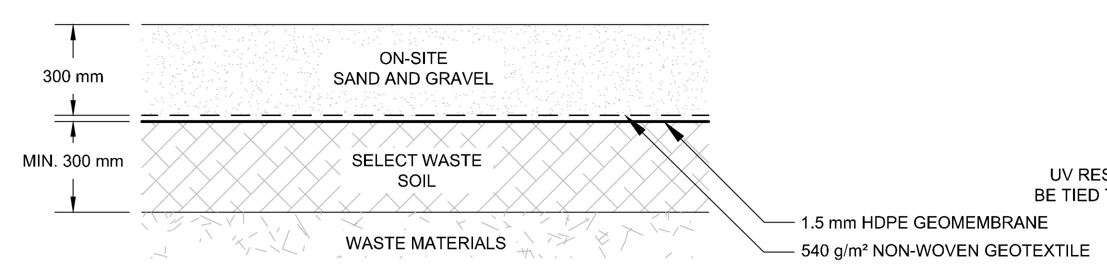
WASTE CONTAINMENT CELL
LINER SYSTEM TIE-IN DETAIL



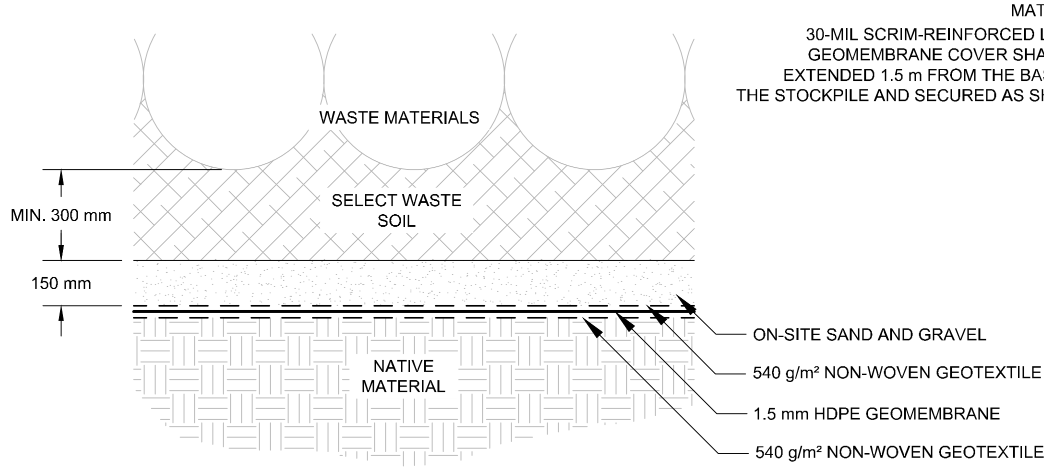
WASTE MATERIALS SHALL BE PLACED IN THE FOLLOWING ORDER:

1. MINIMUM 300 mm THICK LAYER OF IMPACTED SOIL.
2. DRUMS SHALL BE PLACED CONCURRENTLY WITH IMPACTED SOIL TO FILL VOID SPACE BETWEEN DRUMS.
3. OTHER WASTE MATERIALS.
4. MINIMUM 300 mm THICK LAYER OF IMPACTED SOIL BENEATH COVER SYSTEM GEOMEMBRANE.

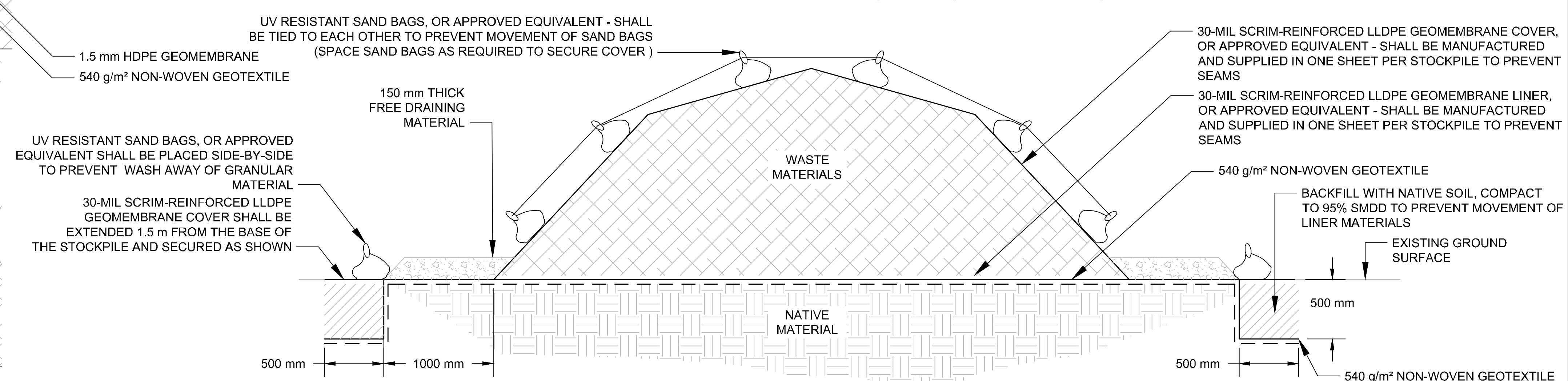
WASTE CONTAINMENT CELL
WASTE PLACEMENT DETAILS



WASTE CONTAINMENT CELL
COVER SYSTEM



WASTE CONTAINMENT CELL
LINER SYSTEM



TEMPORARY SECURE STOCKPILE
LINER AND COVER SYSTEM

figure 4

WASTE CONTAINMENT CELL AND TEMPORARY SECURE STOCKPILE CONSTRUCTION DETAILS
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut

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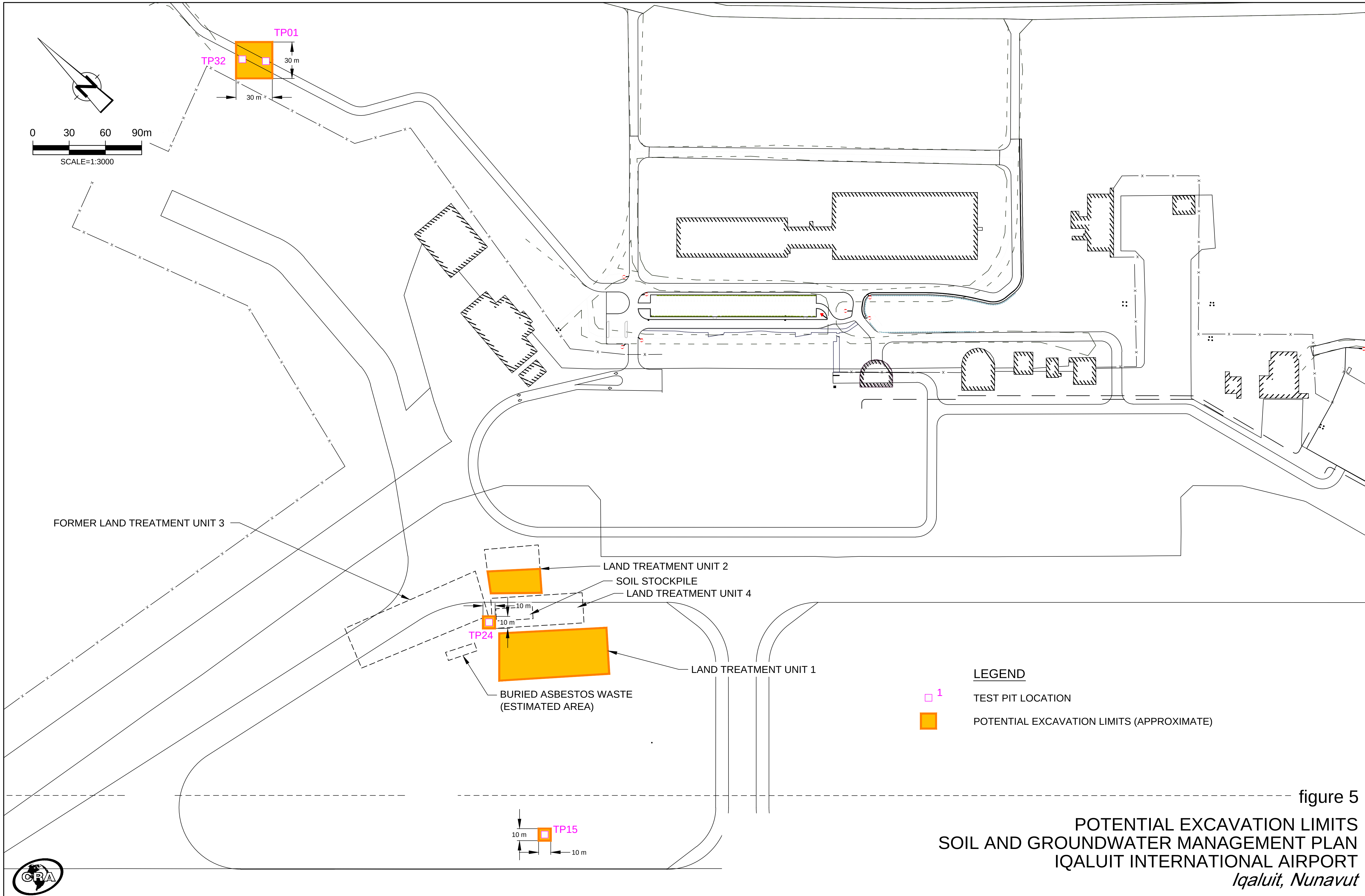

figure 5

POTENTIAL EXCAVATION LIMITS
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut

82415-50(005)GN-WA004 MAY 22/2014

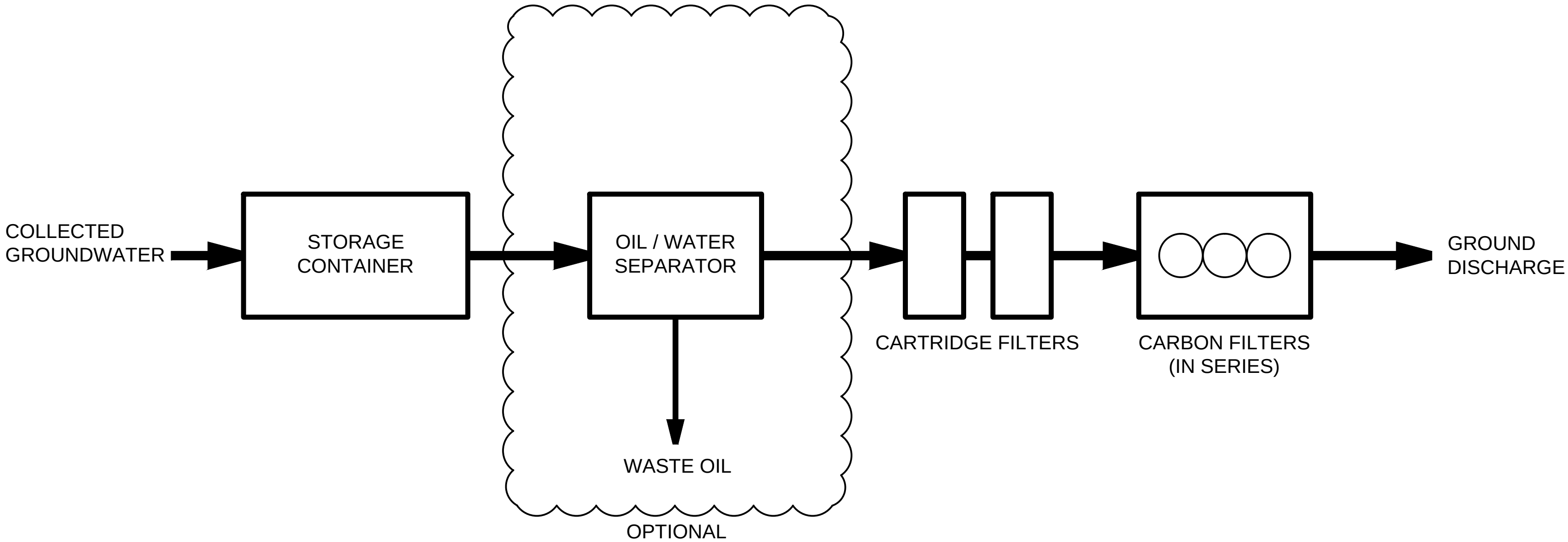

figure 6

CONCEPTUAL PROCESS FLOW DIAGRAM - GROUNDWATER TREATMENT SYSTEM
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
Iqaluit, Nunavut

82415-50(005)GN-WA005 MAY 22/2014

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location: *Sample Date:* *Sample Depth:* *Parameters*	*Units*	*CCME Industrial a*	*RBCs b*	*LTU-1* *7/23/2013* *0.6*	*LTU-1* *7/23/2013* *0.6* *Duplicate*	*LTU-2* *7/23/2013* *0.6*	*TP01* *7/23/2013* *0.9*	*TP02* *7/23/2013* *1.5*	*TP02* *7/23/2013* *1.5* *Duplicate*
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.35)	ND(0.23)	ND(0.060)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.050)	0.36	ND(0.020)	ND(0.0050)	ND(0.0050)	ND(0.0050)
2-Methylnaphthalene	µg/g	-	-	0.028	ND(0.20)	ND(0.010)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthene	µg/g	-	-	ND(0.040)	ND(0.10)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthylene	µg/g	-	-	ND(0.050)	0.057	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Anthracene	µg/g	32	-	0.038	0.35	0.0054	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(a)anthracene	µg/g	-	-	0.28	1.4	0.011	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(a)pyrene	µg/g	72	-	0.31	1.6	0.018	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	0.21	0.80	0.031	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(g,h,i)perylene	µg/g	-	-	0.28	1.3	0.016	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(k)fluoranthene	µg/g	10	-	0.028	0.059	0.0089	ND(0.0050)	ND(0.0050)	ND(0.0050)
Chrysene	µg/g	-	-	0.39	2.0	0.011	ND(0.0050)	ND(0.0050)	ND(0.0050)
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.025)	0.062	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Fluoranthene	µg/g	180	-	0.20	0.85	0.011	ND(0.0050)	ND(0.0050)	ND(0.0050)
Fluorene	µg/g	-	-	ND(0.040)	0.20	0.0082	ND(0.0050)	ND(0.0050)	ND(0.0050)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	0.087	0.36	0.012	ND(0.0050)	ND(0.0050)	ND(0.0050)
Naphthalene	µg/g	22	22	ND(0.20)	0.16	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Phenanthrene	µg/g	50	-	0.14	3.2	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Pyrene	µg/g	100	-	1.3	5.9	0.059	ND(0.0050)	ND(0.0050)	ND(0.0050)
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Arsenic	µg/g	12	26	1.8	1.9	2.7	3.5	1.5	1.5
Barium	µg/g	2000	-	21	24	29	52	13	11
Beryllium	µg/g	8	-	ND(0.20)	ND(0.20)	ND(0.20)	0.46	ND(0.20)	ND(0.20)
Boron (hot water soluble)	µg/g	-	-	0.15	0.12	0.089	0.21	ND(0.050)	ND(0.050)
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	0.12	ND(0.10)	ND(0.10)
Chromium	µg/g	87	-	17	19	21	34	19	9.2
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	4.3	4.6	5.5	12	6.4	4.4
Copper	µg/g	91	-	9.1	9.7	70	24	9.7	9.0
Lead	µg/g	-	-	13	15	17	6.6	3.6	2.2
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	0.56	0.74	0.72	2.2	0.69	ND(0.50)
Nickel	µg/g	50	-	6.8	7.5	8.9	15	6.9	5.7
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	110	130	160	870	ND(50)	ND(50)
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	ND(0.050)	0.076	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.48	0.35	0.40	1.0	0.36	0.23
Vanadium	µg/g	130	-	39	39	44	67	46	19
Zinc	µg/g	360	-	35	36	39	110	30	29
PCBs									
Total PCBs	µg/g	33	-	0.046	0.044	ND(0.010)	ND(0.020)	ND(0.010)	ND(0.010)
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(50)	59	17	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(50)	59	17	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	2800	3000	1000	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	1800	2300	1500	ND(50)	ND(50)	ND(50)
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	740	1200	750	ND(50)	ND(50)	ND(50)
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	-	-	-	-
General Chemistry									
Cyanide (free)	µg/g	-	-	0.03	0.02	0.02	0.04	ND(0.01)	ND(0.01)
pH, lab	s.u.	6-8	-	7.03	7.02	7.07	5.45	6.98	6.79
Moisture	%	-	-	8.0	7.9	8.0	33	3.5	3.3

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:				*TP03*	*TP04*	*TP05*	*TP06*	*TP07*	*TP09*
Sample Date:				*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*
Sample Depth:				*1.3*	*2.1*	*1.45*	*1.1*	*1.25*	*3.5*
Parameters	*Units*	*CCME Industrial a*	*RBCs b*						
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.010)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)
2-Methylnaphthalene	µg/g	-	-	ND(0.010)	ND(0.0050)	ND(0.0050)	0.0057	ND(0.050)	ND(0.0050)
Acenaphthene	µg/g	-	-	ND(0.010)	ND(0.0050)	ND(0.0050)	0.011	ND(0.050)	ND(0.0050)
Acenaphthylene	µg/g	-	-	ND(0.010)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)
Anthracene	µg/g	32	-	ND(0.010)	ND(0.0050)	ND(0.0050)	0.013	ND(0.050)	ND(0.0050)
Benzo(a)anthracene	µg/g	-	-	0.047	ND(0.0050)	ND(0.0050)	0.028	ND(0.050)	ND(0.0050)
Benzo(a)pyrene	µg/g	72	-	0.039	ND(0.0050)	ND(0.0050)	0.025	ND(0.050)	ND(0.0050)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	0.055	ND(0.0050)	ND(0.0050)	0.031	ND(0.050)	ND(0.0050)
Benzo(g,h,i)perylene	µg/g	-	-	0.027	ND(0.0050)	ND(0.0050)	0.015	ND(0.050)	ND(0.0050)
Benzo(k)fluoranthene	µg/g	10	-	0.020	ND(0.0050)	ND(0.0050)	0.012	ND(0.050)	ND(0.0050)
Chrysene	µg/g	-	-	0.034	ND(0.0050)	ND(0.0050)	0.023	ND(0.050)	ND(0.0050)
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.010)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)
Fluoranthene	µg/g	180	-	0.11	ND(0.0050)	ND(0.0050)	0.054	0.072	ND(0.0050)
Fluorene	µg/g	-	-	ND(0.010)	ND(0.0050)	ND(0.0050)	0.0095	ND(0.050)	ND(0.0050)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	0.025	ND(0.0050)	ND(0.0050)	0.015	ND(0.050)	ND(0.0050)
Naphthalene	µg/g	22	22	0.013	ND(0.0050)	ND(0.0050)	0.017	0.075	ND(0.0050)
Phenanthrene	µg/g	50	-	0.032	ND(0.0050)	ND(0.0050)	0.044	0.25	ND(0.0050)
Pyrene	µg/g	100	-	0.088	ND(0.0050)	ND(0.0050)	0.039	0.053	ND(0.0050)
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Arsenic	µg/g	12	26	1.6	4.4	1.1	2.2	2.0	2.4
Barium	µg/g	2000	-	28	31	8.0	47	30	16
Beryllium	µg/g	8	-	0.20	0.24	ND(0.20)	0.33	0.22	ND(0.20)
Boron (hot water soluble)	µg/g	-	-	0.094	ND(0.050)	ND(0.050)	0.055	0.18	0.11
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	0.11	0.10	ND(0.10)
Chromium	µg/g	87	-	17	23	17	30	18	22
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	5.1	7.3	4.8	7.7	6.9	8.2
Copper	µg/g	91	-	12	17	8.0	16	16	15
Lead	µg/g	-	-	10	6.5	2.8	6.5	9.1	4.4
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	0.60	0.83	0.61	0.68	0.69	0.84
Nickel	µg/g	50	-	7.4	12	5.5	14	9.2	9.0
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	100	150	82	130	190	86
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	ND(0.050)	0.099	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.40	0.50	0.40	0.45	0.42	0.39
Vanadium	µg/g	130	-	35	50	38	52	38	49
Zinc	µg/g	360	-	52	53	26	95	56	34
PCBs									
Total PCBs	µg/g	33	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	110	ND(50)	ND(50)	ND(50)	190	ND(50)
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	82	ND(50)	ND(50)	ND(50)	170	ND(50)
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	-	-	610	-
General Chemistry									
Cyanide (free)	µg/g	-	-	0.01	0.01	ND(0.01)	ND(0.01)	0.02	ND(0.01)
pH, lab	s.u.	6-8	-	7.54	7.54	7.96	7.39	7.34	7.99
Moisture	%	-	-	6.3	10	9.5	8.8	10	2.5

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:				*TP10*	*TP12*	*TP13*	*TP14*	*TP15*	*TP16*
Sample Date:				*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*
Sample Depth:				*1.65*	*0.6*	*1.35*	*0.8*	*0.8*	*0.65*
Parameters	*Units*	*CCME Industrial a*	*RBCs b*						
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
2-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.059	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Anthracene	µg/g	32	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(a)anthracene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	0.0076	ND(0.0050)	0.0064
Benzo(a)pyrene	µg/g	72	-	ND(0.0050)	ND(0.0050)	ND(0.050)	0.0089	ND(0.0050)	0.0073
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.062	0.014	ND(0.0050)	0.010
Benzo(g,h,i)perylene	µg/g	-	-	ND(0.0050)	0.0062	ND(0.050)	0.0088	ND(0.0050)	0.0066
Benzo(k)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Chrysene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	0.0077	ND(0.0050)	0.0063
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Fluoranthene	µg/g	180	-	ND(0.0050)	ND(0.0050)	0.059	0.016	ND(0.0050)	0.014
Fluorene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.050)	0.0085	ND(0.0050)	0.0055
Naphthalene	µg/g	22	22	ND(0.0050)	ND(0.0050)	0.094	ND(0.0050)	ND(0.0050)	ND(0.0050)
Phenanthrene	µg/g	50	-	ND(0.0050)	ND(0.0050)	0.077	0.0054	ND(0.0050)	0.0063
Pyrene	µg/g	100	-	ND(0.0050)	ND(0.0050)	0.081	0.012	ND(0.0050)	0.011
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Arsenic	µg/g	12	26	1.2	2.2	1.5	1.6	100	1.7
Barium	µg/g	2000	-	14	16	21	15	24	20
Beryllium	µg/g	8	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Boron (hot water soluble)	µg/g	-	-	0.094	0.053	0.072	0.053	ND(0.050)	0.076
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Chromium	µg/g	87	-	13	28	15	11	20	17
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	4.9	5.2	4.2	3.3	5.3	4.3
Copper	µg/g	91	-	8.0	7.1	9.6	6.2	6.0	8.2
Lead	µg/g	-	-	4.5	20	9.8	3.1	2.8	4.1
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	ND(0.50)	0.81	0.52	ND(0.50)	0.65	0.57
Nickel	µg/g	50	-	6.3	9.1	7.0	5.5	11	6.3
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	53	100	83	63	120	140
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.25	0.42	0.31	0.31	0.33	0.31
Vanadium	µg/g	130	-	30	62	31	23	55	32
Zinc	µg/g	360	-	29	29	36	28	35	40
PCBs									
Total PCBs	µg/g	33	-	ND(0.010)	ND(0.010)	0.015	ND(0.010)	ND(0.010)	ND(0.010)
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	ND(10)	ND(10)	110	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	ND(50)	ND(50)	540	ND(50)	ND(50)	ND(50)
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	ND(50)	ND(50)	740	ND(50)	ND(50)	ND(50)
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	2800	-	-	-
General Chemistry									
Cyanide (free)	µg/g	-	-	ND(0.01)	ND(0.01)	0.01	0.01	0.04	0.02
pH, lab	s.u.	6-8	-	7.69	7.81	7.57	7.24	5.90	7.44
Moisture	%	-	-	4.4	8.8	11	11	7.6	11

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:				*TP17A*	*TP17B*	*TP18*	*TP19*	*TP20*	*TP21*
Sample Date:				*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*
Sample Depth:				*1.15*	*1.1*	*1.1*	*1.5*	*0.9*	*1.45*
Parameters	*Units*	*CCME Industrial a*	*RBCs b*						
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	0.060
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.079
2-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.13
Acenaphthene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.010)
Acenaphthylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.010)
Anthracene	µg/g	32	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0086
Benzo(a)anthracene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.013
Benzo(a)pyrene	µg/g	72	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.033
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0086	0.021
Benzo(g,h,i)perylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0051	0.045
Benzo(k)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Chrysene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.016
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Fluoranthene	µg/g	180	-	0.0056	0.0059	ND(0.0050)	ND(0.0050)	0.0083	0.029
Fluorene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.050)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0052	0.014
Naphthalene	µg/g	22	22	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.010)	ND(0.10)
Phenanthrene	µg/g	50	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0058	0.045
Pyrene	µg/g	100	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.0077	0.054
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Arsenic	µg/g	12	26	2.0	1.0	ND(1.0)	ND(1.0)	1.0	5.2
Barium	µg/g	2000	-	20	11	9.6	12	12	25
Beryllium	µg/g	8	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Boron (hot water soluble)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	0.065	0.11	0.093
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Chromium	µg/g	87	-	16	11	11	7.3	11	22
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	4.0	3.0	5.6	3.6	3.7	6.0
Copper	µg/g	91	-	6.6	6.8	8.4	7.2	7.2	15
Lead	µg/g	-	-	4.5	2.1	1.9	1.8	5.6	14
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	0.74	ND(0.50)	0.58	ND(0.50)	ND(0.50)	0.66
Nickel	µg/g	50	-	6.2	4.6	8.6	5.1	5.2	9.1
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	96	ND(50)	67	64	91	190
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.32	0.23	0.18	0.29	0.22	0.42
Vanadium	µg/g	130	-	38	22	25	13	24	40
Zinc	µg/g	360	-	29	24	27	25	26	41
PCBs									
Total PCBs	µg/g	33	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.016
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(10)	ND(10)	ND(10)	ND(10)	10	ND(10)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(10)	ND(10)	ND(10)	ND(10)	10	ND(10)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	ND(10)	ND(10)	ND(10)	ND(10)	64	130
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	630
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	180
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	-	-	-	-
General Chemistry									
Cyanide (free)	µg/g	-	-	0.02	ND(0.01)	ND(0.01)	ND(0.01)	ND(0.01)	0.01
pH, lab	s.u.	6-8	-	7.23	7.85	7.91	7.87	7.77	7.47
Moisture	%	-	-	6.9	9.4	3.7	4.8	4.9	12

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:				***TP22***	***TP23***	***TP24***	***TP24***	***TP25***	***TP26***
Sample Date:				***7/23/2013***	***7/23/2013***	***7/23/2013***	***7/23/2013***	***7/23/2013***	***7/23/2013***
Sample Depth:				***1.6***	***1.5***	***0.6***	***1.6***	***1***	***0.95***
Parameters	***Units***	***CCME Industrial a***	***RBCs b***						
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.11)	ND(0.050)	ND(0.050)	ND(0.050)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.025	ND(0.0050)	ND(0.0050)	ND(0.0050)
2-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Acenaphthylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Anthracene	µg/g	32	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(a)anthracene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.031	ND(0.0050)	ND(0.0050)	ND(0.0050)
Benzo(a)pyrene	µg/g	72	-	ND(0.0050)	ND(0.0050)	0.063	0.0054	ND(0.0050)	ND(0.0050)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.10	0.0076	ND(0.0050)	ND(0.0050)
Benzo(g,h,i)perylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.067	0.0056	ND(0.0050)	ND(0.0050)
Benzo(k)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.031	ND(0.0050)	ND(0.0050)	ND(0.0050)
Chrysene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.028	ND(0.0050)	ND(0.0050)	ND(0.0050)
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Fluoranthene	µg/g	180	-	ND(0.0050)	ND(0.0050)	0.045	0.0068	ND(0.0050)	ND(0.0050)
Fluorene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.025)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.052	ND(0.0050)	ND(0.0050)	ND(0.0050)
Naphthalene	µg/g	22	22	ND(0.0050)	ND(0.0050)	ND(0.10)	ND(0.0050)	ND(0.0050)	ND(0.0050)
Phenanthrene	µg/g	50	-	ND(0.0050)	ND(0.0050)	0.039	ND(0.0050)	ND(0.0050)	ND(0.0050)
Pyrene	µg/g	100	-	ND(0.0050)	ND(0.0050)	0.14	0.0098	ND(0.0050)	ND(0.0050)
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Arsenic	µg/g	12	26	2.8	2.0	2.0	5.2	1.8	1.9
Barium	µg/g	2000	-	31	18	25	13	21	21
Beryllium	µg/g	8	-	0.24	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Boron (hot water soluble)	µg/g	-	-	0.069	ND(0.050)	0.25	0.064	0.091	0.057
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)
Chromium	µg/g	87	-	22	15	19	27	16	16
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	6.6	4.0	4.6	5.1	4.1	5.7
Copper	µg/g	91	-	15	7.9	10	11	8.2	13
Lead	µg/g	-	-	9.3	2.1	23	3.7	2.4	3.0
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	0.66	0.76	0.60	0.73	0.62	0.57
Nickel	µg/g	50	-	9.9	5.8	7.3	7.1	6.4	7.1
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	320	78	160	140	120	93
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.52	0.32	0.35	0.25	0.39	0.32
Vanadium	µg/g	130	-	49	30	36	63	30	35
Zinc	µg/g	360	-	42	23	40	28	26	28
PCBs									
Total PCBs	µg/g	33	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(10)	ND(10)	ND(50)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(10)	ND(10)	ND(50)	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	13	ND(10)	1300	ND(10)	ND(10)	ND(10)
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	52	ND(50)	1300	ND(50)	ND(50)	ND(50)
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	ND(50)	ND(50)	730	ND(50)	ND(50)	ND(50)
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	-	-	-	-
General Chemistry									
Cyanide (free)	µg/g	-	-	0.02	ND(0.01)	0.01	ND(0.01)	ND(0.01)	ND(0.01)
pH, lab	s.u.	6-8	-	7.27	7.68	7.25	7.80	7.64	7.87
Moisture	%	-	-	14	12	7.7	12	12	4.1

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:				*TP27*	*TP28*	*TP29*	*TP30*	*TP31*	*TP32*
Sample Date:				*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*	*7/23/2013*
Sample Depth:				*0.6*	*1.2*	*1*	*0.6*	*1.2*	*0.15*
Parameters	*Units*	*CCME Industrial a*	*RBCs b*						
Volatile Organic Compounds									
1,1,1,2-Tetrachloroethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,1,1-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,1,2,2-Tetrachloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,1,2-Trichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,1-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,1-Dichloroethene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,2-Dibromoethane (Ethylene dibromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,2-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,2-Dichloroethane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,2-Dichloropropane	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,3-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
1,4-Dichlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(1.5)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(1.5)
Acetone	µg/g	-	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(1.5)
Benzene	µg/g	0.030	-	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.0060)	ND(0.018)
Bromodichloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Bromoform	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Bromomethane (Methyl bromide)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Carbon tetrachloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Chlorobenzene	µg/g	10	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Chloroform (Trichloromethane)	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
cis-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
cis-1,3-Dichloropropene	µg/g	-	-	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.030)	ND(0.090)
Dibromochloromethane	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Dichlorodifluoromethane (CFC-12)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Ethylbenzene	µg/g	0.082	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	**0.31**
Hexane	µg/g	6.5	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
m&p-Xylenes	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	2.3
Methyl tert butyl ether (MTBE)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Methylene chloride	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
o-Xylene	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	1.2
Styrene	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Tetrachloroethene	µg/g	0.6	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Toluene	µg/g	0.37	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	0.22
trans-1,2-Dichloroethene	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
trans-1,3-Dichloropropene	µg/g	-	-	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.040)	ND(0.12)
Trichloroethene	µg/g	0.01	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.030)
Trichlorofluoromethane (CFC-11)	µg/g	-	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.15)
Vinyl chloride	µg/g	-	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.060)
Xylenes (total)	µg/g	11	-	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	3.5
Polycyclic Aromatic Hydrocarbons									
1-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.14
2-Methylnaphthalene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.22
Acenaphthene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Acenaphthylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Anthracene	µg/g	32	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Benzo(a)anthracene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.015	ND(0.0050)	ND(0.0050)	ND(0.10)
Benzo(a)pyrene	µg/g	72	-	ND(0.0050)	ND(0.0050)	0.038	ND(0.0050)	ND(0.0050)	ND(0.10)
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.015	ND(0.0050)	ND(0.0050)	ND(0.10)
Benzo(g,h,i)perylene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.071	ND(0.0050)	ND(0.0050)	ND(0.10)
Benzo(k)fluoranthene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Chrysene	µg/g	-	-	ND(0.0050)	ND(0.0050)	0.020	ND(0.0050)	ND(0.0050)	ND(0.10)
Dibenz(a,h)anthracene	µg/g	10	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Fluoranthene	µg/g	180	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Fluorene	µg/g	-	-	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.10)
Indeno(1,2,3-cd)pyrene	µg/g	10	-	ND(0.0050)	ND(0.0050)	0.018	ND(0.0050)	ND(0.0050)	ND(0.10)
Naphthalene	µg/g	22	22	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.19
Phenanthrene	µg/g	50	-	ND(0.0050)	ND(0.0050)	0.0061	ND(0.0050)	ND(0.0050)	ND(0.10)
Pyrene	µg/g	100	-	ND(0.0050)	ND(0.0050)	0.044	ND(0.0050)	ND(0.0050)	ND(0.10)
Metals									
Antimony	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	0.23
Arsenic	µg/g	12	26	1.4	1.5	2.3	2.4	1.3	1.8
Barium	µg/g	2000	-	25	23	42	24	23	94
Beryllium	µg/g	8	-	ND(0.20)	0.25	0.26	0.28	ND(0.20)	0.23
Boron (hot water soluble)	µg/g	-	-	0.075	0.062	0.11	ND(0.050)	0.059	0.38
Cadmium	µg/g	22	-	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	ND(0.10)	0.13
Chromium	µg/g	87	-	18	19	23	33	14	18
Chromium VI (hexavalent)	µg/g	1.4	-	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)
Cobalt	µg/g	300	-	4.3	4.5	6.1	5.7	4.0	5.2
Copper	µg/g	91	-	7.6	9.4	14	6.7	8.0	22
Lead	µg/g	-	-	2.4	2.8	3.7	3.2	2.9	17
Mercury	µg/g	50	-	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)
Molybdenum	µg/g	40	-	0.65	ND(0.50)	1.1	1.3	0.61	0.71
Nickel	µg/g	50	-	6.9	7.7	10	9.5	6.0	9.7
Selenium	µg/g	2.9	-	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)	ND(0.50)
Silver	µg/g	40	-	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
Sulfur	µg/g	NV	-	58	88	230	220	75	1100
Thallium	µg/g	1	-	ND(0.050)	ND(0.050)	0.055	ND(0.050)	ND(0.050)	ND(0.050)
Tin	µg/g	300	-	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)
Uranium	µg/g	300	-	0.33	0.32	0.54	0.39	0.41	1.3
Vanadium	µg/g	130	-	48	38	46	86	44	31
Zinc	µg/g	360	-	29	30	46	37	29	57
PCBs									
Total PCBs	µg/g	33	-	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.030)
Petroleum Hydrocarbons									
Petroleum hydrocarbons F1 (C6-C10)	µg/g	-	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(30)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX [2]	µg/g	320	-	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	ND(30)
Petroleum hydrocarbons F2 (C10-C16) [2]	µg/g	260	260	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	21
Petroleum hydrocarbons F3 (C16-C34) [2]	µg/g	1700	1700	ND(50)	ND(50)	150	ND(50)	ND(50)	1500
Petroleum hydrocarbons F4 (C34-C50) [2]	µg/g	3300	-	ND(50)	ND(50)	140	ND(50)	ND(50)	1300
Gravimetric heavy hydrocarbons (F4G)	µg/g	-	-	-	-	400	-	-	2700
General Chemistry									
Cyanide (free)	µg/g	-	-	0.02	0.03	0.02	0.02	0.01	0.07
pH, lab	s.u.	6-8	-	7.42	5.96	7.54	5.96	7.13	5.96
Moisture	%	-	-	6.0	10	12	12	5.6	61

TABLE 1

ANALYTICAL RESULTS - SOIL SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Notes:

a	Canadian Council of Ministers of the Environment (CCME) Tier 1 Industrial Guidelines: As presented in "Canadian Environmental Quality Guidelines Summary Tables, Soil Land Industrial Use", Quality Guidelines for the Protection of Environmental and Human Health, dated 1999, updated 2011 (CCME, 2011). CCME has recently updated their Soil Quality Guidelines (SQGs) for some polycyclic aromatic hydrocarbons (PAHs), as presented in Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health-Polycyclic Aromatic Hydrocarbons 2010 (CCME, 2010).
b	Site-specific Risk-Based Concentrations (RBCs) were developed by CRA in 2013 (Reference Appendix A)
1	Environment Protection Department (EPD) of the Department of Environment of the GN Tier 1 Criteria for PHC impacts in Surface Soil: As presented in the "Environmental Guideline for Contaminated Site Remediation", Department of Environment, Government of Nunavut, dated April 1999, updated January 2002 and March 2009. The EPD developed this guidance document with reference to the CCME document "Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil", dated 2001, updated in 2008. The PHC standards are consistent between the two guidance documents. The surface soil depth relates to any soil sample collected less than 1.5 metres below ground surface (m BGS).
1.0	Exceeds RBC and requires risk management measures.
-	No value

TABLE 2

ANALYTICAL RESULTS - GROUNDWATER SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:						*TP06*	*TP12*
Sample Date:						*7/23/2013*	*7/23/2013*
Parameters	*Units*	*CCME [1] Short Term*	*CCME [1] Long Term*	*MOE Table 3*	*RBCs*		
		a	*b*	*c*	*d*		
Volatile Organic Compounds							
1,1,1,2-Tetrachloroethane	µg/L	-	-	3.3	-	ND(0.50)	ND(0.50)
1,1,1-Trichloroethane	µg/L	-	-	640	-	ND(0.20)	ND(0.20)
1,1,2,2-Tetrachloroethane	µg/L	-	-	3.2	-	ND(0.50)	ND(0.50)
1,1,2-Trichloroethane	µg/L	-	-	4.7	-	ND(0.50)	ND(0.50)
1,1-Dichloroethane	µg/L	-	-	320	-	ND(0.20)	ND(0.20)
1,1-Dichloroethene	µg/L	-	-	1.6	-	ND(0.20)	ND(0.20)
1,2-Dibromoethane (Ethylene dibromide)	µg/L	-	-	0.25	-	ND(0.20)	ND(0.20)
1,2-Dichlorobenzene	µg/L	-	0.7	4600	-	ND(0.50)	ND(0.50)
1,2-Dichloroethane	µg/L	-	100	1.6	-	ND(0.50)	ND(0.50)
1,2-Dichloropropane	µg/L	-	-	16	-	ND(0.20)	ND(0.20)
1,3-Dichlorobenzene	µg/L	-	150	9600	-	ND(0.50)	ND(0.50)
1,4-Dichlorobenzene	µg/L	-	26	8	-	ND(0.50)	ND(0.50)
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	-	-	470000	-	ND(10)	ND(10)
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	-	-	140000	-	ND(5.0)	ND(5.0)
Acetone	µg/L	-	-	130000	-	ND(10)	ND(10)
Benzene	µg/L	-	370	44	-	ND(0.20)	ND(0.20)
Bromodichloromethane	µg/L	-	-	85000	-	ND(0.50)	ND(0.50)
Bromoform	µg/L	-	-	380	-	ND(1.0)	ND(1.0)
Bromomethane (Methyl bromide)	µg/L	-	-	5.6	-	ND(0.50)	ND(0.50)
Carbon tetrachloride	µg/L	-	13.3	0.79	-	ND(0.20)	ND(0.20)
Chlorobenzene	µg/L	-	1.3	630	-	ND(0.20)	ND(0.20)
Chloroform (Trichloromethane)	µg/L	-	1.8	2.4	-	ND(0.20)	ND(0.20)
cis-1,2-Dichloroethene	µg/L	-	-	1.6	-	ND(0.50)	ND(0.50)
cis-1,3-Dichloropropene	µg/L	-	-	-	-	ND(0.30)	ND(0.30)
Dibromochloromethane	µg/L	-	-	82000	-	ND(0.50)	ND(0.50)
Dichlorodifluoromethane (CFC-12)	µg/L	-	-	4400	-	ND(1.0)	ND(1.0)
Ethylbenzene	µg/L	-	90	2300	-	ND(0.20)	ND(0.20)
Hexane	µg/L	-	-	51	-	ND(1.0)	ND(1.0)
m&p-Xylenes	µg/L	-	-	-	-	ND(0.20)	ND(0.20)
Methyl tert butyl ether (MTBE)	µg/L	-	10000	190	-	ND(0.50)	ND(0.50)
Methylene chloride	µg/L	-	98.1	610	-	ND(2.0)	ND(2.0)
o-Xylene	µg/L	-	-	-	-	ND(0.20)	ND(0.20)
Styrene	µg/L	-	72	1300	-	ND(0.50)	ND(0.50)
Tetrachloroethene	µg/L	-	110	1.6	396	0.58	ND(0.20)
Toluene	µg/L	-	2	18000	-	ND(0.20)	ND(0.20)
trans-1,2-Dichloroethene	µg/L	-	-	1.6	-	ND(0.50)	ND(0.50)
trans-1,3-Dichloropropene	µg/L	-	-	-	-	ND(0.40)	ND(0.40)
Trichloroethene	µg/L	-	21	1.6	-	ND(0.20)	ND(0.20)
Trichlorofluoromethane (CFC-11)	µg/L	-	-	2500	-	ND(0.50)	ND(0.50)
Vinyl chloride	µg/L	-	-	0.5	-	ND(0.20)	ND(0.20)
Xylenes (total)	µg/L	-	-	4200	-	ND(0.20)	ND(0.20)
Polycyclic Aromatic Hydrocarbons							
2-Methylnaphthalene	µg/L	-	-	1800	164	0.066 J	0.12 J
Acenaphthene	µg/L	-	5.8	600	2048	0.31 J	ND(0.02) J
Acenaphthylene	µg/L	-	-	1.8	1029	0.032 J	ND(0.02) J
Acridine	µg/L	-	4.4	-	353	0.14 J	ND(0.02) J
Anthracene	µg/L	-	0.012	2.4	321	0.36 J	ND(0.02) J
Benzo(a)anthracene	µg/L	-	0.018	4.7	1.0	**2.1 J[d]**	0.03 J
Benzo(a)pyrene	µg/L	-	0.015	0.81	6.6	2.3 J	0.08 J
Benzo(b)fluoranthene/Benzo(j)fluoranthene	µg/L	-	-	0.75	39	3.3 J	0.12 J
Benzo(b)pyridine (Quinoline)	µg/L	-	3.4	-	-	ND(0.02) J	ND(0.05) J
Benzo(c)phenanthrene	µg/L	-	-	-	-	ND(0.3) J	ND(0.02) J
Benzo(e)pyrene	µg/L	-	-	-	6.6	2.0 J	0.30 J
Benzo(g,h,i)perylene	µg/L	-	-	0.2	6.4	1.2 J	0.17 J
Benzo(k)fluoranthene	µg/L	-	-	0.4	150	1.1 J	0.03 J
Chrysene	µg/L	-	-	1	22	1.7 J	0.07 J
Dibenz(a,h)anthracene	µg/L	-	-	0.52	2.6	0.37 J	ND(0.02) J
Fluoranthene	µg/L	-	0.04	130	501	3.3 J	0.09 J
Fluorene	µg/L	-	3	400	733	0.25 J	ND(0.02) J
Indeno(1,2,3-cd)pyrene	µg/L	-	-	0.2	0.096	**1.6 J[d]**	0.07 J
Naphthalene	µg/L	-	1.1	1400	43	0.11 J	0.08 J
Perylene	µg/L	-	-	-	257143	0.54 J	ND(0.02) J
Phenanthrene	µg/L	-	0.4	580	362	1.6 J	0.06 J
Pyrene	µg/L	-	0.025	68	52	2.8 J	0.15 J
Total benzo(a)pyrene equivalents	µg/L	-	-	-	3.9	3.6 J	0.12 J

TABLE 2

ANALYTICAL RESULTS - GROUNDWATER SAMPLES
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Sample Location:						*TP06*	*TP12*
Sample Date:						*7/23/2013*	*7/23/2013*
		CCME [1]	*CCME [1]*	*MOE*	*RBCs*		
Parameters	*Units*	*Short Term*	*Long Term*	*Table 3*			
Metals							
Aluminum (dissolved)	µg/L	-	100	-	-	31 / ND(40)	61 / 270
Antimony (dissolved)	µg/L	-	-	20000	-	ND(0.6)	ND(0.6)
Arsenic (dissolved)	µg/L	-	5	1900	689	0.33	ND(0.2)
Barium (dissolved)	µg/L	-	-	29000	-	ND(10)	ND(10)
Beryllium (dissolved)	µg/L	-	-	67	-	ND(1)	ND(1)
Boron (dissolved)	µg/L	29000	1500	45000	7237	32	35
Cadmium (dissolved)	µg/L	-	-	2.7	-	ND(0.013) / ND(0.013)	ND(0.0058) / ND(0.0058)
Calcium (dissolved)	µg/L	-	-	-	-	65000	39000
Chromium (dissolved)	µg/L	-	-	810	-	ND(1) / ND(10)	ND(1) / ND(10)
Chromium VI (hexavalent) (dissolved)	µg/L	-	1	140	-	ND(1)	ND(1)
Cobalt (dissolved)	µg/L	-	-	66	430	0.36	ND(0.3)
Copper (dissolved)	µg/L	-	2	87	2595	2.5	3.2
Iron (dissolved)	µg/L	-	300	-	-	ND(60)	120
Lead (dissolved)	µg/L	-	1	25	434	0.24	ND(0.2)
Lithium (dissolved)	µg/L	-	-	-	-	ND(20)	ND(20)
Magnesium (dissolved)	µg/L	-	-	-	-	6400	5700
Manganese (dissolved)	µg/L	-	-	-	-	ND(4)	ND(4)
Mercury	µg/L	-	0.026	0.29	0.42	0.06	0.17
Molybdenum (dissolved)	µg/L	-	73	9200	1993	1	4.6
Nickel (dissolved)	µg/L	-	25	490	768	0.81	0.54
Phosphorus (dissolved)	µg/L	-	-	-	-	ND(100)	ND(100)
Potassium (dissolved)	µg/L	-	-	-	-	1500	4600
Selenium (dissolved)	µg/L	-	1	63	478	0.26	ND(0.2)
Silicon (dissolved)	µg/L	-	-	-	-	2700	3200
Silver (dissolved)	µg/L	-	0.1	1.5	-	ND(0.1)	ND(0.1)
Sodium (dissolved)	µg/L	-	-	2300000	-	7400	52000
Strontium (dissolved)	µg/L	-	-	-	-	120	98
Sulfur (dissolved)	µg/L	-	-	-	-	3100	1600
Thallium (dissolved)	µg/L	-	0.8	510	-	ND(0.2)	ND(0.2)
Tin (dissolved)	µg/L	-	-	-	-	ND(1)	ND(1)
Titanium (dissolved)	µg/L	-	-	-	-	ND(1)	1
Uranium (dissolved)	µg/L	33	15	420	248	0.53	1.1
Vanadium (dissolved)	µg/L	-	-	250	-	ND(1)	ND(1)
Zinc (dissolved)	µg/L	-	30	1100	-	ND(3)	ND(3)
PCBs							
Aroclor-1016 (PCB-1016)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1221 (PCB-1221)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1232 (PCB-1232)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1242 (PCB-1242)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1248 (PCB-1248)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1254 (PCB-1254)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1260 (PCB-1260)	µg/L	-	-	-	-	0.03	ND(0.01)
Aroclor-1262 (PCB-1262)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Aroclor-1268 (PCB-1268)	µg/L	-	-	-	-	ND(0.01)	ND(0.01)
Total PCBs	µg/L	-	0.001	7.8	0.39	0.03	ND(0.01)
Petroleum Hydrocarbons							
Petroleum hydrocarbons F1 (C6-C10)	µg/L	-	-	750	-	ND(25)	ND(25)
Petroleum hydrocarbons F1 (C6-C10) - less BTEX	µg/L	-	-	750	-	ND(25)	ND(25)
Petroleum hydrocarbons F2 (C10-C16)	µg/L	-	-	150	-	ND(100)	ND(100)
Petroleum hydrocarbons F3 (C16-C34)	µg/L	-	-	500	-	ND(200)	ND(200)
Petroleum hydrocarbons F4 (C34-C50)	µg/L	-	-	500	-	ND(200)	ND(200)
General Chemistry							
Cyanide (total)	µg/L	-	5	66	-	ND(2)	ND(2)
pH, lab	s.u.	-	6.5-9	-	-	7.91	7.92

Notes:

1	Canadian Environmental Quality Guidelines Summary Tables, Water Quality Guidelines for the Protection of Aquatic, Freshwater, dated 1999, updated 2012.
a	Short Term Guidelines
b	Long Term Guidelines
c	Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition (coarse-textured soils), dated April 15, 2011
d	Site-specific Risk-Based Concentrations (RBCs) were developed by CRA in 2013 (Reference Appendix B)
1.0	Exceeds noted standard.
J	Value is estimated.
ND(0.01)	Value was not detected above the laboratory detection limit in brackets.

TABLE 3

REMEDIAL OPTION MATRIX
SOIL AND GROUNDWATER MANAGEMENT PLAN
IQALUIT INTERNATIONAL AIRPORT
IQALUIT, NUNAVUT

Item	*Waste Streams To Be Managed*	*Location*	*Remedial Options*	*Estimated Waste Volume (m^3)*	*Selected Option*	*Assumptions/Comments*
1	Drums containing tar product	Drum Cache - adjacent to Former Asphalt Plant	Place in On-Site Waste Containment Cell Place in secure container for off-Site disposal	175	Place in On-Site Waste Containment Cell	Assume 300-55 gallon steel drums. Drums will be placed in containment cell in as is condition and will not be crushed. Assume that the drums are 0.597 m in diameter and 0.876 m in height. For volume calculations, assume a rectangular prism using these two dimensions as length, width and height. Based on this, 1-55-gallon drum will make up 0.876x0.597x0.597 = 0.32 m^3. Therefore, 300-55-gallon drums will make up approximately 96 m^3. Plus, include 50,000 litre tank. From site photographs, and research of 50,000 L tank dimensions, assume tank is 3.2 m diameter x 7.32 m in length. Assume rectangular prism - 3.2x3.2x7.32 = 75 m^3
2	Soil impacted with ethylbenzene	Drum Cache - adjacent to Former Asphalt Plant	Place in On-Site Waste Containment Cell Place in secure container for off-Site disposal	135	Place in On-Site Waste Containment Cell (Co-dispose with drums)	Assume 30 m x 30 m area of impacted soil in the vicinity of drums. Assume strip top 0.15 m of soil. Therefore total volume = 0.15x30x30 = 135 m^3 of soil to be co-disposed of with drums to fill void space.
3	Tar product on ground surface	Drum Cache - adjacent to Former Asphalt Plant	Place in On-Site Waste Containment Cell Place in secure container for off-Site disposal	Included in Item 2 above.	Place in On-Site Waste Containment Cell	Excavation volume included in "soil impacted with ethylbenzene" area.
4	PHC-impacted soil	TP24, LTU1, and LTU2 located within Former Fire Training Area	Place as fill under new asphalt areas Place in On-Site Waste Containment Cell	4,950	Place as fill in Project works	Assume 10m x 10m x1mbgs excavation = 100 m^3 in the vicinity of TP24. LTU1 = (1.5 m thick soil + 0.15mbgs) x 2,500 m2 area = 4,125 m^3 . LTU2 = (1 m thick soil +0.15 mbgs) x 1,250 m^2 area (although only half area is impacted) = 7,19 m^3.
5	Arsenic-impacted soil	Adjacent to runway	Place as fill under new asphalt areas Place in On-Site Waste Containment Cell	100	Place as fill in Project works	Assume 10 m x 10 m x 1 mbgs excavation = 100 m^3.
6	PAH-impacted perched groundwater	TP6, south of Arctic College	Direct ground discharge Treatment followed by ground discharge	Waste volume not applicable to containment cell.	Treatment followed by ground discharge	Treatment via granular activated carbon.
7	Building Materials - Asbestos, lead, mercury, PCBs (1)	T-25, T-116, T-120 (Buildings)	Place in secure container for off-Site disposal	Waste volume not applicable to containment cell.	Place in secure container for off-Site disposal	
			Total Waste Materials	5,360		

Notes:

PHC Petroleum Hydrocarbons
PAH Polycyclic Aromatic Hydrocarbons
PCBs Polychlorinated Biphenyls
(1) CRA has been advised by Arctic Infrastructure Partners that all designated substances removed from the buildings will be shipped off Site.

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SOIL AND GROUNDWATER MANAGEMENT PLAN

ADDENDUM MARCH 2015

Prepared for:

IQALUIT INTERNATIONAL AIRPORT IMPROVEMENT PROJECT "IIAIP"
BOUYGUES-SINTRA JOINT VENTURE

June 2015

Final – Rev 1.1

O/Ref.: QE14-214-11

SOIL AND GROUNDWATER MANAGEMENT PLAN

ADDENDUM MARCH 2015

Prepared for:

IQALUIT INTERNATIONAL AIRPORT IMPROVEMENT PROJECT "IIAIP"
BOUYGUES-SINTRA JOINT VENTURE

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Qikiqtaaluk environmental
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June, 2015

Final – Rev 1.1

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The original Soil and Groundwater Management Plan was prepared prior to the voluntary abatement activities of summer 2014. This version of the Soil and Groundwater Management Plan presents an update of the new management methods used.

1. HISTORICAL PROJECT OVERVIEW

In September 2013 IIAIP requested that Conestoga-Rovers & Associates (CRA) perform Phase I & II environmental site assessments to determine if any environmental contaminants exceeding regulation levels were found at the Iqaluit International Airport (the Airport) in the areas where excavation works were to be carried out.

Upon completion of the sampling work CRA prepared a report entitled *Pre-Existing Environmental Contamination Assessment and Mitigation Plan* (PECAMP), dated September 2013, No. 082415(4), Report #3. The PECAMP presented all of the contamination that was found during sampling. Four areas of concern were found:

- The Drum Cache, a stockpile of drums of bitumen that had been abandoned. The soil in the area was contaminated by Ethylbenzene, and bitumen that had leaked from the drums;
- Petroleum Hydrocarbon (PHC) impacted soil at the Transport Canada Landfarms (LTUs 1, 2 and TP-24), and surrounding area;
- An area of Arsenic contaminated soil alongside the runway;
- PAH impacted ground water in the area where an arch culvert is to be installed in a man-made creek bed and the main parking lot for the terminal building will be constructed;

CRA then prepared a remediation plan, the *Pre-Existing Environmental Contamination Management Plan* (PECMP), dated January 2014, No. 082415(4), Rev.1. The PECMP presented the options chosen for remediation of the work areas and the methodology to carry out the work. These options included the following:

- Drum Cache:
  - Removal and disposal of the drums of bitumen either in an on-site containment cell or by shipment to a licensed facility in southern Canada,
  - Excavation of the Ethylbenzene and bitumen contaminated soils and disposal by packaging and shipment to a licensed facility in southern Canada;
- PHC impacted soils:
  - Excavation and use on site as fill for all soils that respected a level of contamination determined by risk analysis or placement in the on-site containment cell;
- Arsenic Contaminated Soil:
  - Excavation and use on site as fill for all soils that respected a level of contamination determined by risk analysis or placement in the on-site containment cell;
- PAH Impacted Groundwater:
  - Treatment to remove the PAH contamination and discharge to the ground.

Prior to starting the remediation work, as recommended in the PECMP, a phase III Environmental Site Assessment (ESA) was carried out by Qikiqtaaluk Environmental Inc. (QE) to sample additional soil and water to delineate the extent of the contamination (the sampling done by CRA was to determine if contamination existed in a location, it was not to delimit the extent). At the beginning of June 2014, a Phase III ESA was conducted in the areas where contamination was identified. The results of this sampling were presented in QE's report entitled *Phase III Environmental Site Assessment, Iqaluit Airport.* This report is included in Appendix A. Based on the conclusions of these reports the areas to be excavated and volumes to be managed were determined.

During the Phase III investigation, additional sampling was performed in the area of the footprint for the new location of Taxiway G. This sampling found an area of soil with Chromium content above the CCME regulation threshold.

A subsequent report was delivered by WSP in November 2014, *Environmental Management of Chromium in Soil*, Project 121-06109-15 which provided an overview of recent assessments and previous environmental studies and guidance documents, and recommended methods of managing the soil containing Chromium. WSP has reviewed and considered the management standard applied in Ontario and recommended its use and corresponding mitigation measures to the GN.

1.1 Drum Cache

The final plan for the drum cache was for transport and disposal in southern Canada. The only exception being the large reservoir on-site, which was cutup, had the contaminated water and debris removed, which debris were disposed of at the City of Iqaluit's Landfill. The water was collected in storage containers and is waiting for AANDC's approval to be treated and discharged once test results show that it respects the discharge criteria. The site work was carried out by Qikiqtaaluk Environmental Inc. and completed in October 2014. Disposal was completed by December 2015 with the transfer of the waste to a licensed treatment facility in the Province of Quebec. Although work was interrupted in the middle of the summer of 2014, the work was resumed and completed in September once the Nunavut Water Board confirmed that this work did not require a licence. AANDC also confirmed that the work could proceed under QE's water licence from the Nunavut Water Board. A letter and photo report was submitted by QE entitled *Letter Report on Drum Cache Activities 2014-10-01* that describes the site work in more detail. Details for the drum disposal were provided in a report with photos and the certificates of disposal entitled *Disposal of Drum Cache Area Waste, Project Photos & Certificates of Disposal.* These reports are presented in Appendix B. A clarification was sent regarding the disposal of the reservoir in the City of Iqaluit Landfill. This letter is attached in Appendix B.

1.2 Remediation of the PHC/Arsenic Contaminated Soil

The initial plan for the management of all of the contaminated soil on site was to use a Tier III Risk Based Approach (Tier III RBA). All of the levels of contamination at the site respected the levels set by the Tier III RBA, thus, the plan was to use all of the contaminated soils as backfill with certain mitigating measures put into place. The soils were excavated, transported and placed as per the *Soil and Ground Water Management Plan* prepared by CRA, dated August 2014, No. 082415, Report No. 5 rev 1. This report has already been submitted to all parties and is available upon request. Following the movement of contaminated soil from their original locations (PHC impacted soils removed from the former Transport Canada LTUs and Arsenic impacted soils removed from the area adjacent to the airport runway), and discussions with the authorities bearing jurisdiction, it was decided that the soils could not be used as fill based on a Tier III risk based approach at that time. Through a voluntary abatement process agreed upon with AANDC the contaminated soils were relocated to a containment cell until a final decision was provided on the means to manage them. Specifications for the construction of the new containment cell were prepared by QE. The Specifications were submitted in a document entitled *Remediation Work Plan Iqaluit Airport 2014-08-25*. This document is included in Appendix C. All soils were transferred into a containment cell in September 2015, and confirmatory sampling proved that all of the contaminated soils had been removed. A letter report entitled *Characterisation of Soil Laydown Area Next to Apron I, Iqaluit Airport, 2014-09-17* was submitted to AANDC that provided all of the results of the samples collected, showing that no contamination remained. This document is included in Appendix C.

The monitoring wells at the location where the impacted soils from the former LTUs were placed were temporary and are not believed to be relevant since all contaminants have been removed from that location and that confirmatory sampling has been completed throughout the affected area that shows that no contamination remains in place. Results of the sampling program that were sent to AANDC are included in Appendix C.

LTU-2 had water collected inside the berms. This water was collected into storage containers and is currently waiting for AANDC approval to be discharged as test results show that it respects the discharge criteria in QE’s water licence.

The current plan is to use the current containment cell as a semi-permanent solution during the construction phase of the airport performed by the BBC-Sintra Joint Venture. Once the construction phase of the operations is complete, the cell may be converted into a landfarm to treat the soils so that they respect the guideline values in place. The option of using the soils as fill through a Tier 3 Risk Based Assessment has been abandoned and will no longer be considered.

1.3 Discrepancies in Quantities

The original amount of soil estimated to be managed was 4,950 m^3, and the final amount excavated was 5,257 m^3 based on the risk based approach. As part of the voluntary abatement additional soil was added to the total volume as the part of the soil cover, and the ground on which the contaminated soils were placed, were considered to be contaminated. This brought the total volume of soil to be managed up to 8,249 m^3 (7,704 m^3 of PHC soil and 545 m^3 of arsenic soil).

2. REVIEW OF THE SOIL AND GROUNDWATER MANAGEMENT PLAN AND UPDATES ON MODIFICATIONS

The following section will discuss sections 2 to 5 of the *Soil and Ground Water Management Plan* prepared by CRA, dated August 2014, and any deviations from this Plan. Now that it has been determined that numerous activities to be conducted as part of the IIAIP require a water licence, reference will also be made as to how this plan will now apply to the entire project, and not just the original areas of environmental concern identified by CRA.

2.1 Section 2.0 Remedial Objectives/ Applicable Guidelines

The remedial objectives for the project remain the same. Now that a water licence is required for the Project additional guidelines apply. These guidelines have been referenced in the management plans described in Section 4 of this report.

2.2 Section 3.0 Nature and Extent of Pre-Existing Environmental Contamination

This section describes the areas of environmental concern that had been identified when the report had been issued. The following is an update on each of these areas, and the additional areas of concern discovered during the 2014 field season:

- Drum Cache:
  - As discussed in Section 1.1 of this report, this area was completely remediated in 2014. All full and empty drums, debris and contaminated soil have been removed from this area and disposed to licensed disposal facilities;
- Land Treatment Units (LTUs) and underlying soil (7,704 m^3):
  - All of the contaminated soil from the former Transport Canada LTUs and the underlying soil has been removed from this area and put into a new containment cell that is located next to the projected Taxiway G location. In addition Transport Canada removed additional soils from under the LTUs and had these soils disposed offsite and managed to a remote facility. The area of the former LTUs is now considered remediated;
- Arsenic-impacted soil adjacent to runway (545 m^3):
  - All of the contaminated soil was excavated and has been removed from this area and put into a new containment cell that is located next to the proposed Taxiway G location. These soils were put into the containment cell and were isolated from the hydrocarbon contaminated soils using plastic sheeting. This area is now considered remediated;
- PAH-impacted groundwater:
  - No work was performed in this area in 2014; this is work scheduled for 2015, once the water licence has been issued. The plan for the management of this contamination will be discussed in Section2.4.4 of the *Soil and Groundwater Management Plan*;

- Chromium soil adjacent to Taxiway G:

  No work was done in this area in 2014. Additional sampling was conducted in September 2014 to delineate the extent of the Chromium levels in soil in the areas to be excavated. As discussed in Section 3.1.1.4 of this addendum to the *Soil and Ground Water Management Plan* a site-specific criterion is now being applied to these soils. Chromium soils at the Airport Terminal Building (ATB) and the Common Services Building (CSB).

  The soils excavated from the footprint of the ATB were sampled due to a strong odour from organic degradation in anaerobic conditions. The only element of concern found in these soils was Chromium which concentration exceeded the tier-1 Canadian Council of Ministers of the Environment (CCME) Quality Guidelines threshold. However, with the approval of the site-specific criterion presented in the WSP report entitled Environmental Management of Chromium in Soil, dated November 2014, Project no: 121-06109-15, these soils no longer require any special management, and will be used as fill at the CSB site and surroundings.

  The soils at the CSB site were also sampled following the discovery of Chromium concentrations in soils at the ATB site. This area was also found to contain Chromium within the soil above the CCME guideline values. However, with the application of the new site-specific criterion for the site, these soils no longer require any special management other than special procedures to be followed to use these soils as fill.

- Drum Cache 2 (New Drum Cache):

  During excavation of the footprint of the Taxiway F and associated areas, buried debris containing metal, wood, concrete debris and drums containing a hydrocarbon substance were found. Work was stopped in this area until a management plan can be implemented. Remediation of this area will be done following the same processes at the remediation of Drum Cache 1. The work will be done according to the procedures described in Section 3.1.1.1 of this Addendum to the Soil and Ground Water Management Plan.

2.3 Section 4.0 Conceptual Remedial Design

All of the remediation options presented in the *Soil and Groundwater Management Plan* are still valid and may still be used. The only exception is the use of soils as fill using a risk based approach; this option has not been retained for this Project.

2.4 Section 5.0 Application of Remedial Options to Areas Requiring Management

2.4.1 Section 5.1 – Drum Cache

As mentioned in Sections 1.1 and 2.2 this area has been completely remediated by disposal off-site of all contaminants, and disposal of the reservoir in the City of Iqaluit's landfill.

2.4.2 Section 5.2 – LTUs and Underlying Soil

As mentioned in Sections 0 and 2.2 the contaminated soil from the LTUs and the underlying soil were transferred into a containment cell. These soils will remain in place until 2018, after which the containment cell will be converted into a landfarm. Plans and specifications, signed by an engineer registered in Nunavut, to convert the containment cell into a landfarm will be submitted to the Nunavut Water Board for approval in 2017. These plans will also include the possibility of the construction of new or additional landfarm areas inside, or outside of the fenced airport property, as long as the city zoning by-laws are respected. It is anticipated that the treatment of soil will start by June 2018. The soil will be treated in layers of 50 cm. The current plan is to remove the covering membrane and sample the first 50 cm of soil to determine the level of contamination. Should the soils meet the guideline levels, then it will be removed and used as fill at a pre-approved location. Should the soils not respect the guideline values, then an amendment will be added to accelerate the treatment process, and the soils will be tilled. The amount and type of amendment and the frequency of the tilling will be based on the level of contamination. Once the soil respects the guideline values, then the 50 cm layer will be removed and the treatment process will restart on the next 50 cm layer until all of the soils have been treated. It is expected that all soils will be treated by fall 2023.

Milestones:

a) Send Landfarm Treatment Unit engineering and monitoring plans, specifications, abandonment and reclamation plans to the NWB with Licence amendment for Fall 2017;
b) LTU construction in the summer of 2018;
c) LTU reclamation initiated in 2018 with groundwater monitoring; and
d) LTU soils reclamation completed by 2023 (if no adverse conditions or situations encountered).

2.4.3 Section 5.3 – Arsenic-Impacted Soil Adjacent to Runway

As mentioned in Sections 0 and 2.2 the contaminated soils from the Arsenic impacted area next to the runway were transferred into a containment cell. These soils will be managed prior to converting the containment cell into a landfarm. The plan for these soils is to divide them into sections and sample them to determine the level of Arsenic concentration, in an attempt to reduce the volume of soil to be managed. Depending on the total volume to be managed, these soils will be confined to a permanent engineered containment cell localised on or off site. An amendment to the water licence will be provided to the NWB in 2017 and the construction of the new containment cell will be done in the summer of 2018. The plans and specifications for the construction of the new containment cell will be stamped and signed by an engineer registered in Nunavut. An alternate option (but not the preferred one), is to dispose of the materials at a licensed disposal facility outside Nunavut.

Milestones:

a) Send containment cell specifications, signed by an engineer registered in Nunavut, and monitoring plans, specifications, abandonment and reclamation plan to the NWB with Licence amendment for Fall 2017;

b) Containment cell construction in the summer of 2018 with groundwater monitoring ; and

c) Reclamation to be determined with life cycle expectancy of the containment cell.

2.4.4 Section 5.4 PAH-Impacted Groundwater

2.4.4.1 The management of the contaminated ground water found in this area has been modified as follows:

- Disturbance to this area will be reduced as much as possible;
- A bypass channel will need to be excavated to divert the water from Carney Creek during the installation of the arch culvert. This bypass channel will be lined with an impermeable geomembrane to prevent the contaminated ground water from coming into contact with the creek water;
- Any ground water that collects in the channel during construction will be pumped into holding basins for testing and treatment if required. Any water that collects under the membrane will also be pumped into a holding basin for testing and treatment;
- Once the by-pass channel is no longer required, any remaining water will be pumped into a holding basin for testing and treatment and the channel will be backfilled;
- The management of all water collected from this area is planned to be done by Qikiqtaaluk Environmental Inc. using their water treatment units if required. Treatment and discharge of hydrocarbon contaminated water will be done under Qikiqtaaluk Environmental's water licence. File number 1BR-THI1419. Any other types of contamination will be treated and discharged according to the AILP's Water Licence. Should there be a discrepancy in the discharge criteria between AILP's and QE's water licence then the strictest criteria will be used.
- Holding basins will be constructed at the locations show in the drawing in Appendix D; and
- None of the remaining work at the site requires contact with this contaminated ground water.

2.5 Site Grading Amendments

Section 4.1.4 of the original Soil and Groundwater Management Plan prepared by CRA, states that approximately 10,000 m^3 of material will be used in a cut and fill method (meaning the soil will be excavated from one area at the airport (the cut) and used in another as backfill to bring the area up to grade (the fill)). This volume presents only the space that was available to encapsulate soil with contaminants that were to be managed through a Tier 3 Risk Based Approach, which required the soils to be buried 1 m deep. It was originally planned to use the soils from TP-15 (arsenic contamination) and TP-24 & the LTU's (Hydrocarbon contamination) in this manner. However, these soils have now been moved into the Containment Cell constructed on site under the Voluntary Abatement Notice.

Areas of the site will be subject to a cut and fill, however all imported fill materials are being sourced from the quarry located next to the airport and crushed to achieve the gradations required for construction. The location of the quarry is shown in the figure in appendix D

3. NEW AREAS REQUIRING MANAGEMENT

3.1.1.1 Existing and Potentially Contaminated Areas

The contaminated soils identified in the SGMP has been excavated and moved to the containment cell or shipped south for disposal. The following areas are known to still contain contaminated soils:

- Hydrocarbon Contaminated Soils from the footprint under LTU 1 (estimated at 900 m^3). It is the intention of the Government of Nunavut and Transport Canada to manage these soils through remediation in a licenced land treatment unit; and
- Drums containing hydrocarbon substances and soiled materials, metal parts and concrete wastes partially unearthed at on the projected Taxiway F footprint (referred as the Drum Cache 2).

With the exception of the Drum Cache 2 discussed in the following section, all other areas are assumed to be free of contamination. However should any of the following signs of contamination be detected at the site then a sampling program will be initiated:

- Odours
- Soils staining or sheens
- Buried debris

The sampling program will involve at a minimum analysis for the following parameters in the soil:

- Total Petroleum Hydrocarbons
- Polycyclic Aromatic Hydrocarbons
- Benzene
- Toluene
- Xylene
- Ethyl Benzene
- Metals

Any water that comes into contact with contaminated or potentially contaminated soils will be assumed to be contaminated until either test results show that the water is not contaminated (in the case where it comes into contact with contaminated soils), or that the potentially contaminated soils are determined not to contain contamination based on analytical results from a laboratory.

Once contamination in soils, water or debris (e.g. buried drums) is confirmed, a management plan will be submitted to the department at the Government of Nunavut responsible for managing the Iqaluit Airport Improvement Project for approval. The management plan will respect all of the guidelines and laws of the Territory of Nunavut as well as any requirements in the water licence from the Nunavut Water Board.

3.1.1.2 Drum Cache 2 (New Drum Cache)

Remediation of this area is still waiting approval. The current plan is to proceed as follows:

- Removal of any large debris from the excavated area and disposal at the City of Iqaluit's landfill or to licensed facility outside Nunavut if it is contaminated or hazardous waste;
- Excavation of the remaining soil and debris, and screening of the soil to remove any debris larger than 100 mm;
- Sorting of the screened materials and the screener rejects to remove any debris. Debris will be disposed of at the City of Iqaluit's landfill or outside Nunavut in a licensed facility if it is contaminated or hazardous waste;
- All soil will be tested to ensure that it is not contaminated. Non-contaminated soil will be blended with non-contaminated rocks from the screener and used as fill. A management plan for the contaminated soil will be developed based on the type of contamination found;
- Any soiled rocks or debris recovered from the screener reject pile will be disposed outside Nunavut to a licensed facility;
- Any drums found in the excavation will be removed and managed as a hazardous waste and disposed outside Nunavut to a licensed facility;
- Any water that is found in the excavation will be pumped into a holding basin, and tested. Contaminated water will be treated and discharged; non-contaminated water will be discharged directly to the ground;
- The management of all water collected from this area is planned to be done by Qikiqtaaluk Environmental Inc. using their water treatment units if required. Treatment and discharge of contaminated water will be done under Qikiqtaaluk Environmental's water licence, File number 1BR-THI1419;
- Approval from AANDC will be obtained before the discharge of any water.

3.1.1.3 Contaminated Water from the Drum Cache Reservoir and the LTUs

This water contains hydrocarbon contamination. It will need to be treated prior to discharge. The management of this water is planned to be performed by Qikiqtaaluk Environmental Inc. using their water treatment units if required. Treatment and discharge of contaminated water will be done under Qikiqtaaluk Environmental's water licence, File number 1BR-THI1419. Approval from AANDC will be obtained before the discharge of any water.

3.1.1.4 Chromium Soil from the Proposed Taxiway G

The current plan for Chromium soil is to use this material as fill as long as it respects the criteria given in the report Environmental Management of Chromium in Soil prepared by WSP referenced in section 0. These conditions are:

- Any soil exceeding the surface soils standard of 160 µg/g (pending volume requirements) will be restricted for use as surface soil and will be used as subsurface fill;
- The Chromium concentration must be less than 11,000 µg/g for subsurface management;
- On-going soil management should be conducted in accordance with the Ministry of the Environment of Ontario's Soil, Ground Water and Sediment Standards (2011).

3.1.1.5 Polycyclic Aromatic Hydrocarbon Contaminated Ground Water

In the area where the arch culverts will be installed under the new parking lot, Polycyclic Aromatic Hydrocarbon contamination was found in the groundwater. The contaminated water will be managed as per the directions provided in section 5.4 of the Soil and Groundwater Management Plan prepared by CRA.

4. MANAGEMENT PLANS

The following is a list of plans that have been prepared for the Iqaluit International Airport Improvement Project for environmental management and submitted to the Nunavut Water Board as part of an application for a type B water licence.

4.1.1 Spill Contingency Plan

This plan covers the procedures to follow should a spill of hazardous materials occur on site. A copy of this plan is included in Appendix E.

4.1.2 Hazardous Waste Management Plan

This plan covers the handling, storage and disposal of all hazardous waste materials on site. A copy of this plan is included in Appendix E.

4.1.3 Water Management Plan

This plan covers the use of water on the site for backfill compaction and dust control measure. A copy of this plan is included in Appendix E.

4.1.4 Long-Term Monitoring Plan

This plan covers the long-term monitoring of the existing containment cell to ensure that it is performing properly. A copy of this plan is included in Appendix E.

4.1.5 Erosion and Sediment Control Plan

This plan covers the prevention of sediments from entering water bodies, how to manage any water that contain sediments and preventing erosion at the work site. A copy of this plan is included in Appendix E.

4.1.6 Environmental Impacts Plan

This plan covers the work to be done to reduce the impacts of work in drainage ditches, creeks and streams in the project area, and measures to be put into place to reduce the impact on fish habitat.

4.1.7 Specifications for Cell Cover

This plan presents the procedures to follow to install a cover on the containment cell. This cover will be more resistant than the temporary cover installed in the fall of 2014. The anticipated life span of the containment cell is 10 years, which will extend beyond the period where the cell will be converted into a landfarm. The containment cell will be monitored as per the details laid out in the *Long-term Monitoring Plan*.

5. ABANDONMENT AND RECLAMATION

A detailed report will be submitted to the authorities having jurisdiction (the Nunavut Water Board and the Government of Nunavut's Department of Environment) detailing all of the steps followed to decommission the landfarm treatment area. These steps shall include the following:

- Should any water be found in the bottom of the containment cell, it will be treated (if necessary) and discharged (once approval is obtained by AANDC or other body with jurisdiction if AANDC is no longer responsible);
- The geomembrane and geotextile from the containment cell will be disposed of at the City of Iqaluit's landfill or shipped outside Nunavut for disposal if the City does not accept this waste;
- The soil used for the berms and the underlying soil will be tested for contamination. Should contamination be found, then the soil will be disposed of at a soil treatment facility located in the City of Iqaluit. Non-contaminated soils will be used for reshaping the cell's footprint as to prevent ponding of water;
- Monitoring wells will be cut off at 50 cm below the ground surface and filled with bentonite.

APPENDIX A

PHASE III ENVIRONMENTAL SITE ASSESSMENT, IQALUIT AIRPORT

APPENDIX B

LETTER REPORT ON DRUM CACHE ACTIVITIES 2014-10-01

DISPOSAL OF DRUM CACHE AREA WASTE, PROJECT PHOTOS AND CERTIFICATES OF DISPOSAL

LETTER REPORT DRUM CACHE CLARIFICATIONS TANK DISPOSAL

APPENDIX C

CHARACTERISATION OF SOIL LAY DOWN AREA NEXT TO APRON, IQALUIT AIRPORT, 2014-09-17

REMEDIATION WORK PLAN IQALUIT AIRPORT 2014-08-25

APPENDIX D

FIGURES OF LOCATION OF CONTAMINATED WATER HOLDING BASINS TO BE CONSTRUCTED, WATER DISCHARGE POINTS AND HAZARDOUS WASTE STORAGE, AND QUARRY

APPENDIX E

SPILL CONTINGENCY PLAN
HAZARDOUS WASTE MANAGEMENT PLAN
WATER MANAGEMENT PLAN
LONG-TERM MONITORING PLAN
ENVIRONMENTAL IMPACTS PLAN
EROSION AND SEDIMENT CONTROL PLAN
SPECIFICATIONS FOR CELL COVER