November 18, 2015

Inuvialuit Water Board
P.O. Box 2531, 125 Mackenzie Road
Suite 302, Professional Building
Inuvik, NT X0E 0T0

Dear Mardy Semmler,

Project: **BAR-C DEW Line/IOL Tununuk Remediation Project**
Annual Report

Regarding: **Water Use License Number N7L1-1836**

Imperial is providing the following information as per the requirements listed in Part B.2 for Water License Number N7L1-1836. The information was prepared by AECOM Canada Ltd. and WorleyParsons on behalf of Imperial Oil Resources (Imperial).

a) Water Usage from Water Source

No water was sourced from any area of the site during the 2015 construction season.

b) Sewage Accepted by the Town of Inuvik

The monthly and annual quantities in cubic metres (m^3) of sewage accepted by the Town of Inuvik in the 2015 Construction Season is shown on Table 1.

Table 1: Sewage Accepted by the Town of Inuvik

Month	Discharge Location	Volume (m^3)
September, 2015	Inuvik Sewage Lagoon	270
TOTAL for 2015		270

c) Non-Hazardous Waste

Three types of Non-Hazardous Waste (NHW) were removed from site during the 2015 construction season: soil NHW, metal debris, and remaining general debris (wood, foam / insulation, and plastics such as liner material).

Table 2 presents a summary of the monthly and annual quantities for the three types of NHW as well as their intended final disposal locations. All necessary approvals have been provided by the landfills / facilities prior to disposal.

Table 2: Summary of Non-Hazardous Waste Removed From Site During 2015

Month	Non-Hazardous Waste Type	Quantity (m^3)	Intended Final Disposal Location
August 2015	Soil	1,037	Tervita Northern Rockies Landfill
	Metal Debris	1,623	Richmond Steel
	Remaining General Debris	359	Inuvik Landfill
September 2015	Soil	157	Tervita Northern Rockies Landfill
	Metal Debris	50	Richmond Steel
	Remaining General Debris	20	Inuvik Landfill
2015 TOTAL	**Soil**	**1,194**	**Tervita Northern Rockies Landfill**
	Metal Debris	**1,673**	**Richmond Steel**
	Remaining General Debris	**379**	**Inuvik Landfill**

d) Hazardous Waste

Four different types of Hazardous Waste were removed from the site in 2015: batteries (UN 2794), petroleum distillates / products (UN 1268), soil containing leachable lead (UN 2291), and white asbestos (UN 2590).

Table 3 presents a summary of the monthly and annual quantities for the four different types of Hazardous Waste as well as their intended final disposal locations.

Table 3: Summary of Hazardous Waste Removed From Site During 2015

Month	Hazardous Waste Type (UN Identification)	Quantity (m^3)	Intended Final Disposal Location
August 2015	Soil containing leachable lead (UN 2291)	59.0	Swan Hills Treatment Centre
	Petroleum distillates / products (UN 1268)	4.8	Wide Sky Disposal
	Batteries (UN 2794)	1.3	Wide Sky Disposal
September 2015	Soil containing leachable lead (UN 2291)	60.2	Swan Hills Treatment Centre
	Petroleum distillates / products (UN 1268)	1.0	Wide Sky Disposal
	White asbestos (UN 2590)	3.0	Tervita Northern Rockies Landfill
2015 TOTAL	**Soil containing leachable lead (UN 2291)**	**119.2**	**Swan Hills Treatment Centre**
	Petroleum distillates / products (UN 1268)	**5.8**	**Wide Sky Disposal**
	Batteries (UN 2794)	**1.3**	**Wide Sky Disposal**
	White asbestos (UN 2590)	**3.0**	**Tervita Northern Rockies Landfill**

e) Waste Water Discharge

Table 4 presents the coordinates, quantity, and the direction of flow for the discharge of waste water during the 2015 construction season. The water discharged on August 28, 2015 was tested prior to release, met discharge criteria, and was approved for release by the Government of Northwest Territories (GNWT) water inspector.

Table 4: Waste Water Discharge

Area	Date of Discharge	UTMs (Northing/Easting)	Discharge Volume (m^3)	Direction of Discharge
Area F Treatment Cell	28-Aug-15	7655363 / 513108	3	North-northwest

f) Bioremediation Facility Treated Soils

The volumes of soil removed from the bioremediation facility during the 2015 Construction Season and the associated locations of placement are summarized in Table 5.

Table 5: Bioremediation Facility Treated Soils

Plume Source ID	Volume Treated (m^3)	Location of Placement
D1 / D2	47.2	Area F East Depression
D2	40.0	Area F East Depression (below 0.5 m)
D4	67.8	D4
Landfill E	1,333.3	Area F East Depression Area F East Depression (below 0.5 m)
TOTAL	**1,488.3**	**-**

g) Surveillance Network Program Summary

See **Appendix A**, attached.

h) Monitoring Plan Summary

A summary of the data and information generated during the execution of the Monitoring Plan is presented in the following sections.

Baseline Geochemical Monitoring

During previous assessments at BAR-C, baseline soil quality data was collected from all identified landfills (Areas A, B, E, and G) and debris areas (Area F). As such, no additional soil data was collected during the 2015 Construction Season of the project.

As per the Monitoring Plan, new groundwater monitoring wells were installed at Landfill A and Landfill B, with an additional groundwater monitoring well installed within Area J2. The groundwater monitoring well locations are presented in Table 6.

Table 6: 2015 Monitoring Well Installations

Monitoring Well ID	Location	Northing (m)	Easting (m)	Relative Elevation of Top (m)
MW14-1A	Landfill A	7655794.045	512619.892	49.284
MW14-2A	Landfill A	7655856.618	512573.560	46.574
MW14-3A	Landfill A	7655833.583	512537.207	45.713
MW14-4A	Landfill A	7655772.683	512523.008	44.951
MW14-5A	Landfill A	7655738.505	512545.738	44.808
MW14-2B	Landfill B	7655861.900	512754.100	47.850
MW14-3B	Landfill B	7655920.700	512739.600	46.946
MW14-4B	Landfill B	7655899.200	512677.700	48.634
MW15-J2	Area J2	7655544.771	512371.001	26.852

Capping of Landfills A and B was completed during the 2015 construction season. As such, “baseline” groundwater quality samples for the landfills were obtained before demobilizing from site. Table 7 presents the “baseline” groundwater quality data for the samples obtained during the 2015 construction season. Samples were analyzed at Maxxam Analytics in Edmonton - AB.

Table 7: 2015 "Baseline" Groundwater Quality Data

	UNITS	GW-14-1A-E	GW-14-2A-E	GW-14-3A-E	GW-14-4A-E	GW-14-5A-E	GW-14-1B-E	GW-14-1B-DE	GW-14-2B-E	GW-14-3B-E	GW-14-4B-E
Petroleum Hydrocarbons											
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	N/A*	N/A*	<0.10	<0.10	<0.10
Benzene	mg/L	<0.00040	<0.00040	**---****	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Toluene	mg/L	<0.00040	<0.00040	**---****	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Ethylbenzene	mg/L	<0.00040	<0.00040	**---****	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
m & p-Xylene	mg/L	<0.00080	<0.00080	**---****	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
o-Xylene	mg/L	<0.00040	<0.00040	**---****	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040	<0.00040
Xylenes (Total)	mg/L	<0.00080	<0.00080	**---****	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	**---****	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
F1 (C6-C10)	mg/L	<0.10	<0.10	**---****	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Inorganic Parameters											
Hardness (CaCO3)	mg/L	490	1400	1100	1000	1500	N/A*	N/A*	200	1300	1400
Ion Balance	N/A	1.0	1.1	N/A*	1.0	1.1	N/A*	N/A*	1.3	1.1	1.5
Dissolved Nitrate (NO3)	mg/L	6.5	<0.044	N/A*	0.093	0.15	N/A*	N/A*	1.3	<0.044	<0.22
Nitrate plus Nitrite (N)	mg/L	1.5	<0.020	N/A*	0.021	0.050	N/A*	N/A*	0.35	<0.020	<0.020
Dissolved Nitrite (NO2)	mg/L	0.068	0.042	N/A*	<0.033	0.053	N/A*	N/A*	0.18	<0.033	<0.16
Conductivity	uS/cm	1100	3100	N/A*	2200	3000	N/A*	N/A*	470	2800	2000
pH	Standard Units	7.57	7.09	7.76	7.38	7.14	N/A*	N/A*	6.98	6.32	7.21
Total Dissolved Solids	mg/L	740	2000	1500	1500	2200	N/A*	N/A*	740	2100	1500
Total Suspended Solids	mg/L	1800	360	280	140	120	N/A*	N/A*	N/A*	490	240
Alkalinity (PP as CaCO3)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	N/A*	N/A*	<0.50	<0.50	<0.50
Alkalinity (Total as CaCO3)	mg/L	470	600	930	860	770	N/A*	N/A*	180	390	850
Bicarbonate (HCO3)	mg/L	580	730	1100	1100	940	N/A*	N/A*	220	470	1000

	UNITS	GW-14-1A-E	GW-14-2A-E	GW-14-3A-E	GW-14-4A-E	GW-14-5A-E	GW-14-1B-E	GW-14-1B-DE	GW-14-2B-E	GW-14-3B-E	GW-14-4B-E
Carbonate (CO3)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	N/A*	N/A*	<0.50	<0.50	<0.50
Hydroxide (OH)	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	N/A*	N/A*	<0.50	<0.50	<0.50
Dissolved Sulphate (SO4)	mg/L	120	150	69	140	190	N/A*	N/A*	29	3.9	15
Dissolved Chloride (Cl)	mg/L	20	640	200	190	490	N/A*	N/A*	23	690	140
Dissolved Nitrite (N)	mg/L	0.021	0.013	N/A*	<0.010	0.016	N/A*	N/A*	0.055	<0.010	<0.050
Dissolved Nitrate (N)	mg/L	1.5	<0.010	N/A*	0.021	0.033	N/A*	N/A*	0.29	<0.010	<0.050
Organics											
Total PCB	ug/L	0.03	<0.01	N/A*	<0.01	<0.01	N/A*	N/A*	N/A*	<0.01	<0.01
Trace Elements / Metals											
Dissolved Arsenic (As)	mg/L	0.00067	0.0019	N/A*	0.0013	0.0033	N/A*	N/A*	0.0079	0.0031	0.0070
Total Arsenic (As)	mg/L	0.022	0.0066	N/A*	0.0081	0.0062	N/A*	N/A*	N/A*	0.014	0.015
Dissolved Barium (Ba)	mg/L	0.13	0.46	N/A*	0.12	0.41	N/A*	N/A*	0.17	0.82	0.55
Total Barium (Ba)	mg/L	0.85	0.62	N/A*	0.28	0.53	N/A*	N/A*	N/A*	1.1	0.75
Dissolved Cadmium (Cd)	mg/L	0.000040	0.000049	N/A*	0.00014	0.00020	N/A*	N/A*	0.000084	0.00028	0.000038
Total Cadmium (Cd)	mg/L	0.00094	0.00018	N/A*	0.00046	0.00040	N/A*	N/A*	N/A*	0.00086	0.00041
Dissolved Calcium (Ca)	mg/L	130	320	250***	240	370	N/A*	N/A*	52	320	330
Dissolved Chromium (Cr)	mg/L	<0.0010	<0.0010	N/A*	<0.0010	0.0010	N/A*	N/A*	0.0028	0.0012	<0.0010
Total Chromium (Cr)	mg/L	0.039	0.0055	N/A*	0.011	0.0034	N/A*	N/A*	N/A*	0.021	0.011
Dissolved Cobalt (Co)	mg/L	0.0016	0.034	N/A*	0.0050	0.021	N/A*	N/A*	0.0083	0.037	0.017
Total Cobalt (Co)	mg/L	0.023	0.043	N/A*	0.012	0.025	N/A*	N/A*	N/A*	0.056	0.020
Dissolved Copper (Cu)	mg/L	0.0036	0.0011	N/A*	0.0047	0.013	N/A*	N/A*	0.0048	0.0091	0.0027
Total Copper (Cu)	mg/L	0.051	0.0062	N/A*	0.016	0.028	N/A*	N/A*	N/A*	0.037	0.016
Dissolved Iron (Fe)	mg/L	0.14	48	<0.060***	0.42	15	N/A*	N/A*	11	8.3	3.3
Dissolved Lead (Pb)	mg/L	<0.00020	<0.00020	N/A*	0.00050	0.00048	N/A*	N/A*	0.00070	0.00025	0.00032

	UNITS	GW-14-1A-E	GW-14-2A-E	GW-14-3A-E	GW-14-4A-E	GW-14-5A-E	GW-14-1B-E	GW-14-1B-DE	GW-14-2B-E	GW-14-3B-E	GW-14-4B-E
Total Lead (Pb)	mg/L	0.032	0.0032	N/A*	0.0070	0.0029	N/A*	N/A*	N/A*	0.011	0.0085
Dissolved Magnesium (Mg)	mg/L	43	140	100***	110	130	N/A*	N/A*	17	130	140
Dissolved Manganese (Mn)	mg/L	1.2	7.1	6.9***	2.9	5.1	N/A*	N/A*	0.80	8.7	16
Dissolved Nickel (Ni)	mg/L	0.0058	0.014	N/A*	0.011	0.021	N/A*	N/A*	0.018	0.032	0.014
Total Nickel (Ni)	mg/L	0.062	0.023	N/A*	0.028	0.027	N/A*	N/A*	N/A*	0.066	0.028
Dissolved Potassium (K)	mg/L	8.5	3.2	9.5***	64	8.8	N/A*	N/A*	1.6	3.0	9.0
Dissolved Sodium (Na)	mg/L	66	130	120***	77	120	N/A*	N/A*	40	86	67
Dissolved Zinc (Zn)	mg/L	0.0046	0.012	N/A*	0.0077	0.0099	N/A*	N/A*	0.015	0.028	0.012
Total Zinc (Zn)	mg/L	0.18	0.027	N/A*	0.052	0.017	N/A*	N/A*	N/A*	0.10	0.055
Low Level Elements											
Dissolved Mercury (Hg)	mg/L	<0.0000050	<0.0000050	N/A*	0.0000080	<0.0000050	N/A*	N/A*	N/A*	0.000018	0.0000091
Total Mercury (Hg)	mg/L	0.00023	<0.000050	N/A*	0.000050	0.000062	N/A*	N/A*	<0.0000050***	0.000075	0.00017

* Insufficient water for sample collection.

** BTEX sample misplaced by laboratory.

*** Laboratory filtered results.

Natural Environment Monitoring

Natural Environment data collected during the 2015 construction season is summarized as follows:

Wildlife Sightings

Wildlife sightings recorded during the 2015 construction season are summarized in Table 8.

Table 8: 2015 Wildlife Sightings

Date	Wildlife sighted
August 21	Fowl (non-specified)
August 28	Bear (across the river from site)
August 29	Bear (in vicinity of site), Fox

Re-vegetation of Disturbed Areas

Grass seed was spread over the top of Landfill A and Landfill B and then covered with erosion matting to promote vegetative growth. Grass seed was also spread over Area J2 with previously salvaged alder branches scattered over top to encourage vegetation to develop.

Use of Site by People for Traditional Activities

There were no observations of people using the Site for traditional activities during the 2015 construction season.

Monitoring During Remediation

As per the NWT Water Board License, required monitoring during remediation has been detailed in the other items of this report.

Post-Construction Monitoring

As per the Monitoring Plan, new thermistors were installed at Landfill B (in addition to the four installed last year), at Landfill A, and within Area J as part of a thermal monitoring system. The locations of thermistors installed during the 2015 construction season are presented in Table 9.

Table 9: 2014 Thermistor Installations

Thermistor ID	Location	Northing (m)	Easting (m)	Relative Elevation of Top (m)
T1-A	Landfill A	7655834.070	512594.978	49.568
T2-A	Landfill A	7655787.833	512535.192	49.546
T3-A	Landfill A	7655763.138	512607.074	49.980
T4-A	Landfill A	7655782.228	512590.588	52.616
T5-A	Landfill A	7655785.723	512545.047	50.520
T2-B	Landfill B	7655848.543	512691.579	50.977
T4-B	Landfill B	7655896.344	512696.606	50.859
T1-J	Area J2	7655551.920	512367.448	28.362

As remediation activities were recently completed or on-going during the 2015 construction season, no post-construction monitoring data is yet available.

i) Reclamation Activity Summary

The reclamation activities completed at site during the 2015 construction season are presented below in Table 10.

Table 10: 2014 Reclamation Activities

Items	Comments
Plume A7	Plume A7 was re-excavated to complete confirmatory sampling on August 16, 2015. The soil in Plume A7 was backfilled and compacted on August 20, 2015.
Plume D4	Plume D4 was further excavated to complete the work remaining from 2014. Confirmatory sampling was conducted on August 17, 2015. Plume D4 was backfilled and compacted on August 25, 2015.
Landfill E – Remaining Contaminated Soil Excavation	The remaining contaminated soil in Landfill E was excavated to complete the work remaining from 2014. Confirmatory sampling was conducted on August 12, 2015. Soil was backfilled and compacted in the Landfill E excavation on August 26, 2015.
Plume F1	Plume F1 was further excavated to complete the work remaining from 2014. Confirmatory sampling was conducted on August 12, 2015. Soil was backfilled and compacted in Plume F1 on August 26, 2015.
Plume G1	A limited source removal excavation occurred at G1 on August 16, 2015. Soil was backfilled and compacted in Plume G1 on August 16, 2015.
Plume G2	An attempt to excavate Plume G2 was conducted on August 16, 2015; however, refusal was encountered due to debris near the surface.
Plume J3	PHC impacted soil was removed on August 28, 2015. The excavation was then backfilled and compacted on August 30, 2015.
Airstrip	The reclamation of the Airstrip was completed on August 30, 2015.
North Borrow Pit Area F	The reclamation of the North Borrow Pit Area F was completed on August 23, 2015
Laydown / Camp Area F	The reclamation of the Laydown / Camp Area F was completed on August 29, 2015
PHC Treatment Cell	The reclamation of the PHC Treatment Cell was completed on August 29, 2015

j) Modifications to the Reclamation Project

No modifications were made to the Reclamation Project in 2015.

Further to the maintenance work required on the barge dock walls during the 2014 construction season, additional maintenance work on the dock took place from April 4 to 20, 2015. Inuvialuit Land Administration (ILA) was notified of this additional maintenance work.

k) Studies

No studies were required by the Water Board and no future studies are expected.

l) Plan Updates

i) Waste Management Plan

No updates or revisions were made to this plan.

ii) Spill Contingency Plan

No updated or revisions were made to this plan.

iii) Quality Assurance/Quality Control Plan

No updated or revisions were made to this plan.

iv) Monitoring Plan

No updates or revisions were made to this plan.

Locations of the thermistor and monitoring well networks will be provided to the Inuvialuit Water Board as part of the Engineered Landfill Cap as-built drawings due 90 days after the end of the 2015 construction season. The final day of the 2015 construction season was September 3, 2015.

v) Remedial Action Plan

No updates or revisions were made to this plan.

m) Discharges and Spills

No discharge or spills greater than or equal to the amount listed in the GNWT Spill Contingency Planning and Reporting Regulations, and exceeding discharge criteria, occurred on-site. This is also in accordance with the "Spill Contingency Plan" previously submitted to the IWB in April, 2014.

There was one event, on August 15, where approximately 1,250 litres (L) of water from the PHC Treatment Cell flowed through a puncture in the liner. The IWB and the GNWT were notified as per the process. Soil underneath the liner was sampled, and results were below the site remediation criteria.

n) Spill Training

Training on spill mitigation and clean up procedures was provided to all on-site staff during the project kick-off meeting or during site orientation.

We trust the information provided is sufficient. Please feel free to contact the undersigned if you have any questions or comments.

Sincerely,

Ramy Rahbani
Project Manager
Tel: (587) 476-4262
ramy.rahbani@esso.ca

Appendix A – Surveillance Network Program (SNP) Summary

AECOM

Water License – 2015 Year End Summary

GENERAL INFORMATION
Project: BAR-C Tununuk Point Remediation
Water License Number: N7L1 – 1836
Reporting Period: 2015 Year End Summary

Monthly Report:

- Monitoring locations were established on July 26th, 2014 as noted below:

Northing	Easting	Sample Monitoring Name
7655755.548	513199.799	SNP 1836-2
7655248.066	513168.383	SNP 1836-3
7654732.334	513147.286	SNP 1836-4
7654497.321	513027.588	SNP 1836-5
7655259.511	513011.809	SNP 1836-1

- Photos of the areas being tested are also included.

SNP Monthly Discharge Recordings:	This Period: approximately 3 m^3	2015 Project to Date: 3 m^3

Additional Comments

The 2015 field season commenced on August 2, 2015. A sample was collected from SNP 1836-1 on August 24, 2015, sample number SW-TC-02-E, with results received August 27, 2015. The water met all discharge criteria and approval to discharge was granted by Philippe Thibert-Leduc (GNWT Inspector) on August 28, 2015. The water was subsequently discharged on August 28, 2015 after permission to discharge was received. Construction activities concluded on August 30, therefore monitoring was not conducted after this month.

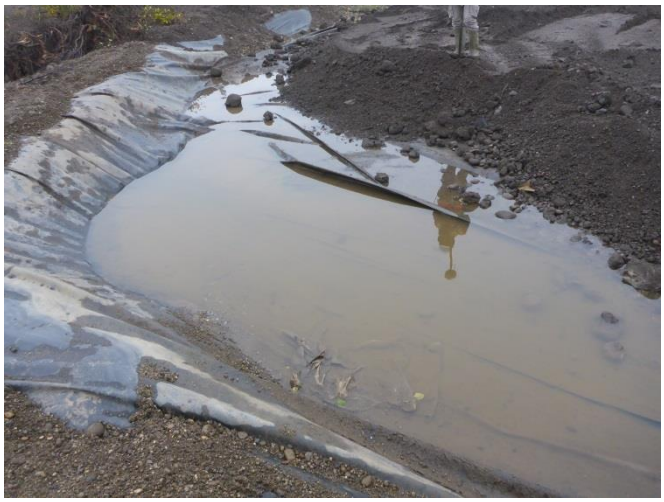
AECOM

Water License – 2015 Year End Summary

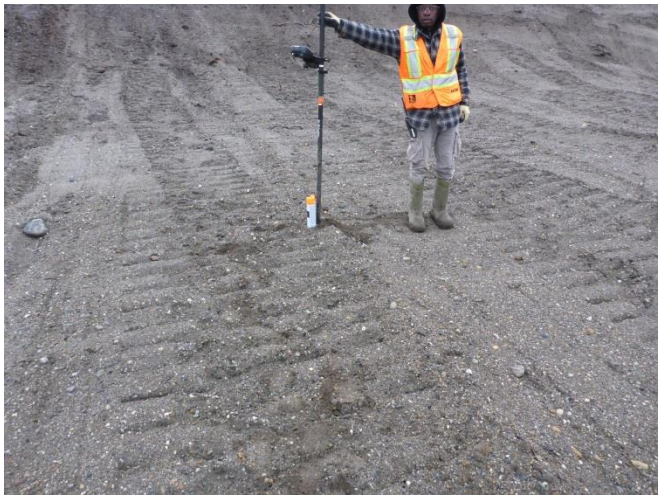
GENERAL INFORMATION
Project: BAR-C Tununuk Point Remediation
Water License Number: N7L1 – 1836
Reporting Period: 2015 Year End Summary

Photos:

SNP 1836-1
Water from the corner of the treatment cell prior to discharge.

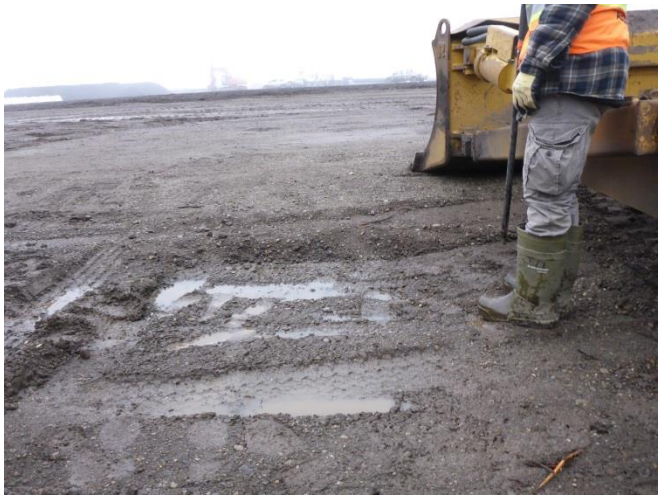


SNP 1836-2
Area has been re-graded and the SNP monitoring location is not remaining.



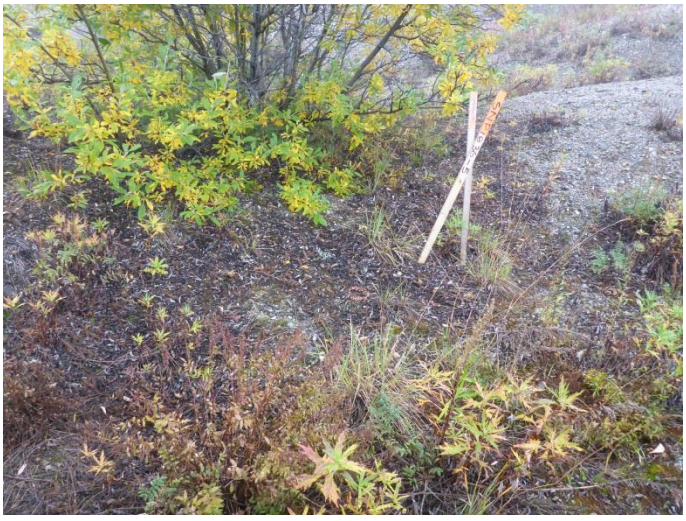
Water License – 2015 Year End Summary

SNP 1836-3
Area has been re-graded and the SNP monitoring location is not remaining.



SNP 1836-4

SNP 1836-5



AECOM

Water License – 2015 Year End Summary

GENERAL INFORMATION
Project: BAR-C Tununuk Point Remediation
Water License Number: N7L1 – 1836
Reporting Period: 2015 Year End Summary

Weather Statistics			
Date	Temp (^{o}C)		Precip. (mm)
	High	Low	
08/01/2015	16	11	4.06
08/02/2015	17	2	0.25
08/03/2015	18	8	0
08/04/2015	15	7	1.02
08/05/2015	14	7	0.51
08/06/2015	6	3	7.11
08/07/2015	13	0	0.25
08/08/2015	19	6	0
08/09/2015	24	12	0
08/10/2015	23	8	0
08/11/2015	7	5	7.11
08/12/2015	9	4	0
08/13/2015	16	6	0
08/14/2015	16	9	0.25
08/15/2015	14	10	0.51
08/16/2015	9	5	0.25
08/17/2015	8	3	2.03
08/18/2015	9	5	0.25
08/19/2015	8	2	0.25
08/20/2015	9	4	0
08/21/2015	16	5	0
08/22/2015	17	8	0
08/23/2015	15	4	0
08/24/2015	11	8	0
08/25/2015	17	2	0
08/26/2015	19	11	0.51
08/27/2015	11	3	3.05
08/28/2015	7	2	0.51
08/29/2015	7	1	1.02
08/30/2015	6	2	7.11