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Petroleum Products Division,
Department of Community & Government Services,
Government of Nunavut

Amendment to Rankin Inlet Landfarm, Supplement Information Guideline, Operation and Maintenance Plan – Existing Licence # 1BR-RAN2131

Date of Application – March 07, 2022

Name and mailing address of Applicant - Petroleum Products Division,
Department of Community and Government Services,
Government of Nunavut, PO Box 590, Rankin Inlet, NU X0C 0G0

Contact Information including phone number(s) and email address –

Sulaimon Ayilara,
Environmental Services Specialist,
Petroleum Products Division
Phone – 18676458444
Email – sayilara@gov.nu.ca

or

Ayo Ogunkoya,
Manager, Technical & Environmental Services,
Petroleum Products Division
Phone – 18676458433
Email – aogunkoya@gov.nu.ca

Name of Facility operator – PPD Rankin, NU

Number of years requesting for water license – Five (5) years

Existing Location GPS - (Lat/Long) 62º 49' 49.66" N, 92º 10' 28.15" W, (UTM) Easting 542,055.88, Northing 6,966,969.53.

New Expansion Location GPS - (Lat/Long) 62°49’52.0”N , 93°49’36.3”W

Table of Contents **Page**

1. INTRODUCTION

The community of Rankin Inlet is located within the Kivalliq Region, Nunavut, on the west coast of Hudson Bay. The community is in a zone of continuous permafrost, which has an active layer of approximately one metre. The Rankin Inlet Fuel Facility is being upgraded. As part of the upgrade, approximately 5,000 cubic metres of hydrocarbon-contaminated soils must be removed from the site and remediated.
Contaminated soils are remediated in a lined engineered landfarm.
The existing landfarm is located adjacent to the new Rankin Inlet Municipal Solid Waste Site. It will be accessed from the same road. The Government of Nunavut in consultation with the Hamlet of Rankin Inlet selected the site.

In 2021, the landfarm experienced large deposit of impacted soil from both PPD spill and other agencies in the community. This implied PPD for an expansion to the existing landfarm which is proposed to construct in May 2022.

1.1 DETAILED DESCRIPTION OF FACILITY

The existing site for the landfarm is in (Lat/Long) 62º 49' 49.66" N, 92º 10' 28.15" W, (UTM), Easting 542,055.88, Northing 6,966,969.53. (Map sheet number 55K16) near the Hamlet of Rankin Inlet's municipal solid waste site. The landfarm is designed to hold 6450 CU.M. of contaminated soil.

New Expansion Location GPS – Approximately (Lat/Long) 62°49’52.0” N, 93°49’36.3” W will be designed to hold **7000 CU.M** of contaminated soil which will be screen and remediated inside the landfarm.

1.2 OPERATION AND MAINTENANCE PLAN

- ✓ Soil is always deposited no deeper than 1 meter.
- ✓ When depositing contaminated soil trucks do not drive over existing contaminated soil as to not track contaminates out of the berm.
- ✓ When equipment leaves the landfarm care should be taken not to track excess material out of the berm.
- ✓ Contaminated soils are turned once a month during snow free seasons. Care is always taken not to rip the liner as this could cause contaminate leakage.
- ✓ No effluent discharge of contaminated material is permitted. Contaminated liquid collected within the treatment area will be dispersed within the containment area over the contaminated soil.
- ✓ Only Type B contaminates shall are stored within the landfarm. No Heavy Metals, glycols and or heavy oils is be placed in the landfarm.

1.3 RUNOFF MANAGEMENT

Our landfarm was always designed to manage runoff and eliminate surface and subsurface contamination. Surface water that appears outside the containment area are being routed around the berms and will have no chance to penetrate the contaminated soils. Water outside the landfarm is not in contact with contaminated soils thus will have no chance to effect Iqalugaarjuup Nunanga or the two small located southwest of the landfarm.
Water that collects inside the containment area have no chance to contaminate local groundwater sources because of the berm and the 60 mil HDPE textured impervious membrane installed.

The landfarm will be expanded in an area where evaporation exceeds precipitation. Any water that does collect in the sump is not discharged but rather pumped back over the contaminated soil to maximize remediation and evaporation.

Water monitoring wells have been designed into landfarm plan. These wells monitored to ensure no contamination of the local groundwater.

1.4 SPILL CONTIGENCY PLAN/MITIGATION MEASURES TO PREVENT SEEPAGE

Our landform was designed to prevent seepage and same will be for the new expansion. The berm was 2 to 1 slope and is lined with an impervious HDPE 60 mil textured membrane. On either side of the liner will be 80mm lift of sand.
This will accomplish two objectives.

- Protect the liner from contacting the native ground that could have sharp edges, which in turn could cause wear and tearing of the liner.
- Protect the equipment from contacting the liner. Over the lift of sand will be a geo-textile membrane with further gravel on top of that. This layer system will ensure containment of the contaminates.

Water monitoring wells have been designed into landfarm plan. These wells will be monitored to ensure no contamination of the local groundwater.
Spill Contingency Plan identifies lines of authority and responsibility, established proper reporting and communication procedures and described an action plan to be implemented in the event of a spill. All the information necessary to effectively control and clean up a spill.
Action Plan

- Potential spill sizes and sources for each hazardous material on site.
- Potential environmental impacts of spill (include worst case scenario)
- Procedures (include alternative action in case of impeding environmental conditions):

  A. Procedures for initial actions

  B. Spill reporting procedures

  C. Procedures for containing and controlling the spill e.g., on land, water, snow, ice using Spill kits, Spill absorbent, booms and earth moving equipment to contain spill.

  D. Procedures for transferring, storing, and managing spill-related wastes.

  E. Procedures for restoring affected areas.

1.5 ANNUAL WATER/SOIL QUALITY REMEDIATION OBJECTIVES

The objective of our sample procedure (AS ATTACHED) is to obtain commercial levels of petroleum hydrocarbons in water/soil as a minimum. Based on the GN and CCME Guidelines as applicable below -

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Certificate of Analysis

Nunatta Environmental Services Inc.

P.O. Box 267
Iqaluit, NU X0A 0H0
Attn: Jim Wilson

Client PO: 21-47 Rankin Landfarm
Project: Rankin Landfarm
Custody:

Report Date: 5-Oct-2021
Order Date: 29-Sep-2021

Order #: 2140411

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2140411-01	Berm Water Landfarm
2140411-02	Berm Water Landfarm

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	30-Sep-21	30-Sep-21
Ammonia, as N	EPA 351.2 - Auto Colour	30-Sep-21	1-Oct-21
Anions	EPA 300.1 - IC	30-Sep-21	30-Sep-21
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	30-Sep-21	1-Oct-21
Conductivity	EPA 9050A- probe @25 °C	30-Sep-21	30-Sep-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	30-Sep-21	30-Sep-21
Oil & Grease, mineral/synthetic	SM5520F - Gravimetric	29-Sep-21	4-Oct-21
Oil & Grease, total	SM5520B - Gravimetric, hexane soluble	29-Sep-21	4-Oct-21
PAHs by GC-MS	EPA 625 - GC-MS, extraction	4-Oct-21	5-Oct-21
pH	EPA 150.1 - pH probe @25 °C	30-Sep-21	30-Sep-21
PHC F1	CWS Tier 1 - P&T GC-FID	30-Sep-21	1-Oct-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	4-Oct-21	5-Oct-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	1-Oct-21	4-Oct-21
Total Suspended Solids	SM 2540D - Gravimetric	30-Sep-21	30-Sep-21

PARACEL LABORATORIES LTD.

Order #: 2140411

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

	Client ID:	Berm Water Landfarm	Berm Water Landfarm	-	-
	Sample Date:	26-Sep-21 13:00	24-Sep-21 15:30	-	-
	Sample ID:	2140411-01	2140411-02	-	-
	MDL/Units	Water	Water	-	-
General Inorganics					
Alkalinity, total	5 mg/L	-	115	-	-
Ammonia as N	0.01 mg/L	-	0.06	-	-
Conductivity	5 uS/cm	-	376	-	-
pH	0.1 pH Units	-	8.0	-	-
Phenolics	0.001 mg/L	-	<0.001	-	-
Total Suspended Solids	2 mg/L	-	16	-	-
Anions					
Chloride	1 mg/L	-	33	-	-
Nitrate as N	0.1 mg/L	-	0.4	-	-
Nitrite as N	0.05 mg/L	-	<0.05	-	-
Sulphate	1 mg/L	-	15	-	-
Metals					
Aluminum	1 ug/L	-	377	-	-
Antimony	0.5 ug/L	-	<0.5	-	-
Arsenic	1 ug/L	-	4	-	-
Barium	1 ug/L	-	50	-	-
Beryllium	0.5 ug/L	-	<0.5	-	-
Boron	10 ug/L	-	16	-	-
Cadmium	0.1 ug/L	-	<0.1	-	-
Calcium	100 ug/L	-	40900	-	-
Chromium	1 ug/L	-	3	-	-
Cobalt	0.5 ug/L	-	1.2	-	-
Copper	0.5 ug/L	-	12.6	-	-
Iron	100 ug/L	-	838	-	-
Lead	0.1 ug/L	-	0.8	-	-
Magnesium	200 ug/L	-	7000	-	-
Manganese	5 ug/L	-	22	-	-
Molybdenum	0.5 ug/L	-	2.2	-	-
Nickel	1 ug/L	-	9	-	-
Potassium	100 ug/L	-	10200	-	-
Selenium	1 ug/L	-	<1	-	-
Silver	0.1 ug/L	-	0.1	-	-
Sodium	200 ug/L	-	16300	-	-
Strontium	10 ug/L	-	343	-	-

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
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Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

	Client ID:	Berm Water Landfarm	Berm Water Landfarm	-	-
	Sample Date:	26-Sep-21 13:00	24-Sep-21 15:30	-	-
	Sample ID:	2140411-01	2140411-02	-	-
	MDL/Units	Water	Water	-	-
Thallium	0.1 ug/L	-	<0.1	-	-
Tin	5 ug/L	-	<5	-	-
Titanium	5 ug/L	-	19	-	-
Tungsten	10 ug/L	-	<10	-	-
Uranium	0.1 ug/L	-	1.2	-	-
Vanadium	0.5 ug/L	-	2.1	-	-
Zinc	5 ug/L	-	18	-	-
Volatiles					
Benzene	0.0005 mg/L	-	<0.0005	-	-
Ethylbenzene	0.0005 mg/L	-	<0.0005	-	-
Toluene	0.0005 mg/L	-	<0.0005	-	-
m,p-Xylenes	0.0005 mg/L	-	<0.0005	-	-
o-Xylene	0.0005 mg/L	-	<0.0005	-	-
Xylenes, total	0.0005 mg/L	-	<0.0005	-	-
Toluene-d8	Surrogate	-	87.7%	-	-
Hydrocarbons					
Oil & Grease, animal/vegetable	0.500 mg/L	<0.500	-	-	-
Oil & Grease, mineral/synthetic	0.5 mg/L	<0.5	-	-	-
Oil & Grease, total	0.5 mg/L	<0.5	-	-	-
F1 PHCs (C6-C10)	0.025 mg/L	-	<0.025	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	-	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	-	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	-	-	-
Semi-Volatiles					
Acenaphthene	0.05 ug/L	<0.05	-	-	-
Acenaphthylene	0.05 ug/L	<0.05	-	-	-
Acridine	0.10 ug/L	<0.10	-	-	-
Anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] anthracene	0.01 ug/L	<0.01	-	-	-
Benzo [a] pyrene	0.01 ug/L	<0.01	-	-	-
Benzo [b] fluoranthene	0.05 ug/L	<0.05	-	-	-
Benzo [g,h,i] perylene	0.05 ug/L	<0.05	-	-	-
Benzo [k] fluoranthene	0.05 ug/L	<0.05	-	-	-
Biphenyl	0.05 ug/L	<0.05	-	-	-
Chrysene	0.05 ug/L	<0.05	-	-	-

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

	Client ID:	Berm Water Landfarm	Berm Water Landfarm	-	-
	Sample Date:	26-Sep-21 13:00	24-Sep-21 15:30	-	-
	Sample ID:	2140411-01	2140411-02	-	-
	MDL/Units	Water	Water	-	-
Dibenzo [a,h] anthracene	0.05 ug/L	<0.05	-	-	-
Fluoranthene	0.01 ug/L	<0.01	-	-	-
Fluorene	0.05 ug/L	<0.05	-	-	-
Indeno [1,2,3-cd] pyrene	0.05 ug/L	<0.05	-	-	-
1-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
2-Methylnaphthalene	0.05 ug/L	<0.05	-	-	-
Methylnaphthalene (1&2)	0.10 ug/L	<0.10	-	-	-
Naphthalene	0.05 ug/L	<0.05	-	-	-
Phenanthrene	0.05 ug/L	<0.05	-	-	-
Pyrene	0.01 ug/L	<0.01	-	-	-
Quinoline	0.10 ug/L	<0.10	-	-	-
2-Fluorobiphenyl	Surrogate	85.3%	-	-	-
Terphenyl-d14	Surrogate	97.7%	-	-	-

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Suspended Solids	ND	2	mg/L						
Hydrocarbons									
Oil & Grease, mineral/synthetic	ND	0.5	mg/L						
Oil & Grease, total	ND	0.5	mg/L						
F1 PHCs (C6-C10)	ND	0.025	mg/L						
Metals									
Aluminum	ND	1	ug/L						
Antimony	ND	0.5	ug/L						
Arsenic	ND	1	ug/L						
Barium	ND	1	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10	ug/L						
Cadmium	ND	0.1	ug/L						
Calcium	ND	100	ug/L						
Chromium	ND	1	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Iron	ND	100	ug/L						
Lead	ND	0.1	ug/L						
Magnesium	ND	200	ug/L						
Manganese	ND	5	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1	ug/L						
Potassium	ND	100	ug/L						
Selenium	ND	1	ug/L						
Silver	ND	0.1	ug/L						
Sodium	ND	200	ug/L						
Strontium	ND	10	ug/L						
Thallium	ND	0.1	ug/L						
Tin	ND	5	ug/L						
Titanium	ND	5	ug/L						
Tungsten	ND	10	ug/L						
Uranium	ND	0.1	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5	ug/L						
Semi-Volatiles									
Acenaphthene	ND	0.05	ug/L						
Acenaphthylene	ND	0.05	ug/L						
Acridine	ND	0.10	ug/L						
Anthracene	ND	0.01	ug/L						
Benzo [a] anthracene	ND	0.01	ug/L						
Benzo [a] pyrene	ND	0.01	ug/L						
Benzo [b] fluoranthene	ND	0.05	ug/L						
Benzo [g,h,i] perylene	ND	0.05	ug/L						
Benzo [k] fluoranthene	ND	0.05	ug/L						
Biphenyl	ND	0.05	ug/L						
Chrysene	ND	0.05	ug/L						
Dibenzo [a,h] anthracene	ND	0.05	ug/L						

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Fluoranthene	ND	0.01	ug/L						
Fluorene	ND	0.05	ug/L						
Indeno [1,2,3-cd] pyrene	ND	0.05	ug/L						
1-Methylnaphthalene	ND	0.05	ug/L						
2-Methylnaphthalene	ND	0.05	ug/L						
Methylnaphthalene (1&2)	ND	0.10	ug/L						
Naphthalene	ND	0.05	ug/L						
Phenanthrene	ND	0.05	ug/L						
Pyrene	ND	0.01	ug/L						
Quinoline	ND	0.10	ug/L						
Surrogate: 2-Fluorobiphenyl	*17.1*		*ug/L*		*85.6*	*50-140*			
Surrogate: Terphenyl-d14	*23.7*		*ug/L*		*118*	*50-140*			
Volatiles									
Benzene	ND	0.0005	mg/L						
Ethylbenzene	ND	0.0005	mg/L						
Toluene	ND	0.0005	mg/L						
m,p-Xylenes	ND	0.0005	mg/L						
o-Xylene	ND	0.0005	mg/L						
Xylenes, total	ND	0.0005	mg/L						
Surrogate: Toluene-d8	*0.0731*		*mg/L*		*91.3*	*50-140*			

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L	ND			NC	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	ND	1	mg/L	1.70			NC	10	
General Inorganics									
Alkalinity, total	895	5	mg/L	907			1.4	14	
Ammonia as N	0.058	0.01	mg/L	0.059			2.1	18	
Conductivity	3120	5	uS/cm	3140			0.6	5	
pH	7.0	0.1	pH Units	7.1			0.6	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Suspended Solids	5.0	2	mg/L	5.0			0.0	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.025	mg/L	ND			NC	30	
Metals									
Aluminum	1090	1	ug/L	1220			11.4	20	
Antimony	1.22	0.5	ug/L	0.85			NC	20	
Arsenic	ND	1	ug/L	ND			NC	20	
Barium	32.0	1	ug/L	32.8			2.6	20	
Beryllium	ND	0.5	ug/L	ND			NC	20	
Boron	ND	10	ug/L	ND			NC	20	
Cadmium	ND	0.1	ug/L	ND			NC	20	
Calcium	24100	100	ug/L	24900			3.3	20	
Chromium	2.1	1	ug/L	2.3			9.7	20	
Cobalt	2.07	0.5	ug/L	2.21			6.2	20	
Copper	5.38	0.5	ug/L	5.73			6.2	20	
Iron	1650	100	ug/L	1780			7.7	20	
Lead	1.10	0.1	ug/L	1.18			7.2	20	
Magnesium	2530	200	ug/L	2660			5.2	20	
Manganese	46.2	5	ug/L	47.8			3.5	20	
Molybdenum	0.57	0.5	ug/L	0.57			0.6	20	
Nickel	2.7	1	ug/L	3.0			11.2	20	
Potassium	1220	100	ug/L	1260			2.8	20	
Selenium	ND	1	ug/L	ND			NC	20	
Silver	ND	0.1	ug/L	1.39			NC	20	
Sodium	11200	200	ug/L	11400			2.1	20	
Strontium	216	10	ug/L	226			4.5	20	
Thallium	ND	0.1	ug/L	ND			NC	20	
Tin	ND	5	ug/L	ND			NC	20	
Titanium	72.8	5	ug/L	78.5			7.6	20	
Tungsten	ND	10	ug/L	ND			NC	20	
Uranium	0.1	0.1	ug/L	0.1			7.1	20	
Vanadium	2.83	0.5	ug/L	3.06			7.9	20	
Zinc	9	5	ug/L	8			7.0	20	
Volatiles									
Benzene	ND	0.0005	mg/L	ND			NC	30	
Ethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Toluene	ND	0.0005	mg/L	ND			NC	30	
m,p-Xylenes	ND	0.0005	mg/L	ND			NC	30	
o-Xylene	ND	0.0005	mg/L	ND			NC	30	
Surrogate: Toluene-d8	*0.0607*		*mg/L*		*87.1*	*50-140*			

Certificate of Analysis
Client: Nunatta Environmental Services Inc.
Client PO: 21-47 Rankin Landfarm

Report Date: 05-Oct-2021
Order Date: 29-Sep-2021
Project Description: Rankin Landfarm

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.76	1	mg/L	ND	97.6	85-115			
Nitrate as N	1.02	0.1	mg/L	ND	102	79-120			
Nitrite as N	1.02	0.05	mg/L	ND	102	84-117			
Sulphate	10.4	1	mg/L	1.70	87.0	74-126			
General Inorganics									
Ammonia as N	0.297	0.01	mg/L	0.059	95.2	81-124			
Phenolics	0.024	0.001	mg/L	ND	95.0	69-132			
Total Suspended Solids	22.0	2	mg/L	ND	110	75-125			
Hydrocarbons									
Oil & Grease, mineral/synthetic	7.80	0.5	mg/L	ND	78.0	65-110			
Oil & Grease, total	19.8	0.5	mg/L	ND	98.8	65-110			
F1 PHCs (C6-C10)	1.81	0.025	mg/L	ND	90.4	68-117			
Metals									
Aluminum	67.9	1	ug/L	25.3	85.3	80-120			
Antimony	45.6	0.5	ug/L	0.85	89.4	80-120			
Arsenic	43.5	1	ug/L	ND	85.8	80-120			
Barium	80.5	1	ug/L	32.8	95.4	80-120			
Beryllium	39.8	0.5	ug/L	ND	79.5	80-120			QM-07
Boron	47	10	ug/L	ND	76.4	80-120			QM-07
Cadmium	40.9	0.1	ug/L	ND	81.8	80-120			
Calcium	32900	100	ug/L	24900	80.1	80-120			
Chromium	53.2	1	ug/L	2.3	102	80-120			
Cobalt	52.7	0.5	ug/L	2.21	101	80-120			
Copper	52.0	0.5	ug/L	5.73	92.5	80-120			
Iron	3950	100	ug/L	1780	86.7	80-120			
Lead	45.0	0.1	ug/L	1.18	87.6	80-120			
Magnesium	11500	200	ug/L	2660	88.7	80-120			
Manganese	96.0	5	ug/L	47.8	96.5	80-120			
Molybdenum	48.3	0.5	ug/L	0.57	95.5	80-120			
Nickel	51.0	1	ug/L	3.0	96.0	80-120			
Potassium	10500	100	ug/L	1260	92.2	80-120			
Selenium	46.4	1	ug/L	ND	92.5	80-120			
Silver	44.2	0.1	ug/L	1.39	85.5	80-120			
Sodium	19400	200	ug/L	11400	79.5	80-120			QM-07
Strontium	50	10	ug/L	ND	99.4	80-120			
Thallium	45.6	0.1	ug/L	ND	91.1	80-120			
Tin	50.9	5	ug/L	ND	94.3	80-120			
Titanium	130	5	ug/L	78.5	103	80-120			
Tungsten	47.7	10	ug/L	ND	94.7	80-120			
Uranium	47.8	0.1	ug/L	0.1	95.2	80-120			
Vanadium	54.7	0.5	ug/L	3.06	103	80-120			
Zinc	45	5	ug/L	8	73.3	80-120			QM-07
Semi-Volatiles									
Acenaphthene	4.60	0.05	ug/L	ND	92.1	50-140			
Acenaphthylene	3.25	0.05	ug/L	ND	65.1	50-140			
Acridine	2.75	0.10	ug/L	ND	55.0	50-140			
Anthracene	4.00	0.01	ug/L	ND	79.9	50-140			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Benzo [a] anthracene	3.91	0.01	ug/L	ND	78.3	50-140			
Benzo [a] pyrene	3.84	0.01	ug/L	ND	76.7	50-140			
Benzo [b] fluoranthene	5.67	0.05	ug/L	ND	113	50-140			
Benzo [g,h,i] perylene	4.83	0.05	ug/L	ND	96.6	50-140			
Benzo [k] fluoranthene	5.43	0.05	ug/L	ND	109	50-140			
Biphenyl	3.11	0.05	ug/L	ND	62.2	50-140			
Chrysene	4.65	0.05	ug/L	ND	93.0	50-140			
Dibenzo [a,h] anthracene	5.22	0.05	ug/L	ND	104	50-140			
Fluoranthene	4.13	0.01	ug/L	ND	82.5	50-140			
Fluorene	3.93	0.05	ug/L	ND	78.7	50-140			
Indeno [1,2,3-cd] pyrene	5.05	0.05	ug/L	ND	101	50-140			
1-Methylnaphthalene	4.04	0.05	ug/L	ND	80.7	50-140			
2-Methylnaphthalene	4.41	0.05	ug/L	ND	88.2	50-140			
Naphthalene	4.53	0.05	ug/L	ND	90.6	50-140			
Phenanthrene	3.98	0.05	ug/L	ND	79.6	50-140			
Pyrene	4.22	0.01	ug/L	ND	84.4	50-140			
Quinoline	4.02	0.10	ug/L	ND	80.3	50-140			
Surrogate: 2-Fluorobiphenyl	*16.5*		*ug/L*		*82.7*	*50-140*			
Surrogate: Terphenyl-d14	*22.2*		*ug/L*		*111*	*50-140*			
Volatiles									
Benzene	0.0430	0.0005	mg/L	ND	108	60-130			
Ethylbenzene	0.0379	0.0005	mg/L	ND	94.8	60-130			
Toluene	0.0446	0.0005	mg/L	ND	111	60-130			
m,p-Xylenes	0.0646	0.0005	mg/L	ND	80.7	60-130			
o-Xylene	0.0415	0.0005	mg/L	ND	104	60-130			
Surrogate: Toluene-d8	*0.0581*		*mg/L*		*72.7*	*50-140*			

Qualifier Notes:

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

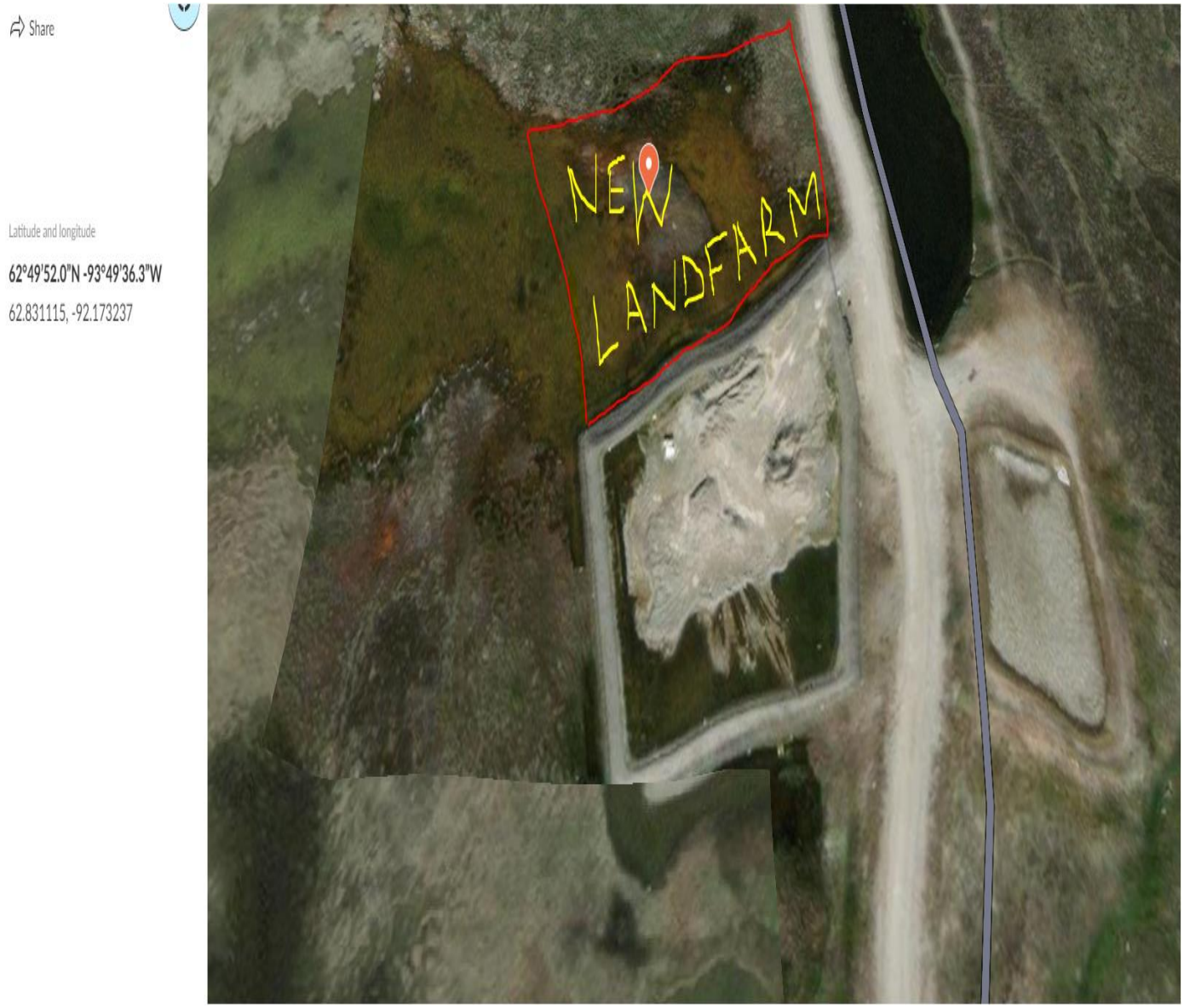
1.6 SITE MONITORING PROGRAM

Soil and Water samples are taken once a month, during the snow free season, immediately after the contaminated soil is turned. This is a good indicator of the progress of the remediation. All samples are taken on a 10 by 10-meter grid. Piezometers will be checked monthly until freeze up. Any water collected in any piezometer are tested for:

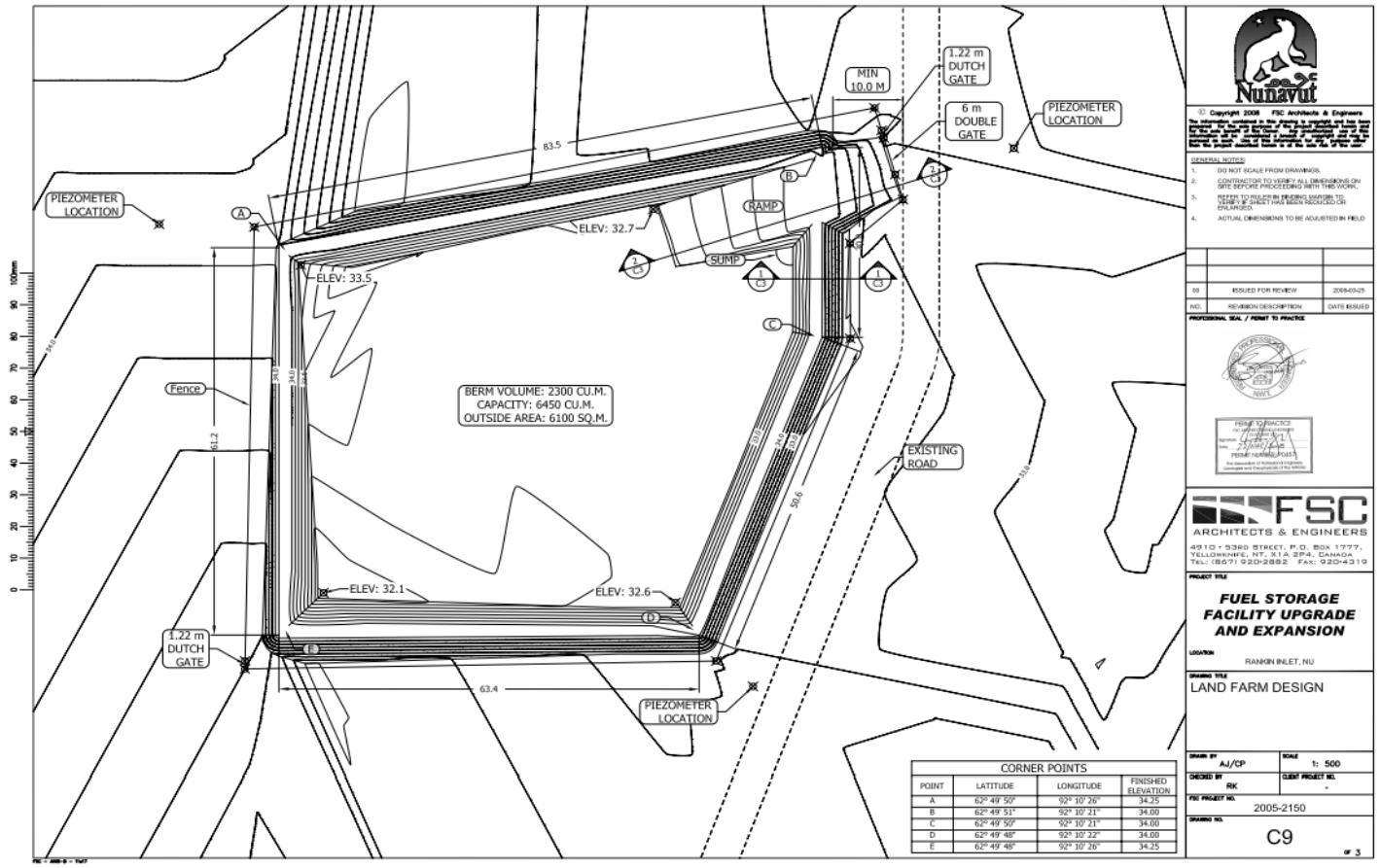
- PHC
- BTEX, F1 to F4
- Total Metals

During construction of the landfarm, background groundwater parameters were collected and tested for reference. QA/QC programs will be implemented soon as part of our monitoring program.

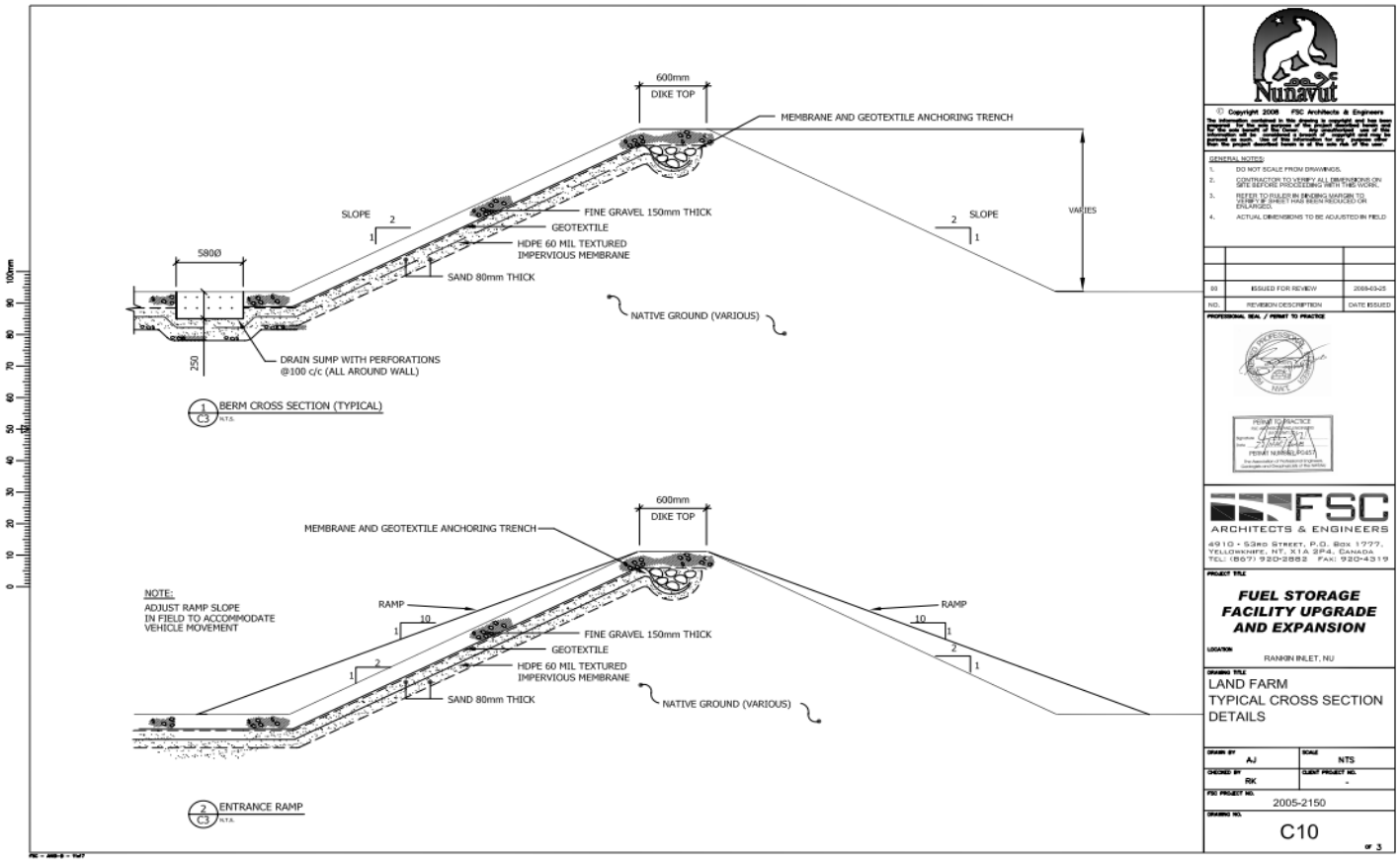
1.7 MAPS

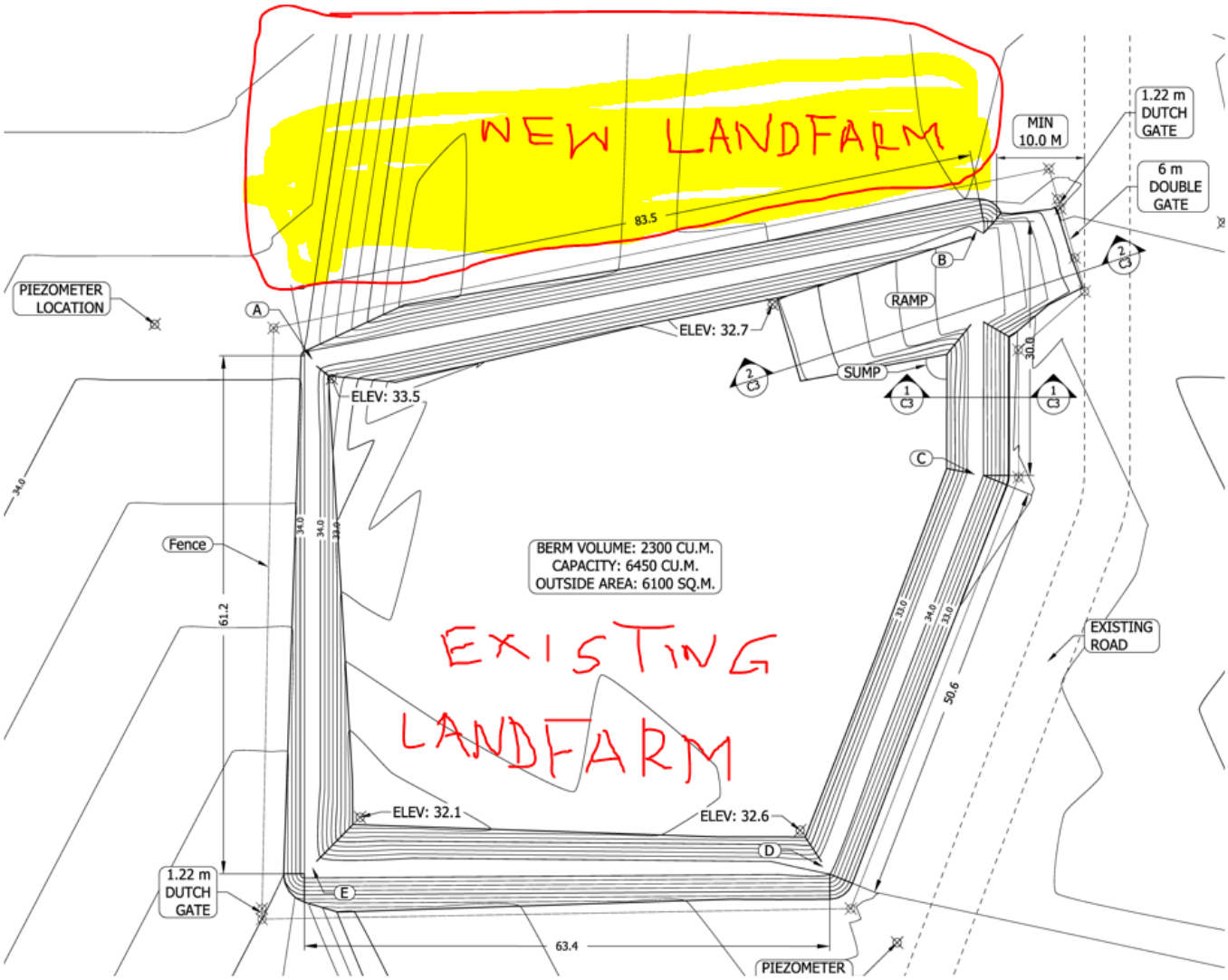


Proposed New expansion as highlighted above in the diagram



Existing landfarm





Proposed Expansion in yellow highlight above

1.8 HEALTH AND SAFETY CONSIDERATIONS

Landfarming requires the appropriate safeguards for the protection of human health. The potential for uncontrolled emissions, such as volatile organic compounds (VOCs), leachates and odours and any other adverse effects from treatment, needs to be considered on a site-specific basis according to the nature of the contamination and the conditions of the site.
The landfarm is already located 4km away from the Hamlet of Rankin Inlet, therefore the chances of emissions reaching the general population are extremely slim. All operational procedures including Personal Protective Equipment (PPE) and methodology are outlined within the Operation and Maintenance Plan associated with this landfarm. There is no risk of emissions affecting the general population or landfarm personnel is significantly decreased (EPA 2014).
PPD will not allow contaminated materials into the landfarm that pose an extreme health risk to the personnel at the landfarm. Unfortunately, those materials will need to be shipped south to an approved facility. The contamination levels can be determined by effective soil sampling.

ENVIRONMENTAL CONSIDERATIONS

PPD promotes public health, safety, and environmental protection.

Leachate and run-off pose a risk to the area around the landfarm, and appropriate water management systems is in place to control stormwater and spring thaw flow onto and off landfarm.
Materials are in place to appropriately contain all contaminated water from leaching the landfarm which include the diversion of water and leachate to a suitable lined retention pond where it can be recycled over the landfarm materials to maintain moisture content. It should be noted that PPD initiated this control system during summer operations.

Prepared by:

Sulaimon Ayilara,
Environmental Services Specialist,
Petroleum Products Division
Department of Community and Government Services
Government of Nunavut
Rankin Inlet, NU