ARCADIS Design & Consultancy for natural and built assets

Public Services and Procurement Canada

2016 ENVIRONMENTAL MONITORING

Resolute Bay Airport Land Treatment Units

December 9, 2016

2016 ENVIRONMENTAL MONITORING

Resolute Bay Airport Land Treatment Units

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EXECUTIVE SUMMARY

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) on behalf of Transport Canada (TC) to conduct an Environmental Monitoring program at the Resolute Bay Airport Land Treatment Units (LTU's) in Resolute Bay, NU. The monitoring program was undertaken in order to meet Nunavut Water Board (NWB) license 1BR-RLF1520 requirements. The site activities were conducted under PSPC project number R.086448.001 and under Northern Standing Offer Contract EW699/141143/001.

The two large LTUs (identified as LTU 1 and LTU 2) at the site were constructed in 2002 as part of the remediation of a former firefighter training area (FFTA). The FFTA included a mock-up area, four aboveground storage tanks, a fuel pump house and underground piping. The volume of soils in the LTUs was reported to be 5,800 m^3 at the time of the remediation.

TC was granted a licence by the Nunavut Water Board for the operations, maintenance and eventual decommissioning of LTU 1 and LTU 2. The licence stipulates sampling, reporting, water use, waste, and other requirements for the operation of the LTUs.

The objectives of the environmental monitoring program were to: Complete a groundwater monitoring program at the site to assess for dissolved chemicals of concern to meet Nunavut Water Board license 1BR-RLF1520 requirements; Assess the LTUs 1 and 2 to evaluate the integrity of the LTUs liner, and condition of the monitoring well network; and, Label the monitoring stations in accordance with Section 3 of the NWB licence with tri-lingual signage (English, French, and Inuktitut).

Arcadis visited the site on August 23-25, 2016 to carry out the monitoring activities. During the site visit, weather conditions were windy and clear, with a temperature of -5 °C.

Groundwater Conditions

All six groundwater wells were inspected and observed to be in good condition at the time of the site visit. During the 2016 monitoring program, three of the wells were dry and three wells had insufficient volumes of water to sample. Similarly, in 2015, all six groundwater wells were frozen therefore no samples were collected.

LTU Volumes and Liner Integrity

Arcadis determined the average depth of soil in the LTUs and was therefore able to approximate the total volume of soil. An average depth of 1.0 m was calculated. The volume of soil within each LTU is estimated at: 1,925 m^3 in LTU 1 and 2,400 m^3 in LTU 2, for a total of 4,325 m^3. These volumes are consistent with those identified in 2015, however are lower than the initial estimated volume of 5,800 m^3.

Minor degradation of the exposed liner was observed at the northwest corner of LTU 1. This degradation is not necessarily the case for the liner below the LTU soil, as it has not been exposed to UV rays. Overall, the geomembrane liner was observed in good condition. Arcadis inspected a piece of the liner from the area of minor degradation and it was observed to be fully intact. The integrity of the liner at both LTU 1 and LTU 2 does not appear to be compromised and is containing soils as designed.

Monitoring Well Signage

Arcadis appended tri-lingual signage (English, French, and Inuktitut) to all six monitoring wells present around the LTUs.

Recommendations

Arcadis proposes the following future work at the Resolute Bay LTUs:

Groundwater monitoring is required as part of the NWB License requirements. No groundwater samples were collected during both the 2015 and 2016 field programs due to frozen well conditions or insufficient water volumes. A groundwater monitoring program should be completed to assess for NWB License requirements and identified chemicals of concern. Attempts should be made to sample the wells in late July or early August 2017 during spring freshet when water levels are presumed to be at their highest. If water is present, sufficient field time should be allowed for groundwater recharge (i.e. 6 to 7 days).

In the absence of groundwater, Arcadis would recommend a review of the subsurface conditions around the monitoring wells to understand the best position for the well screened intervals and depth of any standing water in the active layer. This could be accomplished with a test pitting program completed adjacent to the existing wells. Using a downhole camera or similar instrument, attempt to confirm screening depth of monitoring wells and monitoring well screen conditions should be undertaken. Based on this investigation, new wells could be better established.

If deterioration or damage of PVC well risers is observed, installation of protective well casings around all six monitoring wells should be undertaken.

The associated costs with performing groundwater monitoring as required as part of the NWB License requirements is on the order of $33,690 plus GST. Costs associated with potential additional tasks, an active layer investigation (test pitting and downhole camera assessment) and monument installation, are estimated on the order of $2,900 and $3,950 plus GST, respectively. The cost breakdown table is attached in Appendix B.

1 INTRODUCTION

Arcadis Canada Inc. (Arcadis) was retained by Public Services and Procurement Canada (PSPC) on behalf of Transport Canada (TC) to conduct an Environmental Monitoring program at the Resolute Bay Airport Land Treatment Units (LTU's) in Resolute Bay, NU. The monitoring program was undertaken in order to meet Nunavut Water Board (NWB) license 1BR-RLF1520 requirements. The site activities were conducted under PSPC project number R.086448.001.

This report is submitted under Northern Standing Offer Contract EW699/141143/001 and conducted in according with the Terms of Reference (ToR) entitled, "TOR, Environmental Monitoring Services, Resolute Bay Airport FTA LTU, Nunavut" and the Arcadis proposal "Proposal for Resolute Bay Airport Land Treatment Units Environmental Monitoring, 2016" dated, August 9, 2016. Throughout this report the Resolute Bay LTUs will be referred to as "the site."

1.1 Background

The Resolute Bay airport is five kilometres northwest of the Inuit hamlet of Resolute, in the Qikiqtaaluk Region of Nunavut (Figure 1). The airport was constructed by the Royal Canadian Air Force in 1949, and is now owned and operated by the Government of Nunavut.

Firefighter Training Area and Land Treatment Units

There is a former firefighter training area (FFTA) north of the Resolute Airport. In 2002, Winnipeg Environmental Remediation Inc. (WERI) conducted demolition and remedial activities at the FFTA in attempt to bring the Resolute Bay Airport into compliance with environmental legislation. Remediation and confirmatory sampling in the FFTA was completed between 2002 and 2005. Contaminated soils were excavated and placed in two LTUs.

Neither the contents of the aboveground storage tanks nor the specific nature of any other sources of soil contamination were indicated in the remedial reports.

There is reportedly approximately 5,800 m^3 of impacted soil in the two LTUs (LTU 1 and LTU 2). LTU 1 has external dimensions of 70 m x 40 m and is divided into three zones. Zones 1 and 2 contained soils impacted with heavier hydrocarbons while zone 3 contained soils impacted with lighter hydrocarbons. LTU 2 has external dimensions of 80 m x 30 m. LTU 2 contains soils impacted with lighter hydrocarbons and was not subdivided into zones.

As part of the remediation, a ground heating system was installed in one of the LTUs (LTU 2) to enhance hydrocarbon degradation by providing an optimum temperature for microbial growth, but the system only operated once in 2004.

Between 2002 and 2005, sampling was completed annually to determine if contaminant levels were being reduced. Nutrients were placed in the LTUs in 2002 and 2003.

TC was granted Licence No. 1BR-RLF1520 by the Nunavut Water Board for the operations, maintenance and eventual decommissioning of LTU 1 and LTU 2. The licence stipulates sampling, reporting, water use, waste, and other requirements for the operation of the LTUs.

Two smaller LTUs are present in the area (LTU 3 and LTU 4); however, no background information on the source of contents or construction of the LTUs is available. TC has indicated that it is not the custodian of the smaller LTUs. Arcadis was not able to obtain any additional information regarding these LTUs while in Resolute Bay. The Water Licence does not cover these additional LTUs.

Arcadis collected soil samples from the LTUs in 2015, and found that petroleum hydrocarbons (PHCs) and perfluorinated compounds exceeded guidelines in soil. Groundwater was frozen at the time of the site visit and, as a result, no samples were collected. PWGSC attempted to retain a contractor to remove the heating infrastructure and till the soil in the TC LTUs, but no bids were received.

1.2 Objectives

The objectives of the environmental monitoring program, as outlined in the ToR, were to:

- Complete a groundwater monitoring program at the site to assess for dissolved chemicals of concern to meet Nunavut Water Board license 1BR-RLF1520 requirements;
- Assess the LTUs 1 and 2 to evaluate the integrity of the LTUs liner, and condition of the monitoring well network; and,
- Label the monitoring stations in accordance with Section 3 of the NWB licence with tri-lingual signage (English, French, and Inuktitut).

2 SCOPE OF WORK

The following sections outline the scope of work and methodology implemented during 2016 field program to satisfy the project objectives. The 2016 field program ran from August 24 to August 26, 2016.

2.1 Health and Safety Plan

Arcadis prepared a site specific health and safety plan (HASP) prior to the monitoring program. The HASP included the documentation of all foreseeable work hazards and mitigative actions. It also contained a listing of emergency contact numbers and provided protocols to follow in the event of an incident. Arcadis ensured that the HASP was communicated to all site personnel ensuring that they were aware of all contaminants of concern, associated precautions, and required personal protective equipment.

A health and safety kick-off meeting and daily tailgate meetings, including task specific job safety analyses, were conducted to inform on-site personnel of the potential risks and appropriate safety controls. The HASP has been retained on file by Arcadis.

2.2 Groundwater Monitoring and Sampling

All six groundwater wells were inspected prior to sample collection. The wells were observed to be in good condition at the time of the site visit. The water level, depth of well, the height of the top of casing, and the condition of the well was recorded in the field. Arcadis collected water levels from the six monitoring wells surrounding LTU 1 and LTU 2 on August 24, 2016 using a Solinst interface probe. Three out of the six wells recorded dry groundwater conditions (MW3, MW4 and MW5) and the remaining three wells recorded miniscule water levels.

On August 25, 2016, Arcadis attempted to collect groundwater samples from MW1, MW2 and MW6 using a peristaltic pump and dedicated tubing. Water available in the three wells columns was purged dry and all purged water was collected in laboratory supplied containers. The wells were left to recharge overnight and on August 26, 2016, the water levels were assessed. All three wells did not recharge in a 24-hr period; therefore, water volumes were insufficient to collect groundwater samples. Water that was purged was clear and no odours or sheen was observed.

2.3 LTU Integrity Assessment

During the site visit, Arcadis made observations about the conditions of the LTUs, the conditions of the geomembrane liners, and the dimensions of the LTUs.

Because the soil in the LTUs was frozen at the time of the site visit, it was not possible to assess the liners below the soil in the LTUs. Mechanical excavation would be required to move the soil; however, hand excavation would have been required to expose the liner below the soil without damage. The frozen soil conditions did not permit such hand excavation to expose the liner below the LTUs.

Test pits were manually excavated to depth of permafrost to assess the depth of soil across both LTU 1 and LTU 2. Test pits were evenly distributed across the LTU surface area to gain full coverage of the area of soils. Minor odours were observed during test pitting. No surface water was observed pooling within the LTUs.

2.4 Monitoring Well Signage

Arcadis labelled the six monitoring wells according to NWB licensing requirements with tri-lingual signage (English, French, and Inuktitut). The Arcadis field technician appended the monitoring well signs to the PVC stick up using zip ties using extra caution not to damage the PVC riser. Monitoring well signage is shown in Photos 1 and 2 in Appendix A.

3 RESULTS

3.1 Site Conditions

At the time of the Arcadis site visit, temperatures were approximately -5 °C with gusting winds. No snow accumulation was observed. Soils within the LTU were partially frozen, therefore hand excavation was possible but only until permafrost was reached (0.7 - 1.0 metres below ground surface (m bgs)). Groundwater was not recoverable from the monitoring wells.

3.2 Geology and Surficial Geology

Surficial geology in the area of site consists of colluvial deposits. Colluvial deposits are colluvial and residual materials deposited as veneers and blankets of debris through downslope movement and in place disintegration of bedrock, including areas of rock outcrop. Specifically, the overburden is comprised of colluvial rubble, which contains rubble and silt derived from carbonate and consolidated fine clastic sedimentary rock substrate. The bedrock is of Paleozoic era, specifically the Arctic Platform and is composed Silurian carbonate and siliciclastic rocks (Canada-Nunavut Geoscience Office, 2006).

The Resolute Bay area is subject to continuous permafrost. Groundwater is not used as a drinking water source as glacial water is readily available and is used as the potable water supply.

Soils encountered within the LTU consisted of brown silt mixed with some rock and stones extending to the depth of permafrost (up to one meter).

3.3 Groundwater Conditions

Arcadis measured the groundwater depths at all well locations. In all cases where groundwater depths were measured as dry, the water was observed to be frozen. Monitoring information collected from the wells around LTU 1 and 2 are shown in Table 1, below.

Table 1: Groundwater Monitoring Results on August 24, 2016

Monitoring Well	GPS Coordinates (UTM)	Depth to Bottom (m)	Depth to Water (m)	Comment
MW1	0441209 E 8295900 N	1.182	1.162	Riser in good condition. New signage attached.
MW2	0441149 E 8295868 N	1.185	1.061	Riser in good condition. New signage attached.
MW3	0441155 E 8295853 N	1.233	Dry	Riser in good condition. New signage attached.
MW4	0441241 E 8295900 N	1.191	Dry	Riser in good condition. New signage attached.
MW5	0441257 E 8295811 N	1.242	Dry	Riser in good condition. New signage attached.
MW6	0441241 E 8295809 N	1.613	1.570	Riser in good condition. New signage attached.

Note: MW1 through MW6 contained dedicated bailers which were removed for monitoring practices. New low flow sampling tubing was used to try to acquire groundwater samples, however no dedicated tubing was left in the wells.

There were no protective casings installed around the monitoring well stickup PVC risers. As a result, the risers showed some minor weathering from the elements. Monuments are generally installed on stickup wells in southern Canada to protect the well casing that extends above ground surface. The monitoring wells around the LTUs were installed without such monuments, likely as the result of high costs. Installing the monuments would require extensive reworking of the wells, including excavating around the well at the ground surface, shortening the riser pipe so that it will fit in the monument, and placing bentonite around

the casing, therefore this was not completed as part of this work program. During the site visit, the PVC risers are in good conditions and no frost heave or major deterioration was observed. Installing monuments is not warranted at this time.

Arcadis is unaware of any well installation logs, and did not survey the elevations of the monitoring wells. As a result, it is not possible to determine groundwater flow direction from the measured water levels. However; based on the topography of the area, Arcadis expects that any groundwater present during the short un-frozen ground period will move from east to west across the LTU area, towards Resolute Bay.

3.4 LTU Volumes and Observations

During the site visit Arcadis observed that a berm was constructed around the LTUs. The berm varied in width from one to two metres. Arcadis confirmed the dimensions of LTU 1 and LTU 2 as shown in Table 2, below. Dimensions are internal measurements from berm to berm, whereas previous measurements by WERI were external and included the berms in measurements.

Table 2: LTU Dimensions Measure on August 24, 2016

Unit	Dimensions	Total Area (calculated, rounded to nearest hundredth)
LTU 1	55 m x 35 m	1,900 m^2
LTU 2	80 m x 30 m	2,400 m^2

The measurements of the LTUs recorded during this field program are very similar to those recorded during 2015. In 2015, the LTUs were snow covered impeding visual observations of the extents of the LTU; however, given the lack of snow cover during this site visit, they were confirmed.

Arcadis did measure the depth of the soil in the LTUs via manual test pit excavation to depth of permafrost. After taking into account the depth of soil from permafrost to the base of the LTU, the overall average depth of 1.0 m was estimated for each LTU. Thus, Arcadis can approximate the volume of soils present in the LTUs. The amount estimated in 2015 is the same amount approximated in 2016. Approximately 1,925 m^3 is present in LTU 1 and approximately 2,400 m^3 is present in LTU 2.

The north end of LTU 2 where the heat treatment system was located was inaccessible during the field program as it was covered by a tarp that could not be removed without compromising the integrity of the LTU. No damage was observed to the liner of LTU 2 that Arcadis was able to observe. However, a tarp was covering the northern portion of LTU 2 and no test pits could be advanced in that area to gain an understanding of the soil depths here.

The liner granular cover on LTU 1 was very shallow or non-existent along the majority of the berm walls, which resulted in exposure of the liner to atmospheric conditions and ultraviolet (UV) rays. Minor damage to the liner was observed at one location, the northeast corner. A small portion of the geomembrane liner was removed from the northwest corner and inspected closer (see Appendix A-Photos 7 and 8). After

inspection, Arcadis confirmed that the liner integrity has not been compromised as the weaving of the fibres was fully intact.

4 DISCUSSION AND RECOMMENDATIONS

4.1 Groundwater Conditions

All six groundwater wells were inspected and observed to be in good condition at the time of the site visit. During the 2016 monitoring program, three of the wells were dry and three wells had insufficient volumes of water to sample. Similarly, in 2015, all six groundwater wells were frozen therefore no samples were collected.

It was noted that the wells are shallow in depth and given site conditions and site location, will have a difficult time collecting a significant amount of water for sampling. Any water collected annually within the wells will depend on the volume of melt water and depth to permafrost that varies year to year. Typically, water present would be a shallow groundwater source that is representative of surface water that has percolated through the active layer. It is difficult to correlate permafrost depths with wells performance without well logs indicating the depth of the screen in relation to the ground surface. The depth to permafrost is not a fixed entity and varies significantly from year to year as the active layer and frost interface is not on a continuous planer unit either (such as with a typical groundwater table. This variation can impede the presence of water for sample collection.

4.2 Soil Volumes

Arcadis was able to ascertain the depth of soil in the LTUs and was therefore able to approximate the total volume of soil. An average depth of 1.0 m was calculated. The volume of soil within each LTU is estimated at: 1,925 m^3 in LTU 1 and 2,400 m^3 in LTU 2. These volumes are consistent with those identified in 2015.

WERI estimated the initial volume of soil placed in the LTUs as 5,800 m^3. Arcadis believes that this total is an overestimation based on WERIs measurements methodology from the outside of the berm walls and the estimated average height of soil in the LTUs at 1.3 metres.

4.3 Liner Integrity

Exposure to ultraviolet (UV) rays generally degraded the condition of the geomembrane that was used to line the LTUs where it is exposed around the edges of the LTUs and not covered by soil in the typical manner. While minor degradation was observed at the northwest corner of LTU 1, this degradation is not necessarily the case for the liner below the LTU soil, as it has not been exposed to UV rays. The liner was reportedly made of 20 mil oil resistant polyethylene. Overall, the geomembrane liner was observed in good condition. Arcadis inspected a piece of the liner from the area of minor degradation and it was observed to be fully intact. The integrity of the liner at both LTU 1 and LTU 2 does not appear to be compromised and is containing soils as designed.

4.4 Recommendations

Arcadis proposes the following future work at the Resolute Bay LTUs:

- Groundwater monitoring is required as part of the NWB License requirements. No groundwater samples were collected during both the 2015 and 2016 field programs due to frozen well conditions or insufficient water volumes. A groundwater monitoring program should be completed to assess for NWB License requirements and identified chemicals of concern. Attempts should be made to sample the wells in late July or early August 2017 during spring freshet when water levels are presumed to be at their highest. However, spring freshet conditions do vary from year to year due to annual variabilities.
- Consideration should be given for 7 days of field time onsite to provide adequate time for collection of groundwater samples with slow water recharge. Also, thought should be given for submitting all purge water collected for laboratory analysis.
- If deterioration or damage of PVC well risers is observed, installation of protective well casings around all six monitoring wells should be undertaken.
- If sampling groundwater and recovering representative water in the current wells continues to be an issue in 2017, then it is recommended to:
    - Mechanically advance test pits in the vicinity of MW1 through MW6 (perimeter of LTUs) to determine depth of active layer for correlation to the screen depth of monitoring wells. This data will aid in determining if the monitoring wells are screened accurately.
    - Using a downhole camera or similar instrument, attempt to confirm screening depth of monitoring wells and monitoring well screen conditions.

The associated costs with performing groundwater monitoring as required as part of the NWB License requirements is on the order of $33,690 plus GST. Costs associated with potential additional tasks, an active layer investigation (test pitting and downhole camera assessment) and monument installation, are estimated on the order of $2,900 and $3,950 plus GST, respectively. The cost breakdown table is attached in Appendix B.

5 REFERENCES

Arcadis Canada Inc., Environmental Site Assessment, Resolute Bay Airport Land Treatment Units, February 22, 2015.

Canada-Nunavut Geoscience Office and Geological Survey of Canada, Geology of Nunavut Map, 2006.

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Winnipeg Environmental Remediations Inc. and Eng-Tech Consulting Limited, Final Report – Resolute Bay FTA Remedial Work, Resolute Bay, Nunavut, Canada, 2006.

6 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by Arcadis Canada Inc. (Arcadis) for Public Services and Procurement Canada (PSPC). It is intended for the sole and exclusive use of PSPC. Any use, reliance on or decision made by any other person other than PSPC based on this report is the sole responsibility of such other person. PSPC and Arcadis make no representation or warranty to any other person with regard to this report and the work referred to in this report and they accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

This report has been prepared in accordance with generally accepted engineering and environmental practices for the exclusive use of PSPC. This report is based on the historical information provided and information obtained during this work program.

Third party information reviewed and used to compile the data and conclusions contained in this report is assumed to be complete and correct. Arcadis used this information in good faith and will not accept any responsibility for deficiencies, misinterpretation or incompleteness of the information contained in documents prepared by third parties.

The investigation undertaken by Arcadis with respect to this report and any conclusions or recommendations made in this report reflect Arcadis' judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of preparation of this report. This report has been prepared for specific application to the site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken. Notwithstanding these limitations, this report is believed to provide a reasonable representation of activities completed and Site conditions as of August 2016.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

Other than by PSPC, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Arcadis. Nothing in this report is intended to constitute or provide a legal opinion.

FIGURES

Title: Site Location

ARCADIS

Project: Resolute Bay Airport
Land Treatment Units
Resolute Bay, Nunavut

Date: December 2016

Client: PWGSC

Figure 1

TO BE PRINTED IN COLOUR ON 8.5"X11" PAPER ONLY - DO NOT SCALE

updated on: 8-Dec-16 by rfletcher

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Legend

- Monitoring Well (by others)
- Heating Unit
- Tarp
- Not the property of Transport Canada (TC)

Title: Site Plan	
ARCADIS	Project: Resolute Bay Airport Land Treatment Units Resolute Bay, Nunavut
Date: December 2016	Client: PWGSC
	Figure 2

TO BE PRINTED IN COLOUR ON 8.5"x11" PAPER ONLY - DO NOT SCALE

updated on: 8-Dec-16 by rfletcher

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APPENDIX A

Site Photographs

Project Photographs

Resolute Bay LTU's
Resolute Bay, Nunavut

Photo: #1

Date:
August 24, 2016

Description:
Trilingual signage attached to wells.

Location:
MW4

Photo: #2

Date:
August 24, 2016

Description:
View of signage attached to MW1.

Location:
MW1

Project Photographs

Resolute Bay LTU's
Resolute Bay, Nunavut

Photo: #3

Date:
August 24, 2016

Description:
View of LTU1 looking West.

Location:
Resolute Bay LTU

Photo: #4

Date:
August 24, 2016

Description:
View of LTU1 looking North.

Location:
Resolute Bay LTU

Project Photographs

Resolute Bay LTU's
Resolute Bay, Nunavut

Photo: #5

Date:
August 24, 2016

Description:
View of LTU2 looking West.

Location:
Resolute Bay LTU

Photo: #6

Date:
August 24, 2016

Description:
View of LTU2 looking South-east. Tarped area.

Location:
Resolute Bay LTU

Project Photographs

Resolute Bay LTU's
Resolute Bay, Nunavut

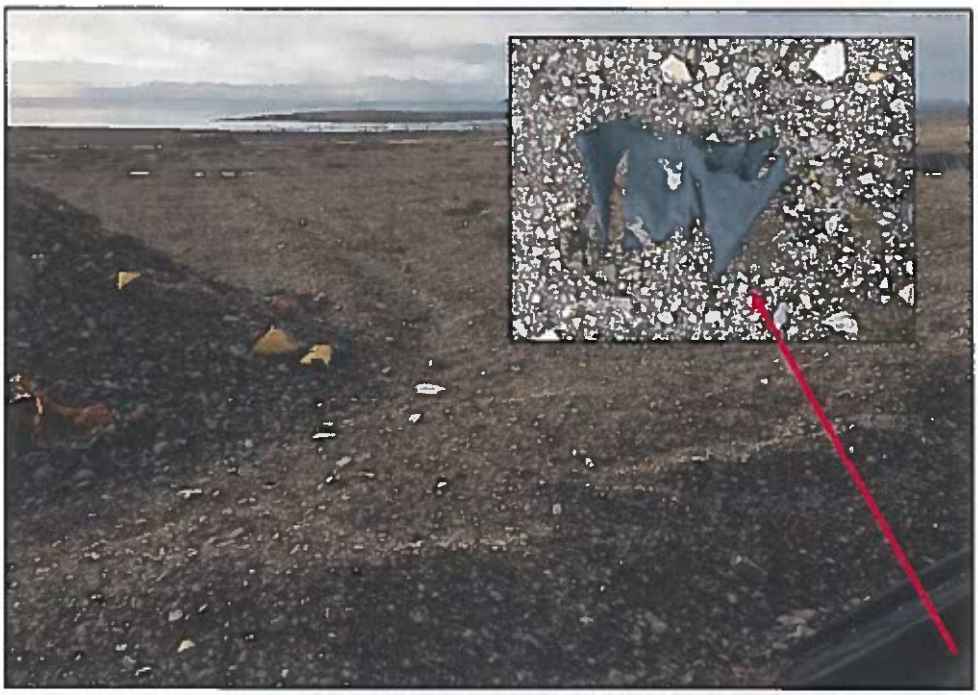

Photo: #7

Date:
August 24, 2016

Description:
View of LTU1-the northeast corner. Minor damage to the liner was observed.

Location:
Resolute Bay LTU

Photo: #8

Date:
August 24, 2016

Description:
The sample obtained and examined for closer inspection from LUT1 northwest corner.

Location:
Resolute Bay LTU

APPENDIX B

Cost Estimate

Project Budget Worksheet

Project Cost Estimate for Further Work in FY2017-18
Site Visit and Monitoring
Resolute Bay Airport LTUs

Category	Rate	Units	Activity 1		Activity 2		Activity 3		Activity 4		Activity 5		Activity 6	
			Project Management / Review of Existing Information		Develop Health and Safety Plan		Develop/ Finalize Sampling Plan and QA/QC		Groundwater Monitoring Program		Interpretation		Reporting	
Professional Fees														
Project Director, Principal	210	hr	4	$840.00		$0.00		$0.00		$0.00	1	$210.00	4	$840.0
Project Manager, Int Prof	120	hr	8	$960.00	1	$120.00	10	$1,200.00		$0.00	4	$480.00	8	$960.0
Junior Professional	90	hr	4	$360.00	4	$360.00	4	$360.00		$0.00	8	$720.00	12	$1,080.0
Junior Technician	50	hr	4	$200.00		$0.00	4	$200.00	70	$3,500.00	28	$1,400.00	32	$1,600.0
Drafting	75	hr		$0.00		$0.00		$0.00		$0.00		$0.00	16	$1,200.0
Administration	25	hr		$0.00		$0.00		$0.00		$0.00	4	$100.00	4	$100.0
	Totals			$2,360.00		$480.00		$1,760.00		$3,500.00		$2,910.00		$5,780.0
Miscellaneous Expenses														
Field Supplies														
Gloves (nitrile)	35	box		$0.00		$0.00		$0.00	1	$35.00		$0.00		$0.0
Decontamination Supplies	5	each		$0.00		$0.00		$0.00	1	$5.00		$0.00		$0.0
Towels	6	roll		$0.00		$0.00		$0.00	1	$6.00		$0.00		$0.0
Field Book	20	each		$0.00		$0.00		$0.00	1	$20.00		$0.00		$0.0
Field Equipment														
DGPS	700	week		$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Shovel	40	week		$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
RKI Eagle	300	week		$0.00		$0.00		$0.00	1	$300.00		$0.00		$0.0
Groundwater Sampling Equipment	350	week		$0.00		$0.00		$0.00	1	$350.00		$0.00		$0.0
Health and Safety Equipment	150	per person		$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Services														
Excavator	2,400	4 hours		$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Monitoring Well Monuments	100	per monument		$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Shipping	475	cooler/box		$0.00		$0.00		$0.00	5	$2,375.00		$0.00		$0.0
	Totals			$0.00		$0.00		$0.00		$3,091.00		$0.00		$0.0
Travel Expenses														
Airplane (Ottawa-Resolute rtn)	7700	return flight		$0.00		$0.00		$0.00	1	$7,700.00		$0.00		$0.0
Rail				$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Rental Motor Vehicle (Truck)	280	day		$0.00		$0.00		$0.00	7	$1,960.00		$0.00		$0.0
Personal Motor Vehicle				$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Taxi (to and from airport in Ottawa)	50	each		$0.00		$0.00		$0.00	2	$100.00		$0.00		$0.0
Other transportation				$0.00		$0.00		$0.00		$0.00		$0.00		$0.0
Accomodations	275	night		$0.00		$0.00		$0.00	7	$1,925.00		$0.00		$0.0
Meals	129.38	day/ person		$0.00		$0.00		$0.00	8	$1,035.04		$0.00		$0.0
Incidentals and other costs	16.48	day/ person		$0.00		$0.00		$0.00	8	$131.84		$0.00		$0.0
	Totals			$0.00		$0.00		$0.00		$12,851.88		$0.00		$0.0
Major Disbursements Mark-up (5%)				$0.00		$0.00		$0.00		$154.55		$0.00		$0.0
	Grand Totals			$2,360.00		$480.00		$1,760.00		$19,597.43		$2,910.00		$5,780.0
Lab Expenses (not included in total)	Rates approximate													

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