AGNICO EAGLE

MELIADINE GOLD PROJECT

Landfarm Management Plan

December 2022
Version 4_NWB

ᓇᐃᓈᖅᓯᒪᔪᖅ

ᐊᒡᓃᑯ ᐄᒍ ᐅᔭᕋᒃᑕᕆᐊᓕᕆᔩᒃᑯᑦ (ᐊᒡᓃᑰᒃᑯᑦ) ᐱᓕᕆᓕᐊᑎᑦᑎᓚᐅᖅᑐᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒎᑐᒧᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ (ᐅᔭᕋᒃᑕᕆᐊᖅ), 25 ᑭᓛᒥᑕᓪᓗᐊᓂᒃ ᐅᐊᖕᓇᖕᖓᓂᑦ ᐅᖕᖓᓯᒃᑎᒋᔪᖅ ᑲᖏᖅᖠᓂᕐᒥᑦ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᓂᒃ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖕᖓᖕᓇᖅᐸᓯᐊᓂᑦ ᐅᖕᖓᓯᒃᑎᒋᔪᖅ ᐃᒡᓗᓕᒐᕐᔪᖕᒥᑦ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐃᓚᐅᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᑦ ᐱᓕᕆᐊᔭᐅᓂᖓᓄᑦ ᑎᕆᖓᓂᐊᖅ ᒎᑐᑕᓕᒃ, ᒪᕐᐳᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖃᖅᑯᓂ (ᑎᕆᖓᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ 1 ᐊᒻᒪᓗ ᑎᕆᖓᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᖅ. ᐃᓚᒋᔭᐅᐸᒍᓂ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᐃᒍᒋᐊᖅᓯᓂᕐᒧᑦ, ᐊᐅᓛᖅᑎᑦᑎᓂᖅ ᖃᐸᓯᐊᕐᔪᖕᓂᑦ ᐊᓯᖏᓐᓂᑦ ᓄᓇᒥᑦ ᐃᓗᑦᑐᖅᓯᒪᔪᓂᒃ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᖅᑕᐅᔪᓂᒃ ᐅᐃᒍᒋᐊᖅᓯᓂᐊᖅᑐᖅ ᐊᐅᓛᕐᓂᕆᔭᖕᖓᓂᒃ ᐅᔭᕋᒃᑕᕆᐊᑉ 2043-ᒧᑦ, ᐊᒻᒪᓗ ᐃᓚᔭᐅᓂᖏᑦ ᒪᕐᐴᒃ ᐊᒃᑕᑯᐃᑦ ᐅᐊᒡᒥᐊᒡᒥᑦ (Wesmeg) ᐊᒻᒪᓗ ᑎᒡᑯᕕᕆ (Discovery) ᐱᑕᓕᖕᓂᑦ.

ᑎᑎᖅᑲᖅ ᑐᓂᓯᔪᖅ ᐊᒃᑕᑯᓂᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐊᒻᒪᓗ ᐋᖅᑭᒃᓯᐸᒍᓂ ᐃᓚᒋᔭᐅᔪᖅ ᑎᑎᖅᑲᐅᑎᒥᑦ ᖃᐸᓯᐊᕐᔪᐃᑦ ᓴᖅᑭᑕᐅᔪᓄᑦ Type A ᐃᒪᕐᒧᑦ ᓚᐃᓴᓯᒥᒃ ᑐᒃᓯᕋᐅᑎᒧᑦ. ᐸᕐᓇᐅᑎ ᐅᖃᐅᓯᖃᖅᑐᖅ ᖃᓄᐃᑦᑑᓂᖓᓄᑦ ᐃᓚᒋᔭᐅᔪᓂᒃ ᐊᒻᒪᓗ ᐊᐅᓛᖅᑎᑦᑎᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᒃᓴᐃᑦ ᐊᒃᑕᑯᓄᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒦᑦᑐᑦ ᑐᖅᑯᖅᑕᐅᓂᐊᕐᓗᑎᒃ ᐊᒻᒪᓗ ᐱᓕᕆᐊᖑᓗᑎᒃ ᐅᖅᓱᐊᓗᕐᒥᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᑦ ᐃᐸᔾᐃᑦ.

ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᑐᖅᑯᖅᓯᓯᒪᕚᒃ ᐊᒻᒪᓗ ᐅᑎᖅᑎᑎᕆᓂᕐᒧᑦ ᓴᖅᑭᑕᐅᓯᒪᔪᑦ ᐊᑐᖅᑕᐅᖕᓚᕈᒪᓪᓗᑎᒃ ᐱᓕᕆᐊᖃᕐᓂᐊᕐᓗᑎᒃ ᐅᖅᓱᐊᓗᕐᒥᑦ ᐃᐸᔾᒧᐊᖅᑐᓄᑦ ᐱᑕᖃᕋᔭᖅᐸᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᐱᔭᓂᒃ. ᐊᒃᑕᑯᐃᑦ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᑦ ᐱᓂᐊᕐᓗᑎᒃ ᐃᐸᔾᓂᒃ, ᐅᔭᖅᑲᓂᒃ, ᐊᐳᑎᒥᑦ, ᐊᒻᒪᓗ ᓯᑯᓂᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᒃ ᐅᖅᓱᓄᑦ. ᐃᓚᐅᓂᐊᖅᑐᑦ ᐅᖅᓱᕆᓗᐊᖏᑦᑐᑦ, ᓃᕐᓗ ᐅᖅᓱᐊᓗᕐᒥᑦ ᐊᒻᒪᓗ ᐅᖅᓱᕐᒥᑦ ᐱᓕᕆᐊᖑᓯᒪᔪᓂᒃ.

ᐊᓂᑉᑳᖅ ᐊᒃᑕᑯᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᖃᑦᑕᖅᑐᖅ ᐊᕐᕌᒍᑕᒫᒃᑯᑦ ᐊᕙᑎᓕᕆᔩᒃᑯᓐᓄᑦ, ᓇᓗᓇᐃᖅᓯᐸᒍᑎᒃ ᐊᖏᑎᒋᓂᖓᓂᒃ ᐃᓚᔭᐅᔪᓂᒃ ᑕᒡᕗᖓ, ᖃᓄᑎᒋᓂᐅᖏᑦ ᐲᖅᑕᐅᔪᓂᒃ, ᐊᒃᑖᖅᑕᐅᔪᓂᒃ ᐅᕝᕙᓘᓐᓃᑦ ᐊᑐᖅᑕᐅᒃᑲᓂᖅᑐᓄᑦ ᐃᓂᐅᔪᓂᒃ, ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᖃᓄᐃᖓᓂᐅᔪᓂᒃ, ᐊᖏᓂᖓᑕ ᐊᒻᒪᓗ ᖃᓄᐃᑦᑑᓂᖏᑦ ᓂᕿᑎᐊᕙᒃᑫᓐᑦ ᐃᓚᔭᐅᔪᑦ, ᑕᑯᐸᓗᒍ ᖃᐅᔨᓴᐃᓂᕐᓂᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ, ᐊᖏᑎᒋᓂᖓ ᐊᒃᑐᖅᑕᐅᔪᖅ ᐃᒪᖅ ᑯᕕᑎᑕᐅᔫᐸ.

ᐃᐸᔾᐃᑦ ᐅᖅᓱᐊᓗᖃᓕᖅᑐᑦ ᐅᑎᖅᑎᑎᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᒪᓕᒃᑯᕐᒥᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐅᖃᖅᓯᒪᔪᑦ ᓄᓇᕗᒻᒥ ᒐᕙᒪᒃᑯᑦ, ᐊᕙᑎᓕᕆᔩᒃᑯᖏᑦᑕ ᐊᕙᑎᒧᑦ ᒪᓕᒃᑕᐅᔾᔭᖏᑦ ᐊᐅᓚᑦᑎᓂᐊᕐᓗᓂ ᐱᐅᖏᑦᑐᖅᑕᓕᖕᓂᑦ ᐃᓂᐅᔪᓂᒃ. ᐊᒡᓃᑰᒃᑯᑦ ᐊᓯᐊᙳᖅᓯᓂᐊᕐᒥᔪᑦ ᐃᐸᔪᓂᒃ ᐅᑎᖅᑎᑎᕆᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᒥᒃ ᕿᒪᒃᑕᐅᔪᑦ ᐅᓇᑕᖅᑐᒃᓴᓄᑦ ᐃᓂᐅᔪᒥᑦ ᐅᑎᖅᑎᑎᕆᓂᕐᒧᑦ ᒪᓕᒃᑕᐅᔾᔭᓄᑦ ᒥᐊᓂᕆᓂᐊᕐᓗᑎᑦ ᐃᓄᐃᑦ ᐋᓂᐊᖅᑕᐃᓕᒪᓂᖏᑦ ᐊᒻᒪᓗ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᑮᓪᓕᐅᔪᖅ, ᓈᒻᒪᖕᓂᖅᓴᐅᐸᓗᑎᒃ ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ. ᐅᑎᖅᑎᑎᕆᓂᕐᒥᑦ, ᐃᐸᔾᐃᑦ ᐲᖅᑕᐅᓗᑎᒃ ᑕᒡᕙᙳᑦ ᐊᒻᒪᓗ ᐊᐅᓚᑕᐅᓂᐊᕐᓗᑎᒃ ᓴᓇᕙᓪᓕᐊᓂᕐᒧᑦ ᐱᔾᔪᑎᓕᖕᓄᑦ, ᓃᕐᓗ ᖃᓪᓕᖅᓯᔾᔪᑕᐅᓗᑎᒃ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕚᖕᒥᑦ, ᐊᒃᑕᑯᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᑲᑎᓯᒪᔪᑦ ᐊᒃᑖᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕚᖕᒧᑦ.

ᐃᓚᒋᔭᐅᐸᒍᓂ, ᐊᒡᓃᑰᒃᑯᑦ ᐅᑎᖅᑎᑎᓄᓐᓇᖅᑐᑦ ᐱᓐᓂᑰᔪᓂᒃ ᐊᒃᑕᑯᓅᖓᔪᓂᒃ Type B ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᒃ - 2BB-MEL1424 ᐊᑐᖅᑕᐅᓚᐅᖅᑐᖅ ᑕᓯᕐᔪᐊᕐᒥᑦ ᕿᓂᖅᓴᐃᓂᕐᒧᑦ ᓄᓇᓕᐊᓛᖑᓚᐅᖅᑐᒧᑦ.

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) has developed the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Approved mine plan includes open pits and underground mining methods for the development of the Tiriganiaq gold deposit, which includes two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. As part of Meliadine Extension, the operation of several other pits and underground mines will extend the life of mine until 2043, as well as the addition of two landfarms at Wesmeg and Discovery deposits.

This document presents the Landfarm Management Plan for the Mine and forms a component of the documentation series produced for the Type A Water Licence Application. The Plan describes the design features and operational procedures for the landfarms located at the Meliadine Mine for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation has been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated at the Meliadine Mine site. The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons, such as diesel and gasoline being treated in the landfarms.

A report of landfarm activities is prepared annually by Environment Department, indicating the volume of material added to the facility, amount of material removed, disposal or re-use location, analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped.

Soils contaminated with light end petroleum hydrocarbons are remediated in accordance with the criteria stated in The Government of Nunavut, Environment Department's Environmental Guideline for the Management of Contaminated Sites. Agnico Eagle is also proposing to change the soil remediation criteria used for the Abandoned Military Site Reclamation Protocol guidelines for the protection of human health and the management limit, which are more appropriate for the Meliadine site. When remediated, the soils will be removed from the facility and can be used for construction purposes, such as part of the cover of the Tailings Storage Facility, Landfill or stacked in the Waste Rock Storage Facility.

In addition, Agnico Eagle continues remediation of the historical landfarm associated with the Type B Water Licence – 2BB-MEL1424 that was in use for the former Meliadine Exploration Camp.

TABLE OF CONTENTS

TABLES AND FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First version of the Landfarm Management Plan	John Witteman, Env. Consultant, Agnico Eagle
2	February 2018	Figure 2-1	5	- "Main Infrastructure for the Meliadine Project, including the Landfarm" - figure added to figure reference	Meliadine Environment Department
		3.1	9	- Antifreeze removed from list of acceptable contaminates for landfarm disposal	
		2.1	3	-Approximate volume of material adjusted to 700 m^3	
		1.3	2	- Updated Oil Pollution Emergency Plan revision date and version	
		All	All	-General review and revision	
3	February 2019	1.1	1	-Estimated quantity of material in Type A landfarm adjusted to 1500 m^3	Sean Arruda
		2.1	3	-Estimated quantity of material in both landfarms adjusted to 3706 m^3 (1500 m^3 in Type A landfarm, 2206 m^3 in Type B landfarm) -Paragraph containing estimated annual inputs to landfarm has been removed - gasoline and light oil added -microbial activity 'slows' (changed from 'stops')	
		2.2.1	4	-'oil' changed to 'hydrocarbons'	
		Figure 2-1	5	-Site map figure updated.	
		Table 2-2	8	-Sump surface area was a typo (10,040 m^2). Changed to 144 m^2	

Version	Date	Section	Page	Revision	Author
		3.1.1	10	-'Aboriginal Affairs and Northern Development Canada' changed to 'Crown-Indigenous Relations and Northern Affairs' -Sentence added "If there is uncertainty whether or not the material contains additional, unknown contaminants, the material should be placed in totes/drums until lab results confirm that they can be placed in the landfarm."	
		3.3	11	-Contaminated snow is now being sent to the snow cell area	
4_NIRB	November 2021			Updated to address Meliadine Extension application submission to NIRB for review and approval	Permitting Department
4_NWB	December 2022	A yellow arrow in the right-hand margin indicates where updates have been made		Submitted to Nunavut Water Board as part of the Meliadine Extension Amendment.	Permitting Department

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
BTEX	benzene, toluene, ethylbenzene, and xylene
CP1	Collection Pond 1
GN	Government of Nunavut
NWB	Nunavut Water Board
PHC	Petroleum hydrocarbons
Project	Meliadine Gold Project
RMMS	Responsible Mining Management System
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

SECTION 1 • INTRODUCTION

1.1 Project History

Agnico Eagle Mines Limited (Agnico Eagle) has developed the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

Nunavut Impact Review Board (NIRB) Project Certificate No.006 was issued in 2015 and included approval of a multi-phase approach to development, including mining of Tiriganiaq deposit using open pit and underground mining methods) and mining of the Pump, F Zone, Discovery and Wesmeg deposits using open pit methods.

The Meliadine Extension proposes to include underground mining and associated saline water management infrastructures at the Pump, F Zone, and Discovery deposits, development of a new portal and associated infrastructures in the Tiriganiaq-Wolf area, construction and operation of a windfarm, use of additional borrow pits and quarries, and two new landfarms at Wesmeg and Discovery deposits. The life of the mine would be extended by an additional 11 years until 2043, closure will occur from 2044 to 2050, and post-closure from 2051 to 2060.

The Landfarm Management Plan (Plan) focuses on minimizing the waste footprint on-site, and maximizing remediation potential through implementation of bioremediation experience and research carried out at the Agnico Eagle's Meadowbank Gold Mine.

During the advanced exploration phase of the Project, the Nunavut Water Board (NWB) approved amendment #6 to Water Licence 2BB-MEL1424, which allowed the operation of a light PHC soil stockpile. This approval supported using a landfarm developed inside a bermed and lined area previously used to store fuel bladders. Soil contaminated with light PHC is being deposited in this bermed and lined area for treatment.

When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

1.2 Objectives

On-site storage and remediation has been established as the preferred method for treatment of light PHC contaminated soil that may be generated at the proposed mine. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this contaminated soil management plan. A pilot project to enhance rates of bioremediation through addition of a nutrient source is being carried out at Meadowbank and will be employed at Meliadine should it prove successful. Alternate contingency options in the event that landfarming is not successful or as efficient as planned are also discussed.

This Plan is a component of the Responsible Mining Management System (RMMS)[1]. The objectives of this Plan are to:

- provide an overview of contaminated soil management at the Project;
- describe the physical setting, location, and design criteria of the landfarm;
- define acceptable types of contaminated soils to be placed in the landfarm and conditions for removal of treated soil;
- define operating procedures and monitoring requirements for the landfarm; and
- describe contingency options for alternate treatment/storage of PHC contaminated soil.

1.3 Related Documents

Spill prevention is the first stage in contaminated soil management at the Project. Documents containing information related to this Plan include:

- Spill Contingency Plan; and
- Risk Management and Emergency Response Plan.

The Landfarm Management Plan is part of the Environmental Management and Protection Plan, which provides overarching environmental direction for the Meliadine Mine.

1.4 Spill Prevention

Similar to the waste management philosophy, plans are to actively work towards minimizing spills through suitable work procedures. Plans developed from the environmental impact study address the management of spills on land, ice, water, and into the marine environment. When spills do occur, the goal is to limit the spread of the spill, and then manage contaminated material resulting from the spill. The Spill Contingency Plan describes spill prevention measures.

[1] The RMMS is described in the Environmental Management and Protection Plan.

SECTION 2 • LANDFARM DESIGN

2.1 Background

In the event of a spill, on-site storage and remediation is the most practical and efficient method in handling contaminated soil, particularly in an isolated location, such as the Meliadine Mine. Any PHC contaminated soils generated during the construction, operation, and closure phases will be adequately managed. Soils contaminated with light PHCs, such as diesel, gasoline, and light oils will be treated on-site in a landfarm. This method involves spreading, mechanical mixing, addition of nutrients and water and placing the contaminated soil in windrows within a containment area, and promoting conditions favorable for the volatilization and aerobic microbial degradation of hydrocarbons. When possible, materials contaminated with heavy hydrocarbons (e.g., hydraulic fluid or grease), are to be segregated, packaged, and shipped south for treatment and/or disposal.

Landfarm option analysis prepared for Agnico Eagle by Golder Associates (2007) identified factors relevant to landfarming in the north. This includes environmental factors and physical properties of the soil that affect microbial growth and rates of biodegradation, including temperature, pH, soil moisture, nutrient content, salinity, and soil particle size.

Although rates of biodegradation decline with temperature, landfarming is still a feasible technique in Arctic climates as demonstrated by the Meadowbank landfarm. Degradation in the north is typically restricted because microbial activity slows between 0 to -5 degrees Celsius (°C) restricting biodegradation to the months of June to September[2]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

It is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the facility and can be used for construction purposes such as part of the cover of the Tailings Storage Facility (TSF) or stacked in the Waste Rock Storage Facility (WRSF). Based on a remediation period of three seasons, it would be possible to close the landfarm facility on three years after the end of the process plant operation.

2.2 Location

The overall site plan showing the main infrastructure for the Meliadine Mine, including the landfarms, is shown in Figure 2-1. The area has no exposed bedrock and up to 20 metres (m) of glacial-fluvial till that has little ground ice and shows no permafrost degradation. The central location of the landfarm was chosen to minimize the footprint of the site and the transport distance of contaminated material from potential spill locations. The management of all waste generated at the Meliadine Mine in the form of dry stack tailings, waste rock, incinerator, and landfill waste are located in close proximity to the main infrastructure.

[2] Even though bioremediation ceases below -5°C, volatilization of the PHCs does continue but at a much slower rate.

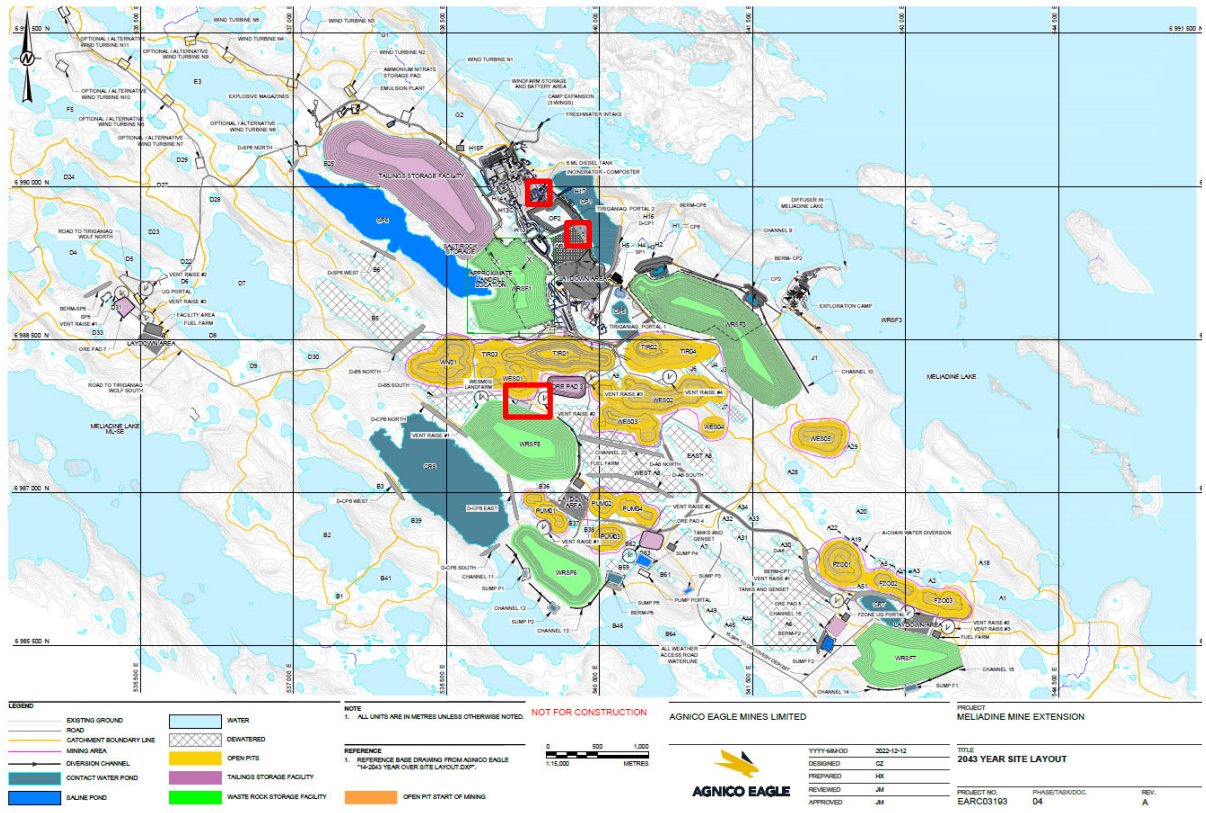
2.2.1 PROXIMITY OF SURFACE WATER

The existing landfarm is located adjacent to the infrastructure pad, approximately 200 m from Collection Pond 1 (CP1). The landfarm is located on land that slopes towards the southwest corner, which results in any rainwater or snowmelt draining to temporary water storage having the capacity to store a 1:100 wet year spring freshet plus 500 m^3 of water from melting of contaminated snow/ice. Drainage from the landfarm may be used as water in the turning of the windrows during the remediation process. Excess water is collected within a sump inside the landfarm and will be pumped to an oil pre-treatment plant to remove any hydrocarbons. The treated water will then be discharged into the CP1. Discharge from CP1, is controlled by a dike, which stops direct flow to Meliadine Lake. Meliadine Lake is the source of freshwater for the site and is used by Inuit for traditional pursuits. If water is to be discharged from CP1 to Meliadine Lake, it is treated to meet compliance criteria. Except for a short duration during the spring freshet or a heavy rainfall, water ponding will be eliminated in the landfarm by the end of the summer such that a sufficient storage capacity is available for the upcoming spring freshet.

The proposed Wesmeg landfarm is adjacent to WRSF5 and open pit WES01. Excess water will be collected within a sump inside the landfarm and will be pumped to an oil pre-treatment plant to remove any hydrocarbons. The treated water will then be discharged into the CP1.

The proposed Discovery landfarm is adjacent to WRSF8 at the Discovery deposit. Excess water will be collected within a sump inside the landfarm and will be pumped to an oil pre-treatment plant to remove any hydrocarbons.

Figure 2-1 Landfarm Site Location Plan



2.2.2 PROXIMITY OF GROUNDWATER

In the Meliadine Mine area, the groundwater within the active layer is estimated to reach 1.5 m in October. The active layer begins to form in July when temperatures largely remain above 0°C, and deepens to a maximum in October. Shallow groundwater flow in the area of the landfarm is towards the industrial site.

To prevent movement of contaminants from the landfarm facility into groundwater and the surrounding environment, Environment Canada (SAIC 2006) recommends implementation of a barrier with 10^{-7} centimetres per second hydraulic conductivity at a thickness of 0.6 m. The Meliadine landfarm has an impervious liner and no impacts on shallow groundwater are anticipated.

2.3 Design

The landfarm is designed to receive soils, rock, snow, and ice contaminated with petroleum hydrocarbons. This will include light hydrocarbons such as diesel and gasoline. The design volume of the landfarm is based on allowances for the materials being treated at Meadowbank.

The average floor slope is 3.1% going in the designed direction of northwest to southeast, matching the natural ground slope. This slope is still adequate allowing leachate/drainage from the PHC soils and internal runoff to gradually seep through the filter berm into the sump area. The water collected in the sump will be pumped to the oil separator for oil removal before being discharge into CP1. The sump area was built as per design capacity.

The geomembrane liner crest elevation was installed at an elevation of 74.80 m, it does allow for 0.45 m of freeboard before reaching the geomembrane liner crest elevation.

The proposed Wesmeg and Discovery landfarms will be designed in a similar manner to the existing landfarms at Meliadine Mine, and final design will be submitted to the NWB 60-days prior to construction as per Part D Items 1 and 2.

2.3.1 SOIL VOLUME REQUIREMENTS

The existing landfarm was built with the expectation of effectively treating up to 5,000 m^3 of contaminated soil over the construction, operations, closure of the Project, and 500 m^3 of snow and ice annually. Based on the experience at Meadowbank, the volume of PHC would be approximately 350 m^3 per year during construction, operation, and closure phases. Table 2-1 outlines the estimated volumes of contaminated soils and rock, and contaminated snow and ice expected during each phase of the mine.

Table 2-1 Estimated Volume of Petroleum Hydrocarbon Contaminated Soil and Ice/Snow to be Managed

Project Phase	Volume of PHC Soil/Rock (m^3)	Annual PHC Snow/Ice (m^3)
Advanced exploration	2,209 (volume in exploration landfarm to date)[(a)]	500 per year
Predevelopment	175 per year	
Construction	350 per year	
Operations	350 per year	
Closure & Reclamation	350 per year	

[(a)] The contaminated soil in the advanced exploration landfarm will be transferred to the mine landfarm upon its completion and commissioning.

As described in the Landfarm Design & Management Plan (Agnico Eagle 2008), it is estimated that soils contaminated with light end PHCs would require three full summer seasons for complete remediation. When remediated, the soils will be removed from the landfarm and used on-site, placed in a WRSF or used as cover at the TSF.

2.3.2 DESIGN SPECIFICATIONS

The footprint is approximately 11,000 square metres (m^2), with a perimeter berm that is approximately 2.0 m high over the landfarm surface. Contaminated material is piled 1.5 m so that the material is below the crest height of the perimeter berm. The landfarm is lined.

SECTION 3 • LANDFARM OPERATION AND MANAGEMENT

Agnico Eagle is responsible for managing and implementing the landfarm operation plan. Operation and monitoring of the landfarm, as well as designation of training requirements will be the responsibility of the Environment General Supervisor, Coordinators or designate.

3.1 Acceptable Landfarm Material

3.1.1 CONTAMINANTS

The landfarm facility will only treat and/or store light PHC contaminated soils that have been generated through mine related activities and which have been transferred from the Mine's advanced exploration camp landfarm upon closure. Material from the Hamlet of Rankin Inlet or other sites will not be accepted without approval from the NWB, Crown-Indigenous Relations and Northern Affairs, Water Resources Inspectors, and the Kivalliq Inuit Association.

The following products are acceptable for treatment in the landfarm if generated on-site and spilled on soil:

- diesel fuel;
- gasoline;
- hydraulic oil
- aviation fuel (Jet A);
- other light oil (e.g., engine oil, lubricating oil);

In the event that the contaminant source is unknown, soil samples will be analyzed for PHCs and possibly additional contaminants prior to placement in the landfarm. These additional parameters could include total metals, oil and grease, and volatile organic compounds. Analysis for additional compounds will be determined by the Environment Department on a case-by-case basis. If there is uncertainty whether or not the material contains additional, unknown contaminants, the material should be placed in totes/drums until lab results confirm that they can be placed in the landfarm.

Concentrations of contaminants are currently compared to the site background values (for metals) and/or criteria in the Government of Nunavut (GN) *Guidelines for Contaminated Site Remediation* (GN 2009); however, Agnico Eagle proposes to use different criteria that is more applicable to Meliadine Mine (refer to Section 3.5 for more details). If this analysis indicates soil contamination above background or GN guidelines for any substance not approved for landfarming (i.e., non-PHC contaminants), the spill material will not be placed in the landfarm. This is to ensure that PHC contaminated soils are not contaminated with other products.

Spills of non-PHC material (e.g., solvents) will be placed in drums and stored on-site for shipment to approved facilities during shipping season.

3.1.2 GRAIN SIZE

Bioremediation of very coarse-grained, larger soil material, is inhibited as it does not readily retain moisture. However, volatilization will occur more rapidly (SAIC 2006). It has been noted that this material likely contains lower concentrations of contaminants due to a lower volume-to-surface area ratio, and can typically be screened out prior to landfarming (SAIC 2006). As a result, soils and rock material with grain size less than 2.5 centimetres (cm) will be separated from larger-grained material, where possible. This will occur at the spill location or in the landfarm using a screen sieve, should it prove necessary. The two soil fractions will be treated separately in the landfarm.

3.2 Contaminated Soil Additions

3.2.1 SPILL EXCAVATION

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated and transported to the landfarm facility in dump trucks or other approved methods. Care will be exercised to ensure that the entire spill is excavated (verified by olfactory and visual assessment, or sampling if necessary) and that none of the contaminated material is lost during transport.

3.2.2 PLACEMENT IN THE LANDFARM

As described above, larger coarse material (rocks) will be separated from the finer material (sand and gravel) in the landfarm and assessed visually for PHC staining and product. If the material is saturated it will be spread to allow volatilization in the designated area of the landfarm.

Materials identified as acceptable in the landfarm will be placed in windrows with dimensions about 18 m wide at base x 1.5 m high x 34 m long. Windrows may be piled wider, higher, or longer as space permits. A record will be kept by the on-site Environmental Coordinator or designate of the amount of contaminated soil placed in the landfarm and the location of each load within it.

3.2.3 DECONTAMINATION OF SOIL MOVEMENT EQUIPMENT

The decontamination of soil movement equipment is outlined in the Landfarm Soil Movement Procedure, included as the Appendix A to this Management Plan.

3.3 Contaminated Snow

Petroleum hydrocarbon contaminated snow and ice will be placed in a designated snow-cell area and treated as contact water after snowmelt. After snowmelt, the contaminated water will pumped through the site's oil-water separator to remove PHC residue. The treated water will be discharged to the CP1.

Snow accumulation in the Landfarm will be allowed to melt and accumulate in the Landfarm sump where it will be treated through the oil-water separator as needed upon melt or used in the bioremediation process for the contaminated soil. Any excess snow accumulation in the Landfarm will be moved to the snowcell.

3.4 Remediation

Remediation of fine grained PHC contaminated soil in the landfarms occurs naturally through volatilization and aerobic microbial degradation. Soil aeration, nutrient amendment and water addition, are recognized as methods for improving rates of remediation. Agnico Eagle commissioned the National Research Council Canada to undertake the bioremediation research study to optimize the biodegradation process. Agnico Eagle will look at increasing biodegradation rates through potential opportunities such as nutrient amendment.

3.4.1 ABSORBENT MATERIALS

Coarse-grained soils are not readily bio-remediated, but concentrations of PHC contaminants may still be reduced through volatilization. Oil absorbent pads will be used to help remove visible product from coarse-grained material.

3.4.2 AERATION

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur approximately two to four times per year, during the summer months.

3.4.3 SOIL MOISTURE

Prior to turning, site personnel will ensure that soil is not so dry as to generate significant dust, nor overly saturated. If soil is too dry, non-contaminated water from within the landfarm containment area will be used as a moisture source and sprayed on the piles. If no accumulated water is available, water from CP1 or freshwater will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

3.4.4 NUTRIENT AMENDMENT

The use of sewage sludge as a nutrient amendment has precedent in the north. Sewage sludge as a nutrient source has also been proposed for the Milne Inlet Mary River Project (EBA 2010). This material not only provides the benefit of nutrients, but also adds organic matter to help retain moisture and microorganisms. Furthermore, the use of sewage sludge produced on-site helps to reduce the waste footprint of the mine by re-directing this material from disposal facilities and avoids needing to import a chemical fertilizer. The use of sewage sludge or another recommended nutrient amendment will be considered for optimization of biodegradation.

3.5 Removal of Soil From the Landfarm

Agnico Eagle currently follows the Government of Nunavut Remediation Guidelines (as outlined in the following sections); however, through the Meliadine Extension application is proposing to change the soil remediation criteria used to the Abandoned Military Site Reclamation Protocol guidelines for the

protection of human health and the management limit, which are more appropriate for the Meliadine site. Further details are provided in Landfarm Remedial Action Plan in Appendix B.

3.5.1 GOVERNMENT OF NUNAVUT REMEDIATION GUIDELINES

The following parameters will be measured and compared with the GN industrial remediation criteria to determine whether PHC contaminated soil has been adequately remediated:

- benzene, toluene, ethylbenzene and xylene (BTEX); and
- petroleum hydrocarbon fractions 1 - 4.

The GN remediation criteria are characterized for agricultural/wildlife, residential/parkland, commercial, and industrial land uses. At the Project, remediation to agricultural/wildlife criteria is targeted; however, if these criteria cannot be met, industrial criteria will be followed.

The GN remediation criteria for coarse-grained soils will be applied. Table 3-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses.

Table 3-1 Summary of Relevant GN Tier 1 Soil Remediation Criteria for Surface Soil (mg/kg)

	Land Use Criteria (mg/kg)	
	Agricultural/Wildlife	**Industrial**
Benzene	0.03	0.03
Toluene	0.37	0.37
Ethylbenzene	0.082	0.082
Xylene	11	11
PHC Fraction 1	30	320
PHC Fraction 2	150	260
PHC Fraction 3	300	1,700
PHC Fraction 4	2,800	3,300

mg/kg = milligram per kilogram

3.5.2 SAMPLING AND ANALYSIS

Landfarm windrows will be sampled annually at the end of the summer season to determine if remediation objectives have been met. Representative composite samples will be taken of each windrow to estimate remaining PHC concentrations. For each 10 m of windrow length, one composite sample will be collected, each consisting of three surface sub-samples and three sub-samples at 1 m depth. Sub-samples will be taken approximately 3.3 m apart, and will be taken from both sides of the windrow. Sampling QA/QC measures will include collection of 1 duplicate per 10 samples.

After two seasons of treatment in the landfarm, degradation rates will be assessed to estimate the total remediation time required for PHC contaminated soil under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with

aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated as described in Section 4.2.

3.5.3 SOIL REMOVAL

Coarse-grained soils will be assessed near the end of the summer season by Environment Department technicians for PHC product and odour. Based on the experience learned at Meadowbank, Agnico Eagle is confident that confirmatory sampling and laboratory analysis is not required prior to removing coarse-grained soil from the Landfarm. Observations show that volatilization of PHCs from coarse-grained soil occurs more rapidly than biodegradation. It has been noted that this material likely contains lower concentrations of contaminations due to a lower volume-to surface area ratio, and can typically be screened out prior to landfarming. Thus, the use of a photoionization detector (PID) is sufficient to confirm material is in a suitable state to be removed from the landfarm. When PHC odours are no longer detected, the material will be removed to waste rock storage facility or at the TSF to be used as cover material.

When sample analysis of fine-grained material at the end of a season indicates that concentrations of contaminants are below GN guidelines, a soil pile or the appropriate section of a pile will be deemed acceptable for removal from the facility. Interim monitoring may be conducted through measurements of headspace with a portable instrument (e.g., flame ionization detector), but samples will be confirmed by an accredited laboratory prior to soil removal.

When remediated, the soils will be removed from the facility and can be used for construction purpose such as normal overburden (i.e., part of the cover of the TSF) or stacked in the WRSF. Based on a remediation period of three seasons, it would be possible to close the landfarm facility three years after the end of the process plant operation.

3.6 Water Management

Since the landfarm facility is uncovered to facilitate natural weathering, water accumulating inside the bermed area may come into contact with contaminated material.

While the landfarm has an impermeable liner, visual inspections by the Environment Department will be conducted for seepage of contact water coming through the perimeter berm, or the accumulation of water within the containment berm. This will be conducted on a weekly basis starting after freshet and continuing until October when water is likely to be present. In the event of water accumulation or seepage, the ponded water will be pumped through the site's oil-water separator to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.7 Winter Landfarm Management

Uncontaminated snow will be removed as much as possible during winter to minimize the quantity of spring melt water inside the berm. Care will be taken to ensure contaminated snow/soil is not disturbed by leaving a base layer of snow of no less than 10 cm in place. Following snowmelt, any contaminated product left from winter spill clean-up operations will be padded up. The base soil in these areas will be excavated and added to existing remediation windrows as soon as possible after snowmelt to minimize migration into the facility substrate.

3.8 Landfarm Closure and Reclamation

After removal of all remediated soil and prior to closure and reclamation of the landfarm, the berm and base will be sampled on a 10 m grid, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria set out in Table 3-1. No excavation will be necessary if agricultural/wildlife criteria are met. If industrial criteria are used, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm.

3.9 Summary of Activities

A summary of landfarm activities including monitoring of the physical condition and potential environmental impacts of the landfarm is provided in Table 3-2. An annual report will be prepared indicating the volume of material added to the facility, amount of material removed, disposal or reuse location, all analysis results, volume and type of nutrient addition, visual inspection results, and volume of contact water pumped. This information will be appended to Agnico Eagle's NWB Annual Report.

Table 3-2 Summary of Landfarm Activities, Analyses, and Records

Activity	Analysis	Frequency of Analysis	Record
Excavation of spill and transport of contaminated material to landfarm.	If unsure of full excavation - F1-F4, BTEX If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs	As needed	Date, time and location of spill and excavation; estimated volume of spill; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable. Any evidence of remaining product
Soil aeration	NA	Two to four times over the summer	Date and time of the aeration; location; soil condition (moisture, odour, granulometrie, etc.)
Soil treatment with sewage sludge as nutrient supplement.	Visual inspection to ensure proper incorporation	At least once during summer on selected windrows	Date and time; type of treatment (aeration or nutrient amendment); location in landfarm; any odour noticed during aeration
Sampling for progress of remediation	Hydrocarbon vapour in headspace (by PID); F1-F4, BTEX (laboratory)	Vapour – as needed; Laboratory - annually	Date and time; location; odour; laboratory report
Soil removal from landfarm	Removal subject to meeting GN criteria	Once GN criteria are met	Date and time; location; quantity of soil removed; final location
Ponded contact water	BTEX, oil and grease, lead – as specified in Water Licence	Prior to any dewatering; if re-used in landfarm, no sampling necessary	Date and time, location, laboratory report, in Annual Report
Seepage	Visual inspection; BTEX, oil and grease, lead – as specified in Water License	Weekly during summer	Location, extent, approximate depth, evidence of sheen
Identification of maintenance requirements	Visual inspection of landfarm	Twice over the summer	Inspected areas; condition of berm and base; previously unidentified safety concerns

SECTION 4 • CONTINGENCY OPTIONS

This section describes the contaminated soil management plan, should a large spill event occur, and if landfarm treatment prove not successful.

4.1 Large Spill Event

A large spill event producing a quantity of soil that cannot be contained in the landfarm is unlikely because the landfarm is designed to hold nearly two times as much contaminated soil as is expected to be produced. Nevertheless, in this event, soils will be placed in a temporary storage area. A temporary stockpile area would be set up on an emergency basis, such as in the WRSF or the TSF. As space becomes available, the soil would be added to the landfarm. Through spill prevention measures discussed earlier in this Plan, Agnico Eagle is minimizing the probability of this scenario occurring.

4.2 Alternate Treatment Options

Should landfarm treatment not perform as anticipated and it is evident that rates of degradation are not sufficient to meet GN Tier 1 criteria within the life-of-mine and the anticipated closure, the following alternative treatment options will be considered. Implementation will be after development of a more detailed protocol and approval of a revised plan by the NWB.

4.2.1 SOIL AMENDMENT

Since pH, salinity, moisture content, and microbial population density all affect rates of biodegradation by microbes, these factors may be monitored and adjusted through soil amendments if they are not found to be optimal (SAIC 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the landfarm allows.

4.2.2 TIER 2 – MODIFIED-CRITERIA APPROACH

According to the GN *Environmental Guideline for Contaminated Site Remediation* (GN 2009), in cases where site conditions, land uses, receptors, or exposure pathways are different from those assumed in the development of the Tier 1 criteria, modified criteria may be permitted. This process requires the collection of site-specific information on exposure and risk estimates, and is subject to GN approval. For the Meliadine Mine, landfarmed soils are to be encapsulated in a WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, a Tier 2 approach could be warranted if Tier 1 criteria cannot be met. A science based approached was thus employed in the landfarm RAP (Appendix B) to develop site-specific PHC remediation guidelines based on the AMSRP and pathways and receptors present at Meliadine Mine.

4.2.3 DIRECT PLACEMENT IN WASTE ROCK STORAGE FACILITY OR ON TAILINGS STORAGE FACILITY

Another option for management of contaminated soil if bioremediation proves not effective would be the direct placement of this material in a WRSF or on the TSF. Although the use of PHC contaminated soils in these storage areas is not optimal, the quantity generated on-site is small in comparison to the quantity of waste rock and cover on the TSF. While this method would not result in the treatment of soil, it is a viable contingency option because it would allow for the safe disposal of the contaminated material. Encapsulation and freeze-back would occur, eliminating any movement of contaminants. Over time, this material would undergo natural degradation. Consideration of this option would also include a suitable monitoring program for PHCs, which would be incorporated into the Closure and Reclamation Plan.

SECTION 5 • ASSESSMENT AND REPORTING

5.1 Feasibility

After two seasons of treatment in the landfarm, degradation rates of PHC contaminants are assessed to estimate the total remediation time required under these conditions. If remediation to GN guidelines is feasible within the life-of-mine timeframe, landfarm operations will continue, with aeration and possible nutrient amendments as described above. If rates of degradation are not sufficient through this method, alternate options will be further investigated (Section 4).

5.2 Reporting

Reporting of landfarm activities is submitted annually by the Environment Department, indicating the volume of material added to the facility, amount of material removed and disposed or the re-use location, and confirmatory analysis results. This information will be appended to Agnico Eagle's NWB Annual Report.

5.3 Plan Review and Continual Improvement

The Landfarm Management Plan is reviewed annually by the Meliadine Environmental Department, and, if necessary, updated at least every two years of operation.

REFERENCES

Agnico Eagle (Agnico Eagle Mines Limited). 2008. Landfarm Design and Management Plan In Accordance with Water License 2AM-MEA0815, Meadowbank Gold Project, 20 p. + Figures and Appendix. October 2008.

Agnico Eagle. 2017. Version 1.1, Supporting Document 8-2 Oil Pollution Emergency Plan, Final Environmental Impact Statement, Meliadine Gold Project, Nunavut. Submitted to the Nunavut Impact Review Board. September 2017.

EBA. 2010. Hydrocarbon Impacted Soils Storage and Landfarm Facility Operations, Maintenance and Monitoring Plan, Milne Inlet, Mary River Project, Nunavut. Prepared for: Baffinland Iron Mines Corporation. Issued for Review. December 2010.

Golder (Golder Associates Ltd). 2007. Technical Memorandum: Landfarm Option Analysis, Meadowbank Gold Project, Nunavut. Prepared for: Agnico-Eagle Mines Ltd. August 23, 2007.

Government of Nunavut, March 2009. Environmental Guideline for Contaminated Site Remediation http://env.gov.nu.ca/sites/default/files/Guideline%20Contaminated%20Site%20Remediation.pdf

Paudyn, K. et al, 2008. Remediation of hydrocarbon contaminated soils in the Canadian Arctic by landfarming. Cold Regions Science and Technology, v53, p 102-114, n 1 June 2008

SAIC (Science Applications International Corporation), 2006. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Final report presented to: Contaminated Sites Division and Emergencies Engineering Technologies Office (EETO), Environmental Technology Centre, Environment Canada. SAIC Canada Project #: 11953.B.S08. CM #: 001659. March 31, 2006.

TetraTech EBA. 2014. Tailings, Waste And Water Management For Feasibility Level Study Meliadine Project, Nunavut, FILE: E14103188-01, AEM Report Number: 6509-REP-05, 145 p. + Appendix.

APPENDIX A

AGNICO EAGLE NUNAVUT

DOCUMENT ID: NU-E&I-PRO – Land farm soil movement	
People concerned: Site services HEO, environmental department	**Effective Date: 2018-03-13**
This procedure corresponds to the required minimum standard. Each and everyone also have to comply with the rules and regulations of the Nunavut Government in terms of health and safety at work.	

Rev #	Date	Description	Initiator
0	2018-03-13	Draft	Guillaume Gemme

Objective:

- Safe operation of equipment during land farm soil movement

Definitions (If applicable):
This procedure is in place to ensure proper usage of heavy equipment on the land farm during the soil movement process.

Tool/Equipment Required	PPE Required
• Heavy equipment (Backhoe/excavator/ Dozer/ Etc.) equipped with flat lip bucket to avoid membrane damage • Measuring device (Ex: Measuring tape) • Shovel and broom	• Standard PPE

Specific Training Requirements
• Appropriate Heavy equipment operator training. (Class 2 Operator or equivalent)

1. Access to the Land farm a. Before entering the land farm, the operator need to have the approval of the Site Services field Supervisor and be accompanied by an environmental representative. 2. Soil movement a. Following the environmental department direction, proceed with the requested soil movement work. (Drawing of the work to be done including exact location, dimension of the area and maximum deepness to reach need to be done by Environment department before proceeding with the work) b. Sampling will be completed by environment department following procedure : MEL-ENV-Permanent Land farm & Soil Sampling

AGNICO EAGLE NUNAVUT

3. Equipment decontamination
   a. Before exiting the area, make sure to remove all contaminated soil from the heavy equipment.
   b. Using a hand shovel remove all contaminated soil on the equipment. If required use a broom to reach all potential contaminated parts of equipment
   c. Call the field supervisor to assess the equipment cleanness before exiting the land farm.

Related Documentation (If applicable):
• N/A

References (If applicable):
• Meliadine Water license type A (Land farm Management plan)

Appendix (If applicable):
• Pictures • Plans

APPENDIX B. LANDFARM REMEDIAL ACTION PLAN

GOLDER
MEMBER OF WSP

REPORT

Agnico Eagle - Meliadine Gold Project

Landfarm Remedial Action Plan

Submitted to:

Agnico Eagle Mines Limited
11600, rue Louis-Bisson
Mirabel, Quebec, Canada
J7N 1G9

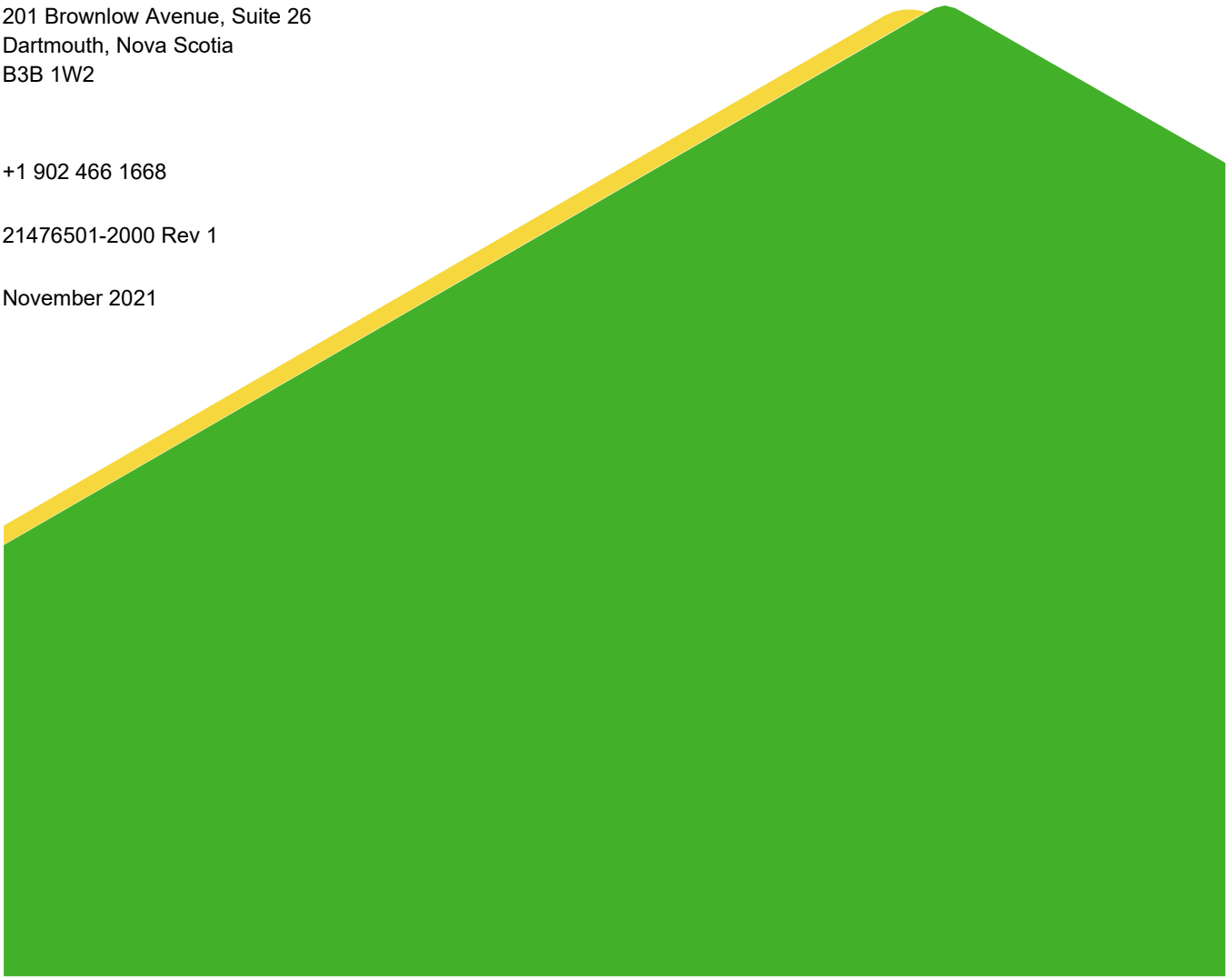
Submitted by:

Golder Associates Ltd.
201 Brownlow Avenue, Suite 26
Dartmouth, Nova Scotia
B3B 1W2

+1 902 466 1668

21476501-2000 Rev 1

November 2021



Distribution List

1 Electronic Copy: Agnico Eagle Mines Limited

1 Electronic Copy: Golder Associates Ltd.

Table of Contents

TABLES [in text]

TABLES [after text]

List of Abbreviations

>	greater than
<	less than
°C	decrees Celsius
%	Percent
AANDC	Aboriginal and Northern Affairs Development Canada
AMSRP	Abandoned Military Site Remediation Protocol
BTEX	benzene, toluene, ethylbenzene, xylenes
CCME	Canadian Council of Ministers of the Environment
cm	centimetres
CP1	collection pond 1
CRP	Closure and Reclamation Plan
CWS	Canada Wide Standards
DEW	Distant Early Warning
DIAND	Department of Indian Affairs and Northern Development
EBA	EBA Engineering Consultants Ltd.
Earth Tech	Earth Tech Canada Inc.
F1, F2, F3, F4	petroleum hydrocarbon fractions 1, 2, 3, 4
Golder	Golder Associates Ltd.
GN	Government of Nunavut
HHERA	human health and ecological risk assessment
Imperial	Imperial Oil Limited
INAC	Indian and Northern Affairs Canada
IWB	Inuvialuit Water Board
Jacques Whitford	Jacques Whitford Ltd
km	kilometres
LMP	landfarm management plan

m	metre
m^2	squared metres
m^3	cubic metres
mm	millimetre
mbgs	metres below ground surface
mg/kg	milligrams per kilogram
NAPL	non-aqueous phase liquid
NIRB	Nunavut Impact Review Board
NRC	National Research Council
NWB	Nunavut Water Board
NWT	Northwest Territories
PHC	petroleum hydrocarbon
PID	photoionization detector
RAP	Remedial Action Plan
SCP	Spill Contingency Plan
SENES	SENES Consultants
SSTL	Site Specific Target Level
Stantec	Stantec Consulting Ltd.
SNC	SNC-Lavalin Inc.
TPH	total petroleum hydrocarbon
TSF	tailings storage facility
WorleyParsons	WorleyParsons Canada
WRSF	waste rock storage facility

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Agnico Eagle to develop a Remedial Action Plan (RAP) outlining a proposed approach for managing petroleum hydrocarbon (PHC)-impacted soil at the Meliadine Mine (the Project). The RAP includes an overview of the Project landfarming activities, site conditions and a review of the regulatory framework for PHC remediation in the arctic. The objective of the RAP is to provide Agnico Eagle with site-specific PHC remediation guidelines that, based on the pathways and receptors present at the Project, are more suitable/applicable to the future end land use than those currently being applied. The RAP will be included as an attachment in the updated Landfarm Management Plan (LMP) which will form a part of the documentation submitted to the Nunavut Impact Review Board (NIRB) and Nunavut Water Board (NWB) for the Meliadine Extension permitting application.

The remainder of this document is structured as follows:

- Section 1.1 provides a brief overview of the current management of PHC contaminated soil at the Project.
- Section 2 provides a site description of the Project area.
- Section 3 describes the landfarm design.
- Section 4 details the contaminant types that are permitted for treatment in the landfarms.
- Section 5 provides a review of the regulatory framework for PHC remediation guidelines in the arctic, including a description of how the proposed Abandoned Military Site Remediation Protocol (AMSRP) guidelines were developed.
- Section 6 presents the applicable AMSRP guidelines based on the site-specific conditions of the Project.
- Section 7 details the RAP for soil treated in the landfarm, including minimum sampling requirements and the end use of treated soil.
- Section 8 describes recommended post-remedial monitoring activities following closure of the landfarm.
- Section 9 provides a summary.

1.1 Background

The Project operates a Type A Landfarm, associated with the NWB Type A Water Licence 2AM-MEL1631, for on-site storage and remediation of light-end PHC-contaminated soil that is generated at the mine site. This involves screening, mixing and placement of contaminated soil into windrows to enhance the conditions for volatilization and aerobic microbial degradation of PHCs.

The landfarm accepts soil, rock, snow and ice from the mine site that is contaminated with diesel fuel, gasoline, aviation fuel, hydraulic oil and other light oil (e.g., engine oil, lubricating oil) associated with on-site activities. Coarse-grained material (>2.5 centimetres [cm] diameter) is being separated from fine-grained material in the landfarm as biodegradation is not as effective in coarse-grained material due to low moisture content. However, PHC concentrations can still be reduced in coarse-grained material through volatilization. Coarse-grained soils are assessed by Meliadine Environment Department technicians near the end of each summer season for PHC odour and visible liquid PHC. When PHC odours are no longer detected using a photoionization detector (PID), the material may be removed to the waste rock storage facility (WRSF) or used as cover material in the tailings storage facility (TSF).

Fine-grained material is retained in the landfarm and placed into windrows. To promote aerobic conditions in the windrows, the soil is mixed multiple times a year during the summer months and water is added from the landfarm area or collection pond 1 (CP1) if the windrows are too dry (Agnico Eagle 2019a). Nutrient amendments were added to the windrows in 2018, 2019 and 2020 during mixing (Agnico Eagle 2019b, 2020, 2021). Contaminated snow and ice are placed in a designated area of the landfarm and treated as contact water after snowmelt. Contaminated water collected in the landfarm is pumped through the oil-water separator to remove PHC residue and is discharged to CP1.

To assess the success of the remediation of the fine-grained soil, composite samples are collected for each 10 metres (m) of windrow length (composite of three surface and three sub-surface [>1 m deep] samples) for PHC analyses at the end of the summer season and compared to the Government of Nunavut (GN) Tier 1 soil remediation criteria for surface soil in an agricultural/wildlife or industrial setting (GN 2009). Successfully remediated fine-grained soil with PHC concentrations less than the applicable GN Tier 1 criteria is then removed from the landfarm and stockpiled for use in site works or reclamation (if agricultural/wildlife criteria met) or placed in the WRSF (if industrial criteria met). It was estimated in the LMP that soils contaminated with light-end PHCs would take three years to meet the remediation criteria (Agnico Eagle 2019a). Based on the analytical results of the landfarm sampling, the rate of biodegradation in the Type A Landfarm is not performing as anticipated, taking more than three years to biodegrade PHC to less than the GN Tier 1 criteria.

In addition to the Type A Landfarm, there is a Type B Landfarm associated with NWB Water Licence 2BB-MEL1424, containing PHC-contaminated soil from the exploration phase. Material is not actively being treated while in the Type B Landfarm. As space becomes available in the Type A Landfarm, material will be transferred from the Type B Landfarm to undergo active remediation.

As part of Meliadine Extension, Agnico Eagle is also proposing to add two landfarms (i.e., Wesmeg and Discovery) to optimize contaminated soil management. This plan will also apply to these landfarms.

A human health and ecological risk assessment (HHERA) was conducted by Golder (2014) to evaluate the potential for adverse health effects on humans and terrestrial and aquatic life associated with changes in environmental quality due to chemical releases from the Meliadine Gold Project. The HHERA considered the impact from airborne emissions, dust generation and subsequent atmospheric deposition to soil and surface water, as well as discharges to aquatic environments occurring through the operations of the mine. Spills and leaks of PHCs from equipment during operation were not included in the pathway analysis of the HHERA because of the mitigation measures in place to address these occurrences within the LMP (Agnico Eagle 2019a) and Spill Contingency Plan (SCP) (Agnico Eagle 2015b). Therefore, the LMP and, by extension, this RAP, do not fall within the purview of the HHERA and any proposed changes to the guidelines for assessing PHC concentrations in landfarm soils will not impact the HHERA.

2.0 SITE DESCRIPTION

2.1 Location

The Project is in the Kivalliq Region, Nunavut, on Inuit Owned Lands. The Project is on the eastern shore of Hudson Bay on a peninsula between the east, south and west basins of Meliadine Lake (63°1’23.8” N, 92°13’6.42”W). The Type A Landfarm is central to the mine workings and the Type B Landfarm is to the southeast.

The nearest communities to the Project are Rankin Inlet, approximately 25 kilometres (km) to the south, and Chesterfield Inlet, approximately 80 km to the northeast. The Project is accessed via the airport in Rankin Inlet and the All-weather Access Road, which will be completely removed during the post-closure phase of the Project (Agnico Eagle 2015c).

2.2 Physiography and Topography

The Project is near the northern boarder of the southern Arctic terrestrial ecozone. The area is dominated by drumlins (glacial till), eskers (gravel and sand) and waterbodies. Low relief ridges of glacial deposits oriented to the northwest-southeast control the regional surface drainage and the Project is in low-lying topography with many waterbodies and is at about 60 metres above sea level (Agnico Eagle 2015a).

2.3 Climate

The Project is within the Arctic tundra climate region, characterized by long cold winters and short cool summers. The mean annual air temperature based on climate normals for Rankin Inlet is approximately -10.4 decrees Celsius (°C) with monthly averages ranging from +10.5°C in July to -30.8°C in January and above freezing average temperatures for June to September (Environment Canada 2021, internet site). Mean annual precipitation is estimated to be 411.7 millimetres (mm) per year with 49 percent (%) falling as snow and 51% as rain (Agnico Eagle 2015a).

2.4 Permafrost

The Project is in a zone of continuous permafrost with intervening thaw bulbs and taliks. The permafrost in the region has an average annual surface temperature and zero amplitude temperature of less than -4 °C. The depth of permafrost at the Project is generally between 360 to 495 m and the depth of the active layer ranges from approximately 1 m in areas with shallow soil and up to approximately 3 m adjacent to lakes. The depth of the permafrost and active layer varies based on distance to the lakes, vegetation, climate conditions, overburden thickness and slope direction (Agnico Eagle 2015a). Ground ice content is expected to be less than 10% (dry permafrost) based on the regional scale (National Research Council [NRC] 1995), with areas of local ground ice associated with low-lying areas of poor drainage (Agnico Eagle 2015a).

2.5 Surface Water

The Project is on a peninsula between the east, south and west basins of Meliadine Lake with numerous small shallow lakes and ponds on the peninsula. The Type A Landfarm is approximately 80 m southwest of the CP1 and approximately 550 m southwest of Meliadine Lake. The Type B Landfarm is approximately 250 m southeast and north of some small ponds.

2.6 Groundwater

Areas of continuous permafrost typically have two groundwater flow regimes: shallow flow in the active layer near surface and deep flow below the permafrost. Shallow groundwater flow in the active layer occurs between spring and fall when the temperatures are greater than 0°C, where water flow follows surface topography. Shallow groundwater in the area of the Project flows towards local depressions and ponds that drain to lakes at estimated velocities of approximately 0.0025 to 0.02 m/day (Agnico Eagle 2015a). Permafrost in the bedrock would be nearly impermeable, with virtually no hydraulic connection between the active layer and the deep groundwater flow regime, except for taliks below lakes that extend to the base of the permafrost layer.

Open taliks of this nature may exist below Meliadine Lake and Lake B7. Groundwater flow velocity in the deep flow regime and in taliks is estimated to be approximately 0.2 to 0.3 m/year (Agnico Eagle 2015a).

Groundwater is not a source of drinking water in the area of the Project due to the continuous permafrost and the thin active layer.

2.7 Vegetation

Vegetation community types identified in the Project area include upland terrestrial vegetation classes (heath vegetation – low-growing evergreen shrubs [e.g., Labrador tea, bearberry and black crowberry]), wetland classes (wet sedge meadows or tussock hummock areas and low shrubby riparian vegetation along waterbodies) and unvegetated classes (bare ground and water and areas disturbed by pre-mining activities) (Agnico Eagle 2015a).

2.8 Land Use

The current land use is for industrial purposes. The Project preliminary Closure and Reclamation Plan (CRP) described the plan to carry out closure activities and establish self-sustaining ecosystems with similar land uses to pre-development conditions (Agnico Eagle 2015c). The CRP is updated throughout the Project life and the interim CRP (SNC-Lavalin Inc. [SNC] 2019) set out the following specific objectives:

- physically and chemically stable lands and waters at the reclaimed Meliadine site that are safe for human, wildlife and aquatic life;
- lands and waters at the reclaimed Meliadine site that allow for traditional uses;
- final landscape guided by pre-development conditions and traditional knowledge; and
- post-closure conditions that, where appropriate, do not require a continuous presence of Project staff until a walk-away condition is achieved (SNC 2019).

Some areas may be left in a semi-industrial condition with different end land use if agreed upon with regulators and community (SNC 2019).

The surrounding land use is undeveloped and may be used for traditional land uses.

2.9 Geology

Surficial geology in the Project area consists of a silty sand and gravel, with cobbles and boulders (till, marine sediments and beach ridges), underlying a thin layer of topsoil. Bedrock is encountered between approximately 2 and 18 metres below ground surface (mbgs) and is composed of a sequence of greywacke and siltstone, iron formation and mafic volcanics and volcaniclastics of the Archean Rankin Inlet Greenstone Belt (Agnico Eagle 2015a).

3.0 LANDFARM DESIGN

Tetra Tech was retained by Agnico Eagle to undertake the detailed design of the Type A Landfarm. The landfarm was designed based on the following (Tetra Tech 2017):

- The landfarm will have a raised base with perimeter containment berms, constructed over the original ground with no or minimum excavation to avoid disturbing the permafrost foundation.

- A geomembrane liner system will be enclosed in the landfarm base and perimeter berms to contain drainage/leachate and runoff water from the PHC-impact soils and thawing snow/ice in the landfarm.
- The landfarm base will have a gentle slope, generally parallel to the original ground surface, which has a slope of approximately 3%.
- A sump area will be built in the lower portion of the landfarm to temporarily collect the drainage/leachate and runoff water.
- A pumping station with an oil separator will be installed on a pad close to the landfarm. The water in the landfarm sump will be pumped to the oil separator, on an as needed basis, to remove the oil products in the water. The treated water will then be pumped to CP1.
- A dedicated zone for temporary storage of the PHC-impacted snow/ice during each winter period will be in the lower portion of the landfarm close to the sump area, without blocking the natural drainage within the landfarm.
- A pad around the entrance to the landfarm will serve as an unloading zone for the PHC-impacted soils and snow/ice to avoid heavy equipment traffic over the area with the geomembrane liner system. A shovel or dozer with relatively low ground pressure will move the materials from the unloading area into the landfarm.
- Upon landfarm start-up, PHC-impacted soils that are temporarily stored at the site will be transferred and uniformly spread over the majority of the inside base of the landfarm, except for the sump and nearby areas. This initial layer of PHC-impacted soils will serve as a base for future lifts of incoming PHC-impacted soils.
- The PHC-impacted soils/rock will be typically treated for three years in the landfarm. After three years, the treated soils/rock that meet the treatment criteria can be removed from the landfarm to provide space for the PHC-impacted soils/rock for a future year.

4.0 LANDFARM CONTAMINANTS

As detailed in the LMP (Agnico Eagle 2019a), the landfarms only accept soil, snow and ice from the mine site that are contaminated with diesel fuel, gasoline, aviation fuel, hydraulic oil and other light oil (e.g., engine oil, lubricating oil) generated through mine-related activities at the Project. If the source of contamination is unknown, the material is placed in totes or drums until soil samples collected and analyzed for PHCs, total metals, oil and grease, and volatile organic compounds can confirm that the soil is only contaminated with PHCs approved for treatment in the landfarm. Soils contaminated with non-PHCs, such as solvents, are placed in drums for off-site disposal at approved facilities. Snow and ice are placed in a designated snow-cell area where it is considered contact water after snowmelt. Once melted, the water is pumped through the oil-water separator and discharged to CP1 (Agnico Eagle 2019a).

Contaminated soil is placed into windrows in the Type A Landfarm, where it is aerated multiple times during the summer and sampled as per the LMP (Agnico Eagle 2019a). Contaminated soil in the Type B Landfarm is from the exploration stage of the Project. The soil is undergoing natural remediation until there is space in the Type A Landfarm for active bioremediation treatment.

5.0 REGULATORY FRAMEWORK

Contaminated sites in Nunavut are managed through the *Environmental Protection Act* which gives the GN authority to take measures to ensure the protection, preservation and enhancement of the environment. The act

gives the Minister of Environment the authority to administer the Environmental Guideline for Contaminated Site Remediation (GN 2009).

The guidelines provide GN Tier 1 contaminant-specific remediation criteria for four land uses: agricultural/wildland, residential/parkland, commercial and industrial. The LMP currently applies the GN Tier 1 PHC soil remediation criteria for surface soil in an agricultural/wildlife or industrial setting as the target for successfully treated soil that can be removed from the landfarms (Agnico Eagle 2019a).

The GN Tier 1 PHC criteria, however, are considered generally protective of human and environmental health for the 'normal' activities associated with each land use (GN 2009). This may not, based on site-specific conditions, be applicable to remote sites in the arctic, resulting in remediation targets that are unnecessarily conservative given the pathways and receptors present in remote arctic environments.

To address this gap, the AMSRP Volume I Main Report and Volume II Chapter 4 (Protocol for the Evaluation of Hydrocarbon Impacted Sites) were developed to provide modified hydrocarbon remediation guidelines for Distant Early Warning (DEW) Line sites and other abandoned military sites in the arctic where the protection of all receptors may not be applicable (Indian and Northern Affairs Canada [INAC] 2008a,b). The development of the guidelines incorporated the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards (CWS) for PHC Tier 1 criteria and Site-Specific Target Level (SSTL) obtained by Jacques Whitford Ltd. (Jacques Whitford 2005, 2006) through quantitative risk assessments at INAC sites. A review of the modified hydrocarbon remediation guidelines and how they were developed is presented in Section 5.1 and a review of select artic sites where the AMSRP guidelines have been used for PHC remediation is presented in Section 5.2.

5.1 Abandoned Military Site Remediation Protocol

The AMSRP was developed to provide a consistent protocol for abandoned military site cleanup in the arctic and is based on an approach that addresses legal requirements, INAC's Contaminated Sites Policy and standard environment practices (INAC 2008a). Hydrocarbon contamination is pervasive at most northern military sites and is associated with fuel storage, distribution, dispensing, vehicle repair, power generation, spills, long term leakage and/or inappropriate disposal of hydrocarbon wastes. The AMSRP Volume II Chapter 4 provides a framework for assessing hydrocarbon contamination at abandoned military sites whose remedial objectives address the potential risks to human health and the environment while considering the economic cost and potential negative impacts of remediation on the arctic environment (INAC 2008b). The typical hydrocarbon contaminant sources and their distribution in the environment, potential exposure pathways and receptors, remedial objectives and minimum sampling requirements described in the AMSRP are summarized below.

5.1.1 Contaminant Source and Distribution

The main type of hydrocarbon contamination at abandoned military sites in the arctic is diesel fuel with lesser quantities of soil contaminated with lubricating oils. Diesel is typically composed of mid-range petroleum products (petroleum hydrocarbon fractions F2 and F3) with insignificant amounts of F1. Benzene, toluene, ethylbenzene, xylenes (BTEX) concentrations may be low but are not considered the driving force for remedial activities. Lubricating oils are typically composed of the F3 and F4 fractions. The AMSRP has designated soils containing predominantly F3 and F4 hydrocarbons as Type A total petroleum hydrocarbon (TPH) (non-mobile; sum of F3 and F4 must be greater than 70% of the sum of F1 to F4 plus the F2 concentration must be less than the F4 concentration) and predominantly F2 and F3 as Type B (mobile). Hydrocarbon contamination in the subsurface can occur in: 1) the liquid phase (non-aqueous phase liquid [NAPL]) which is mobile in response to gradients; 2)

the residual phase on soil surfaces in pore spaces which is not mobile; 3) the dissolved phase that is transported with groundwater flow; and 4) the vapour phase which is mobile (INAC 2008b).

The DEW line sites across the arctic are within the zone of continuous permafrost, with a depth range of 1 to 2 m. NAPL released to soil in this environment migrates downward to the water table or until it reaches the permafrost table where it may spread laterally following topography or the permafrost surface (if permafrost is ice-saturated and well bonded). The mobility of the NAPL in the subsurface is associated with total porosity pore space interconnectivity and water content. The residual concentration in soil below which NAPL will not be mobilized by gravity or advection was estimated based on typical grain size distributions at arctic sites and NAPL characteristics. The residual concentration of Type A and Type B contamination, below which the NAPL will not be mobile, was conservatively estimated as 20,000 and 5,000 milligrams per kilogram (mg/kg), respectively (INAC 2008b).

Groundwater occurs in the active layer and given its shallow depth, may respond rapidly to precipitation. The rising water table may dissolve hydrocarbons present in the active layer. Groundwater flow in the active layer is defined by lithology, hydrogeological characteristics and the presence of permafrost. The study of abandoned military sites in the arctic suggests that groundwater flow in these environments is intermittent and discontinuous resulting in contamination that is localized. Contaminated groundwater may, however, flow to nearby surface water environments. Therefore, groundwater contamination is generally not of concern at arctic sites, unless a hydraulic connection between the contaminated area and a surface water body with aquatic life can be established. Surface water transport of contaminated sediment is a potential concern in areas that experience erosion (INAC 2008b).

Volatilization of hydrocarbon products is not considered a significant source of contaminant migration due to the cold temperatures and the short frost-free period (INAC 2008b).

5.1.2 Potential Exposure Pathways and Receptors

Numerous quantitative and qualitative risk assessments were carried out for DEW Line sites by Jacques Whitford (2005, 2006) in which potential exposure pathways and receptors were identified. The following section describes the guidelines that are protective of each receptor and the applicability of the guidelines to arctic sites is described in Section 5.1.3.

Human Health

Humans were identified as receptors that may be exposed to contaminated soil via soil contact/ingestion. The CCME CWS provide PHC Tier 1 guidelines that are protective of human health (dermal contact and soil ingestion) that were derived for the most sensitive receptor (i.e., toddler that ingests 100% of their daily intake of soil and is drinking water and breathing indoor air from the property). The CCME CWS PHC Tier 1 guidelines are presented in Table A below (INAC 2008b).

Soil Invertebrates/Vegetation

Soil invertebrates and vegetation were identified as receptors that may be exposed to contaminated soil through soil contact/ingestion (soil invertebrates) and porewater uptake (vegetation). The CCME CWS PHC has guidelines for ecological soil contact that are based on the exposure of soil invertebrates, microbes and vascular plants to hydrocarbons. The guidelines include values for surface soils (0 to 1. 5 m) and subsoils (greater than 1.5 m) and are based on plant root growth and soil invertebrate contact. In arctic environments, invertebrates and root depth are generally limited to the top 0.10 m of the soil horizon and the permafrost table is generally between

1 and 2 m; therefore, a depth of 1.5 m is not considered applicable in the arctic. Surface soils defined as between 0 and 0.5 m are considered more appropriate for artic environments.

Below a depth of 3 m, the CWS allows the exclusion of ecological soil contact with the application of management limits, which consider that soils at these depths are not available to certain receptors. The CCME CWS ecological direct contact guidelines are presented in Table A below (INAC 2008b).

Terrestrial Wildlife/Avi-fauna (Birds)

Terrestrial wildlife and avi-fauna were identified as receptors that may be exposed to contaminated soil through soil contact/ingestion and the ingestion of terrestrial plants and birds/mammals as prey. The exposure of terrestrial wildlife and avi-fauna to hydrocarbon-impacted soil is based on their home range and duration of residence. Species with smaller home ranges are potentially near or on impacted areas for longer time periods, leading to higher estimated total daily intake values. Risk assessments carried out by Jacques Whitford (2005, 2006) identified the most sensitive receptor to be the Rock Ptarmigan. When soils are contaminated with PHCs, Rock Ptarmigan which have an estimated home range of 24 hectares, are exposed through direct soil ingestion, consumption of terrestrial invertebrates and terrestrial plants. A SSTL for hydrocarbons of 2,350 mg/kg was derived from toxicology studies of mallard ducklings. Alberta Environment (2007) provides guidelines for wildlife soil and food ingestion with the meadow vole selected as the most sensitive receptor. The Alberta guidelines and the SSTL are presented in Table A below (INAC 2008b).

Aquatic Life

Aquatic life was identified as a receptor that may be exposed to contaminated soil through ingestion of surface water. The CCME CWS PHC guidelines for the protection of surface water quality is based on simplified hydrogeological flow and transport models and are only considered applicable for impacted areas that are less than 10 m from a surface water body. The models used to develop the guidelines use several assumptions that are not considered applicable in the arctic environment. AMSRP developed modified guidelines that incorporate arctic conditions and are applicable to impacted areas within 30 m of surface water bodies. Guidelines were not derived for F3 and F4 fractions because they are essentially insoluble. The AMSRP soil quality guidelines for the protection of aquatic life are presented in Table A below (INAC 2008b).

Table A: Summary of Human Health and Environmental Guidelines.

Hydrocarbon Fraction	Human Health - Direct Soil Contact (mg/kg)[a]	Ecological - Direct Soil Contact (mg/kg)		Wildlife - Soil and Food Ingestion (mg/kg)		Soil Quality for the Protection of Aquatic Life (mg/kg)[e]
		Surface Soil[a]	Management Limit[b]	Alberta[c]	SSTL[d]	
F1	12,000	210	700	11,000	2,350 to 10,880	1,290
F2	6,800	150	1,000	9,800		330
F3	15,000	300	2,500	16,000		-
F4	21,000	2,800	10,000	8,400		-

[a]Residential/Parkland coarse-grained surface soils (CCME CWS 2008)
[b]Below 3.0 m (CCME CWS 2008)
[c]Alberta Environment (2007)
[d]Jacques Whitford (2006)

[e]Impacted area within 30 m of surface water body (INAC 2008b)
- not available

5.1.3 AMSRP Remedial Objectives for Hydrocarbon Contaminated Soil

The guidelines that are protective of each receptor were summarized in Section 5.1.2 and Table A. The following section describes which guidelines were considered applicable to remote arctic sites and were included in the remedial objectives for PHC-contaminated soil at abandoned military sites in the arctic.

Freshwater Aquatic Life

As described in Section 5.1.2, the AMSRP developed F1 and F2 guidelines for the protection of freshwater aquatic life that incorporate arctic conditions and are applicable to impacted areas within 30 m of surface water bodies. Guidelines were not derived for F3 and F4 fractions because they are essentially insoluble (INAC 2008b). These guidelines were included in the remedial objectives for PHC-contaminated soil at abandoned military sites in the arctic to be applied if the PHC-impacted area is within 30 m of a surface water body (Table B).

Direct Soil Eco-contact

While the AMSRP recognizes that soil conditions support eco-system function, the applicability of the guidelines in Table A to abandoned military sites in the arctic also took into account: 1) the areal extent of hydrocarbon impacts relative to the surrounding local habitat where the total area of the site is considered minor and impacts are localized and associated with disturbed areas that do not support significant vegetation growth; 2) disturbances associated with remediation (e.g. excavation, backfill sources, treatment area) results in a larger physical footprint than original impacted area; and 3) economic considerations. Considering the above and striking a balance between scientific and economic factors, the AMSRP did not include specific numerical guidelines for the protection of the direct ecological soil contact pathway in the remedial objectives for PHC-contaminated soil at abandoned military sites in the arctic (INAC 2008b) and they were not incorporated into Table B below.

Terrestrial Wildlife

The AMSRP selected a guideline of 2,500 mg/kg for Type B hydrocarbons based on the results of the site-specific risk assessments done by Jacques Whitford (2005, 2006), and based on arctic conditions, is considered only applicable to the top 0.5 m of the soil horizon. This value is also conservative when compared to the Alberta Environment (2007) guidelines in Table A. A guideline for Type A hydrocarbons was not selected because Type A impacts are typically localized and limited (INAC 2008b). The guideline of 2,500 mg/kg was included in the remedial objectives for PHC-contaminated soil and is included in Table B.

Human Health

The CWS guidelines listed in Table A that are protective of human health are considerably less conservative than the selected guideline of 2,500 mg/kg for Type B hydrocarbons for the protective of terrestrial wildlife; therefore, no guidelines are provided for the protection of human health for Type B hydrocarbons. The CWS guidelines listed in Table A for F3 and F4 (Type A) are 15,000 and 21,000 mg/kg, respectively. In a risk assessment based on traditional land use, Jacques Whitford (2005, 2006) developed a SSTL for F3 of 20,000 mg/kg. As this is generally consistent with the CWS guideline, it was adopted by the AMSRP as the guideline that is protective of human health for Type A hydrocarbons (INAC 2008b) and is included in Table B below.

Management Limits

The AMSRP recognized that hydrocarbon contamination impacts are not restricted to ecological and human receptors. The CWS developed managements limits that addresses the formation of free phase product (NAPL), vapour exposure in trenches, fire and explosive hazard, off-site migration, aesthetics and impacts of buried infrastructure.

The AMSRP considered the formation of NAPL, aesthetics and off-site migration to be applicable to abandoned military sites. The management limit was set at 5,000 mg/kg for Type B hydrocarbons for depths greater than 0.5 m and is based primarily on the potential for NAPL to form in coarse-grained material (INAC 2008b).

Table B: Summary of AMSRP Remedial Objectives for Hydrocarbon-Contaminated Soil

Hydrocarbon Fraction	Freshwater Life (mg/kg)[(a)]	Direct Eco-soil Contact (mg/kg)	Terrestrial Wildlife (mg/kg)	Human Health (mg/kg)	Management Limit (mg/kg)
F1	1,290	Not utilized	-	-	-
F2	330		-	11,000	-
F3	-		-	20,000	-
F4	-		-	-	-
Type B Hydrocarbon	330		2,500[(b)]	-	5,000[(c)]
Type A Hydrocarbon	-		-	20,000	-

[(a)]Within 30 m of a water body
[(b)]For surface soils to 0.5 m depth
[(c)]Below 0.5 m depth, may be applied based on professional judgement
- not available

5.1.4 Minimum Sampling Requirements

The AMSRP specifies a minimum sampling frequency for confirmatory sampling of excavated areas. This sampling frequency is further discussed in Section 8.1 on post-remediation confirmation soil sampling of the base and berms of the landfarms.

The AMSRP describes a sampling protocol for soils excavated from landfills and dumps where the material is stockpiled in piles with maximum volumes of 20 cubic metres (m^3) and five discrete and one composite sample are collected from every pile for the first 20 piles and then from every 20^{th} pile thereafter.

The AMSRP does not, however, specify a sampling frequency for PHC-impacted soil undergoing treatment in a landfarm. Therefore, a sampling frequency for the treated landfarm soil has been selected based on other jurisdictions and is presented in Section 7.3.

5.2 Petroleum Hydrocarbon Remediation Examples in the Arctic

The development of the AMSRP guidelines for PHC remediation was based on human and ecological risk assessments conducted at two DEW Line sites (FOX-A and Simpson Lake) by SENES Consultants (SENES 2003 a,b), and four DEW Line sites (FOX-C, CAM-F, CAM-D, BAR-D) and two additional abandoned military sites (Radio Island and Johnson Point) by Jacques Whitford (2005, 2006). In addition to these sites, the AMSRP remediation guidelines have been used to undertake remediation at numerous other DEW Line sites, other abandoned military sites and non-military sites. A review of the use of the AMSRP guidelines for PHC remediation at selected sites relevant to the current project is presented in Table C below.

Table C: Projects in Nunavut and the Northwest Territories Applying the AMSRP Guidelines to PHC Remediation.

Name, Location	Historical Use	Organization	Guidelines Applied for PHCs	PHC Remediation
Cape Christian, Baffin Island, Nunavut	LORAN communications station	Department of Indian Affairs and Northern Development (DIAND)	RAP proposed the use of AMSRP guidelines for F2 and F3 hydrocarbon-impacted soils (Earth Tech 2007).	NWB approved the use of a landfarm facility to treat Type B hydrocarbon-impacted soils in accordance with the water licence application (and RAP contained therein) (NWB 2008).
Johnson Point, Banks Island, Northwest Territories (NWT)	Former support and staging area for oil and gas exploration throughout Banks Island	INAC	Water licence application proposed the use of 4,750 mg/kg for TPH based on SSTL developed in a HHERA for the tank farm area and 230 mg/kg (F1) and 150 mg/kg (F2) for areas near sensitive aquatic habitats (INAC 2008c).	PHC-contaminated soils were excavated and treated on-site until the TPH concentrations were less than 4,750 mg/kg. The soil was then disposed of in areas that were not near sensitive aquatic habitats (AECOM 2009).
Hope Lake Mines, 55 to 75 km south of Kugluktuk, Nunavut	Three former mining exploration areas: Hope Lake, Willow Creek and Husky Creek	DIAND	2,500 mg/kg for TPH based on SSTL developed using site conditions and the AMSRP as guidance documents (EBA Engineering Consultants Ltd. [EBA] 2011)	Initial soil volume of PHC-contaminated soil was 1,762 m^3 based on CWS generic standards. Application of the SSTL reduced the soil volume by 94%. The NWB approved the excavation and removal for off-site disposal of PHC-contaminated soil with concentrations exceeding 2,500 mg/kg (NWB 2013a) with remaining impacted soil left in place.
CAM-A Sturt Point, 80 km east of Cambridge Bay, Nunavut	Former intermediate DEW Line site	INAC/ Aboriginal and Northern Affairs Development Canada (AANDC)	RAP proposed the use of AMSRP guidelines for Type B hydrocarbons (AECOM 2011).	NWB approved the use of a landfarm facility to treat Type B PHC-contaminated soils in accordance with the AMSRP guidelines (NWB 2013b).
Ennadai Lake, 380 km west of Arviat, Nunavut	Former weather station	AANDC	RAP proposed the use of AMSRP guidelines for Type B hydrocarbons (EBA 2012).	NWB approved the use of landfarms to treat Type B hydrocarbon-contaminated soil in excess of the AMSRP guidelines for F1, F2 and F3 hydrocarbon fractions (NWB 2014). Remedial work was completed in 2014 (Stantec Consulting Ltd. [Stantec] 2016).

Name, Location	Historical Use	Organization	Guidelines Applied for PHCs	PHC Remediation
Contwoyto Lake, 400 km northeast of Yellowknife, Nunavut	Former weather station	AANDC	RAP proposed the use of AMSRP guidelines for Type B hydrocarbons (SENES 2013).	Approximately 2,100 m^3 of Type B PHC-impacted soil was treated in a landfarm until the soil concentrations were less than the AMSRP guidelines (ARCADIS 2016).
CAM-E, Keith Bay, 75 km east of Kugaaruk, Nunavut	Former intermediate DEW Line site	AANDC	RAP proposed the use of AMSRP guidelines for Type A and Type B hydrocarbons (Stantec 2015).	NWB approved the use of landfarms to treat Type B hydrocarbon-contaminated soil in excess of the AMSRP guidelines (NWB 2017).
Tuktoyaktuk Base, NWT	Former explorations logistics base camp	Imperial Oil Limited (Imperial)	RAP proposed the use of AMSRP guidelines for Type A and Type B hydrocarbons (Advisian 2018).	The Inuvialuit Water Board (IWB) approved the implementation of the RAP for on-site treatment of Type A and Type B soils in excess of the AMSRP guidelines (IWB 2019).
BAR-C, Tununuk Point, 80 km north-northwest on Inuvik, NWT	Originally a DEW Line site until 1963; used as a logistics base by Imperial Oil to support oil and gas exploration between 1972 to 1984	Imperial	RAP proposed the use of AMSRP guidelines for Type A and Type B hydrocarbons (WorleyParsons Canada [WorleyParsons] 2013).	Approximately 120 m^3 of Type A PHC-contaminated soil was excavated and disposed of off-site. Approximately 8,196 m^3 of Type B PHC-contaminated soils were remediated in a treatment cell until soil concentrations were less than the AMSRP guidelines after which they were placed in areas at either less than or greater than 0.5 m depth based on results (Advisian 2017).

6.0 PROPOSED GUIDELINES FOR MELIADINE MINE LANDFARMS

Based on the site description of the Project (Section 2.0) and the basis for the development of the AMSRP guidelines (Section 5.1), the Meliadine Mine site is in a similar human and ecological environment as the DEW Line sites and other abandoned military sites in the arctic. In addition, the PHC contaminants being treated in the landfarms (diesel fuel, gasoline, aviation fuel, hydraulic oil and other light oil) are comparable to those found at abandoned military sites (diesel fuel with lesser quantities of soil contaminated with lubricating oils). Therefore, the following section assess the operable pathways at the Project and provides site-specific remediation levels based on the AMSRP guidelines.

The proposed guidelines are applicable to PHC impacted soil undergoing treatment in the landfarms. Other impacts from mine site operations were assessed in and are managed by the HHERA (Golder 2014).

6.1 Summary of Exposure Pathways and Receptors

The possible pathways and receptors at the Project were evaluated to assess which were operable and should be included in the selection of applicable AMSRP guidelines. A summary of the pathways and receptors is presented in Table D below. The only pathway that is considered applicable to the PHC-contaminated soil in the landfarms is the direct contact (ingestion and dermal contact) pathway for humans.

Table D: Exposure Pathway and Receptor Summary

Pathway	Receptor	Operable (Y/N)	Reason
Direct contact (ingestion/dermal contact)	Humans	Yes	The Project area may return to traditional land uses following mine closure. Therefore, incident contact or ingestion of impacted soils is possible.
	Wildlife	No	Treated soils will be placed in the WRSF at a depth greater than 0.5 m, below which the soil is not considered available to terrestrial receptors. Therefore, this pathway is not considered operable.
	Soil invertebrates/ vegetation	No	The AMSRP did not include guidelines for this pathway-receptor. In addition, treated soils will be placed in the WRSF at a depth greater than 0.5 m, the depth at which invertebrates and roots are limited to in arctic conditions. Therefore, this pathway is not considered operable.
Vapour inhalation	Humans	No	No existing buildings or planned buildings are within 30 m of the landfarms or the WRSF. Infrastructure in permafrost areas is typically built on piles above the ground surface to prevent heat transfer to the permafrost below. Therefore, the inhalation of indoor air pathway is not considered operable.
Potable groundwater pathway	Humans	No	There are no potable groundwater wells in the Project area. In addition, in zones of continuous permafrost the shallow groundwater in the active layer is unlikely to be used as a potable water source. Therefore, the protection of potable groundwater pathway is not considered operable.
Groundwater discharge to surface water	Freshwater aquatic life	No	The landfarms are greater than 30 m from surface water bodies. Proposed final placement of treated soil in the WRSF will also be greater than 30 m from surface water bodies. Therefore, this pathway is not considered operable.

6.2 Proposed AMSRP Guidelines

The AMSRP remedial objectives in Table B include guidelines for the receptors considered applicable in remote arctic settings. Since humans were retained as the only applicable receptor for the final placement of treated soil from the landfarms, the guidelines for freshwater life and terrestrial wildlife were removed and the human health and management limit were retained. Table E below summarizes the retained guidelines proposed for use in assessing the success of landfarming activities at the Project. Since the management limit is more conservative than the human health guidelines, it is recommended that all soil analytical results, regardless of the hydrocarbon type (i.e., Type A versus Type B hydrocarbons), be compared to the management limit of 5,000 mg/kg. The applicability of these guidelines requires that the final treated soil be placed at least 30 m from any surface water bodies and at depths greater than 0.5 mbgs.

Table E: Summary of AMSRP Remedial Objectives Applied to the Type A and Type B Landfarms.

Hydrocarbon Fraction	Human Health (mg/kg)	Management Limit (mg/kg)
F1	-	-
F2	11,000	-
F3	20,000	-
F4	-	-
Type B Hydrocarbon	-	5,000[(a)]
Type A Hydrocarbon	20,000	5,000[(b)]

[(a)]Below 0.5 m depth, may be applied based on professional judgement.
[(b)]Management limit for Type B hydrocarbons also applied to Type A hydrocarbons.
- not available

7.0 REMEDIAL ACTION PLAN

The landfarm design, operation and management are detailed in the LMP (Agnico Eagle 2019a). The following sections review the historical volume of soil in the landfarms, the PHC concentration of the soil being treated, the proposed changes to the sampling requirements to remove soil from the landfarms and the proposed end use of the soil.

7.1 Landfarm Volume Estimates

The total estimated volume of PHC-contaminated soil placed in the Type A Landfarm between 2017 and 2020 is approximately 3,727 m^3 (Agnico Eagle 2019b, 2020, 2021) and in Type B Landfarm is 2,200 m^3 (Agnico Eagle 2019a). A summary of contaminated soil volume additions between 2017 and 2020 is presented in Table F below.

Table F: Soil Volume Additions to Type A and Type B Landfarms from 2017 to 2020.

Year	Type A Landfarm	Type B Landfarm
	Additions (m^3)	Additions (m^3)
2017	800	2,200*
2018	2,853	0
2019	17	0
2020	57.5	0
Total	3,727	2,200

*Already in Type B Landfarm in 2017.

Recently, the volume of soil in each landfarm has been estimated through survey data. Based on survey data from November 10, 2020, there was approximately 873 m^3 of soil in the Type B Landfarm on that date. In the fall of 2020, the large boulders and rocks in the Type B Landfarm were screened and removed to the WRSF. Based on survey data from August 21, 2021, there was approximately 1,044 m^3 of soil in the Type A Landfarm on that date. Material being added to the Type A Landfarm is screened to remove the larger rocks (>2.5 cm) and, when PHC odours are no longer detected in the coarse material using a PID, the material is removed to WRSF (Agnico Eagle 2019a).

7.2 Landfarm Petroleum Hydrocarbon Analytical Results

The PHC analytical results for soils sampled from the Type A and Type B Landfarms between 2019 and 2021 are presented in Tables 1 and 2, respectively. The results have been compared to the GN Tier 1 soil remediation criteria for surface soil in an agricultural/wildlife and industrial setting in addition to the proposed AMSRP guidelines assuming a final placement depth for the remediated soil of greater than 0.5 mbgs and 30 m from any surface water body. To compare the analytical results to the proposed AMSRP guidelines, the PHC analytical results have been identified as either Type A (non-mobile) or Type B (mobile) hydrocarbons, as described in Section 5.1.1, and have been compared to the management limit of 5,000 mg/kg.

The Type A Landfarm soil analytical results from July 2021 are greater than the GN Tier 1 soil remediation criteria for surface soil in an agricultural/wildlife setting in three of the 22 samples, and greater than the GN Tier 1 soil remediation criteria for surface soil in an industrial setting from one of the 22 samples. When compared to the proposed and suitable AMSRP guidelines, the soil analytical results were less than the management limit of 5,000 mg/kg for both Type A and Type B hydrocarbons.

The Type B Landfarm soil analytical results from July 2021 are greater than the GN Tier 1 soil remediation criteria for surface soil in an agricultural/wildlife and industrial setting in the 16 samples analyzed. When compared to the proposed AMSRP guidelines, the soil analytical results were less than the management limit of 5,000 mg/kg. There were no Type A hydrocarbon types identified from the Type B Landfarm from soil sampled in July 2021.

The mean PHC concentration of soil based on the most recent sampling conducted in July 2021 is summarized in Table G below.

Table G: Mean Concentration of PHC in Soil from July 2021 Sampling Event for Type A and Type B Landfarms.

Parameter	Type A Landfarm (mg/kg)	Type B Landfarm (mg/kg)
Benzene	<0.0060	<0.0060
Toluene	<0.010	<0.010
Ethylbenzene	<0.020	<0.020
Total Xylene	<0.020	<0.020
F1 (C_6-C_{10})	<10	<10
F2 (C_{10}-C_{16})	93	687
F3 (C_{16}-C_{34})	102	342
F4 (C_{34}-C_{50})	<50	54

Based on the analytical and pending final confirmatory soil sampling (Section 7.3), the soil currently in the Type A and Type B Landfarms is below the proposed AMSRP guidelines in Table E and may be removed from the landfarms for placement in the WRSF as discussed in Section 7.4.

7.3 Sampling Requirements

The LMP (Agnico Eagle 2019a) specified sampling requirements for assessing the success of soil treatment by comparing to the GN Tier 1 guidelines. Previously, soil samples were collected for each 10 m of windrow length; one composite sample consisting of three sub-surface (at 1 m depth) and three surface samples collected approximately 3.3 m apart and taken from both sides of the windrow. The application of the AMSRP guidelines as proposed require the treated soil be sampled in a methodological manner that ensures any “hot spots” of higher PHC concentration are identified, sampled and submitted for analytical testing in order to ensure that the soil is fully protective of the receptors specified. Therefore, the sampling requirements below are more extensive that those previously included in the LMP.

When collecting final confirmatory samples for removal of soil from the landfarms, soil samples will be pre-screened in order to select the worst-case soil samples (based on visual observations, odour and PID results) to be submitted to the laboratory for analysis. The worst-case sample of every four field screened samples will be submitted to the laboratory. Sampling will be based on the estimated volume of soil in each windrow according to Table H. For example, a windrow with 1,250 m^3 of soil will require a total of 13 samples collected for laboratory analysis (one sample per 96 m^3), and thus soil in the windrow should be field screened at a rate of one per 24 m^3. Soil samples should be taken from various depths in the windrows, with at least 25% sampled from the core of the windrows. This sampling frequency is adopted from Quebec where biopiles have been extensively used as a treatment option for PHC-impacted soils and also adopted for use for remediations at Tuktoyaktuk Base, NWT (Advisian 2018; Quebec MEF 1996).

To assess the progress of remediation, landfarm windrows will be sampled, at a minimum, at the end of each summer to assess the progress of soil remediation. It is recommended that the performance monitoring sampling be conducted at a rate of 50% of the sampling frequency used when collecting final confirmatory samples (Table H below).

Table H: Windrow Sampling Frequency for Removal of Soil from Landfarm (Quebec MEF 1996).

Soil Volume per Windrow (m^3)	Number of Samples Required
<30	1
30 to 60	2
60 to 100	3
100 to 200	4
200 to 1,000	4 + (1 sample per each 100 m^3 over 200 m^3)
1,000 to 2,000	12 + (1 sample per each 250 m^3 over 1,000 m^3)
>2,000	16 + (1 sample per each 500 m^3 over 2,000 m^3)

Once the PHC concentrations of the final confirmatory samples are less than the proposed AMSRP guidelines for soil at depths greater than 0.5 m (5,000 mg/kg; Table E), the soil can be removed from the landfarm and placed elsewhere at the Project site as described in Section 7.4. If sections of a windrow meet the AMSRP guidelines while other sections do not, the sections that meet the guidelines may be removed and the remainder retained in the landfarm for additional remediation. The retained soil should not be mixed with incoming untreated soils.

7.4 End Use of Soil

According to the LMP (Agnico Eagle 2019a), successfully remediated soil can be placed in the WRSF or used as normal overburden (i.e., cover on the TSF). Since the proposed guideline for assessing the success of soil remediation is the AMSRP management limit for soil at depths greater than 0.5 m (5,000 mg/kg; Table E) and excludes guidelines that are protective of aquatic receptors, successfully remediated soil will be stacked in the WRSF such that the final depth of the soil will be greater than 0.5 m and the final placement will be greater than 30 m from surface water bodies.

At the latest, the treated soil will need to be covered by a minimum of 0.5 m of waste rock or other non-impacted soil when the mine site is undergoing closure; however, an effort should be made to cover the treated soil each fall. In addition, this treated soil will not be placed below the depth of the permafrost table and any other requirements will be met with regards to waste rock placement in the WRSF. Over time, freezing of the WRSF will occur, encapsulating the treated soil and further reducing the likelihood of exposure of treated soil to possible receptors.

8.0 POST-REMEDIAL MONITORING ACTIVITIES

Following the removal of all remediated soil from the landfarm, closure and reclamation will be conducted according to the LMP (Agnico Eagle 2019a), the Interim Closure and Reclamation Plan (SNC 2019) and the final closure and reclamation plan to be submitted prior to mine closure. Prior to closure and reclamation of the landfarm, confirmatory sampling of the landfarm will be done in accordance with Section 8.1 below.

8.1 Soil

According to the LMP (Agnico Eagle 2019a), once all the soil has been remediated to the approved guidelines and placed in the WRSF, the berm and base of the landfarms will be sampled on a 10-m grid to determine if the PHC concentrations of the underlying soils are less than the guidelines. This is in alignment with the AMSRP which provides a practical and simple method for confirmatory testing following the excavation of contaminated soils that is based on excavation area and sampling density (Table I below).

Table I: Sampling Grid Sizes (INAC 2008a).

Size of Area	Grid Size	# Perimeter Samples Analyzed	# Interior Grid Samples Analyzed
<100 squared metres (m^2)	3 m x 3 m	All	All
>100 to 2,500 m^2	6 m x 6 m	50%	40%
>2,500 m^2	12 m x 12 m	50%	50%

Based on the AMSRP guidance, for impacted areas greater than 2,500 m^2, discrete samples should be collected from each 12 m x 12 m grid and 50% should be submitted for laboratory analyses according to Table I. Soil samples for laboratory analysis should be selected based on physical observations (e.g., evidence of staining, soil colour and/or texture, evidence of odours) and field screening results (e.g., highest PID readings). The Type A Landfarm is approximately 11,000 m^2 in total area; therefore, discrete sampling on a 10-m grid and submitting 50% of those samples for laboratory analysis would meet the sampling requirements of the AMSRP (INAC 2008a).

If the PHC concentrations of the analyzed soil samples are less than the AMRSP guidelines for soils between 0 and 0.5 m (see Table E), no additional excavation will be required. If the PHC concentrations are greater than the AMSRP guidelines for soils between 0 and 0.5 m but are less than the guidelines for soils at depths greater than 0.5 m, the landfarm will be covered with 0.5 m of waste rock or other reclamation material. If the PHC concentrations exceed the management limit for soils at depths greater than 0.5 m, the soil will be excavated and treated in another landfarm or disposed of at an approved facility. The excavated area will be sampled according to the grid density in Table I to confirm the AMSRP guidelines are met, and the excavation backfilled with waste rock or other reclamation material.

9.0 SUMMARY

A RAP was developed to provide Agnico Eagle with site-specific PHC remediation guidelines for the landfarm based on the AMSRP and the pathways and receptors present at the Project site. The following summarizes the outcomes:

- Based on the Project setting and the basis for the development of the AMSRP guidelines, the Meliadine Mine site is in a similar human and ecological environment as the DEW Line sites and other abandoned military sites in the arctic.
- The AMSRP guidelines have been used successfully to remediate PHC-impacted soil at a number of other sites in the arctic, both military and non-military.

- Based on the pathways and receptors at the Project, it is recommended that all soil PHC analytical results, regardless of the hydrocarbon type (i.e., Type A and Type B hydrocarbons), be compared to the AMSRP management limit of 5,000 mg/kg.
- Treated soils will be sampled following a robust sampling protocol that relies on field screening four samples for each sample that is submitted to the laboratory. The number of samples submitted to the laboratory is dependent on the size of each windrow being sampled. This ensures that any “hot-spot” higher concentration areas are selected for laboratory analysis.
- When treated soil is determined to meet the proposed AMSRP guidelines, it will be placed in the WRSF at depths greater than 0.5 m and at distances of more than 30 m from surface water bodies.
- When the landfarm is no longer receiving PHC-impacted soil and successfully treated soil has been removed, the base and berms of the landfarm will be sampled according to the AMSRP sampling protocol for confirmatory testing of the contaminated area.

10.0 REFERENCES

AECOM. 2009. Public Works and Government Services Canada, Remediation Completion Report, Johnson Point, Northwest Territories. December 21, 2009.

AECOM. 2011. Remedial Action Plan CAM-A Sturt Point, NU, Intermediate DEW Line Site. March 2011.

Advisian. 2017. Site Remediation Closure Report, BAR-C, Tununuk Point, NT. October 6, 2017.

Advisian. 2018. Imperial Tuk Base Remedial Action Plan. October 30, 2018.

Agnico Eagle. 2015a. Meliadine Gold Project, Type A Water Licence, Main Application Document, Version 1. April 2015.

Agnico Eagle. 2015b. Meliadine Gold Project, Spill Contingency Plan, Version 4, 6513-MPS-05. April 2015.

Agnico Eagle. 2015c. Meliadine Gold Project. Preliminary Closure and Reclamation Plan, Version 1.0, 6513-CRP-01. April 2015.

Agnico Eagle. 2019a. Meliadine Gold Project, Landfarm Management Plan, Version 3, 6513-MPS-15. February 2019.

Agnico Eagle. 2019b. Meliadine Gold Mine Project. 2018 Annual Report. February 2019.

Agnico Eagle. 2020. Meliadine Gold Mine Project. 2019 Annual Report. April 2020.

Agnico Eagle. 2021. Meliadine Gold Mine Project. 2020 Annual Report. March 2021.

Alberta Environment. 2007. Alberta Tier 1 and tier 2 Soil and Groundwater Remediation Guidelines.

ARCADIS. 2016. Completion Report, Remediation of the Contwoyto Lake Former Weather Station, Nunavut. March 2016.

CCME CWS. 2008. Canadian Council of Ministers of the Environment, Canada Wide Standards for Petroleum Hydrocarbons in Soil.

Earth Tech. 2007. Former U.S. Coast Guard Loran Station, Cape Cristian, Nunavut. January 2007.

EBA. 2011. Development of Site-Specific Remediation Criteria for Hydrocarbons for Hope Lake, Nunavut. March 2011.

EBA. 2012. Remedial Action Plan, Former Weather Station, Ennadai Lake, Nunavut. November 2012.

Environment Canada, 2021, internet site. Available at: https://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnProv&lstProvince=NU&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=1721&dispBack=0. Accessed September 8, 2021.

GN. 2009. Environmental Guideline for Contaminated Site Remediation. March 2009.

Golder. 2014. Volume 10.0 - Environmental and Human Health Risk Assessment, Final Environmental Impact Statement (FEIS) - Meliadine Gold Project, Nunavut. April 2014.

INAC. 2008a. Abandoned Military Site Remediation Protocol, Volume I - Main Report. December 2008.

INAC. 2008b. Abandoned Military Site Remediation Protocol, Volume II - Technical Supporting Documentation. December 2008.

INAC. 2008c. INAC Contaminated Sites Program, Johnson Point Site Remediation, Applications for Water Licence. February 15, 2008.

IWB. 2019. Re: N5L8-1841 Imperial Oil Environment and Property Solutions (Imperial Oil) Tuk Base Project, Tuktoyaktuk, NWT. July 11, 2019.

Jacques Whitford. 2005, 2006. Human Health and Ecological Risk Assessments for Ekaluagad Fjord (FOX-C), Sacrpa Lake (CAM-F), Simpson Lake (CAM-D), Atkinson Point (BAR-D), Radio Island, and Johnson Point. Prepared for Indian and Northern Affairs Canada.

NRC. 1995. National Atlas of Canada 5th Edition, Canada Permafrost. Available at: https://ftp.maps.canada.ca/pub/nrcan_rncan/raster/atlas_5_ed/eng/environment/land/mcr4177.jpg. Accessed September 19, 2021.

NWB. 2008. Re: NWB License No. 1BR-LOR0813. May 16, 2008.

NWB. 2013a. Re: NWB License No. 1BR-HLR1314. June 27, 2013.

NWB. 2013b. Re: NWB License No. 1BR-STU1318. August 8, 2013.

NWB. 2014. Re: NWB License No. 1BR-ELR1419. March 31, 2014.

NWB. 2017. Re: NWB License No. 1BR-KE1722. January 17, 2017.

Quebec MEF. 1996; Terraines Contamines - Enlevement de Reservoirs Souterrains Ayant Contenu des Produits Petroliers - Lignes Directrices D'Intervention; Quebec Ministre de l'Environnment et de la Faune; Les Publications du Quebec; ISBN 2550300297. 1996.

SENES. 2003a. Human Health Screening Level Risk Assessments for Bray Island (FOX-A). Prepared for Indian and Northern Affairs Canada

SENES. 2003b. Human Health Screening Level Risk Assessments for Simpson Lake. Prepared for Indian and Northern Affairs Canada

SENES. 2013. Contwoyto Lake Former Weather Station Remedial Action Plan. March 2013.

SNC. 2019. Meliadine Interim Closure and Reclamation Plan 2019. Final Report. December 12, 2019.

Stantec. 2015. Final Report: Remedial Action Plan CAM-E (Keith Bay), Nunavut. March 16, 2015.

Stantec. 2016. Remediation of the Ennadai Lake Former Weather Station, NU, 2014/2015 Annual Report. March 31, 2016.

Tetra Tech. 2017. Design Report for Landfarm, Meliadine Gold Project. June 23, 2017.

WorleyParsons. 2013. Remedial Action Plant, BAR-C, Tununuk Point, NT. December 16, 2013.

11.0 STATEMENT OF LIMITATIONS

This report was prepared for the exclusive use of Agnico Eagle Mines Limited. The report, which specifically includes all tables, is based on data and information provided by Agnico Eagle Mines Limited as described in this report.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during our investigation, our present understanding of the Site conditions, and our professional judgment in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statues are subject to change. The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

Signature Page

Golder Associates Ltd.

Signature is on secured version

Stephanie Villeneuve, M.Sc., P.Geo. (NS)
Environmental Scientist

Signature is on secured version

Punchalee Clair, P.Eng. (NS, NT)
Project Manager

Signature is on secured version

Lenz Haderlein, M.Sc.
Principal, Project Director

SV/PC/LH/hf

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-1 SURFACE	LFA-1-SUB	LFA-2 SURFACE	LFA-2 -SUB	LFA-3 SURFACE	LFA-3-SUB	LFA-4 SURFACE	LFA-4-SUB	LFA-5 SURFACE
						BVL Sample ID	KCO156	KCO157	KCO158	KCO159	KCO160	KCO161	KCO162	KCO163	KCO164
						BVL Job Number	B9H5055	B9H5055	B9H5055	B9H5055	B9H5055	B9H5055	B9H5055	B9H5055	B9H5055
						Sample Date	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	**71**	18	**33**	<10	16	<10	27	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**1,300**	**1,700**	**1,400**	**1,400**	**1,100**	**1,100**	**240**	**1,300**	**470**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	150	130	150	160	150	140	160	160	160
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50	<50	68
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	1,450	1,901	1,568	1,593	1,250	1,256	400	1,487	630

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-5-SUB	LFA-6 SURFACE	LFA-6-SUB	LFA-7-SURFACE	LFA-7-SUB	LFA-8-SURFACE	LFA-8-SUB	LFA-9-SURFACE	LFA-9-SUB
						BVL Sample ID	KCO165	KCO166	KCO167	KCO229	KCO230	KCO231	KCO232	KCO233	KCO234
						BVL Job Number	B9H5055	B9H5055	B9H5055	B9H5065	B9H5065	B9H5065	B9H5065	B9H5065	B9H5065
						Sample Date	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	25	<10	**65**	<10	24	<10	**71**
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**660**	**660**	**1,200**	110	**1,800**	**840**	**1,200**	**1,100**	**1,400**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	170	130	120	97	140	150	180	140	130
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	66	<50	<50	<50	<50	<50	55	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	830	790	1,345	207	2,005	990	1,404	1,240	1,601

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-10-SURFACE	LFA-10-SUB	LFA-11-SURFACE	LFA-11-SUB	LFA-12-SURFACE	LFA-12-SUB	LFA-1-1	LFA-1-2	LFA-2-1
						BVL Sample ID	KCO235	KCO236	KCO237	KCO238	KCO239	KCO240	KRS205	KRS206	KRS207
						BVL Job Number	B9H5065	B9H5065	B9H5065	B9H5065	B9H5065	B9H5065	B9O6777	B9O6777	B9O6777
						Sample Date	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	31-Aug-19	31-Aug-19	31-Aug-19
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	0.12	0.17	0.13
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	20	<10	16	<10	<10	**71**	**64**	**63**
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**860**	**1,200**	**530**	**790**	**460**	**800**	**2,300**	**2,700**	**2,700**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	120	140	180	150	130	170	**350**	**400**	**410**
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	980	1,360	710	956	590	970	2,721	3,164	3,173

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-2-2	LFA-3-1	LFA-3-2	LFA-4-1	LFA-4-2	LFA-5-1	LFA-5-2	LFA-6-1	LFA-6-2	LFA-7-1	LFA-7-2
						BVL Sample ID	KRS208	KRS209	KRS210	KRS211	KRS212	KRS213	KRS214	KRS215	KRS216	KRS217	KRS218
						BVL Job Number	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777
						Sample Date	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]											
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	0.15	0.17	0.15	0.13	0.12	0.15	0.19	0.19	0.14	0.16	0.16
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**110**	**81**	**73**	**87**	**73**	**73**	**85**	**70**	**81**	**65**	**82**
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**2,700**	**2,600**	**2,700**	**2,500**	**2,400**	**2,500**	**2,600**	**2,700**	**2,500**	**2,500**	**2,700**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	**400**	**330**	**380**	**380**	**350**	**370**	**370**	**410**	**390**	**370**	**360**
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	3,210	3,011	3,153	2,967	2,823	2,943	3,055	3,180	2,971	2,935	3,142

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-8-1	LFA-8-2	LFA-9-1	LFA-9-2	LFA-10-1	LFA-10-2	LFA-11-1	LFA-11-2	LFA-12-1	LFA-12-2	LFA-1-SURFACE
						BVL Sample ID	KRS219	KRS220	KRS221	KRS222	KRS223	KRS224	KRS225	KRS226	KRS227	KRS228	NAK646
						BVL Job Number	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	B9O6777	C0G6034
						Sample Date	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	31-Aug-19	28-Jun-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]											
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	0.14	0.040	0.11	0.12	0.057	0.074	0.094	0.056	<0.020	0.092	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**64**	29	**73**	**62**	**80**	**60**	**55**	**69**	**67**	**89**	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**2,600**	**1,600**	**2,400**	**2,800**	**2,200**	**2,100**	**2,900**	**2,700**	**2,000**	**2,700**	**190**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	**400**	250	**360**	**390**	**380**	**350**	**390**	**380**	**330**	**420**	160
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	53
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	3,064	1,879	2,833	3,252	2,660	2,510	3,345	3,149	2,397	3,209	350

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-1-SUB	LFA-2-SURFACE	LFA-2-SUB	LFA-3-SURFACE	LFA-3-SUB	LFA-4-SURFACE	LFA-4-SUB	LFA-5-SURFACE	LFA-5-SUB
						BVL Sample ID	NAK647	NAK648	NAK649	NAK650	NAK651	NAK652	NAK653	NAK654	NAK655
						BVL Job Number	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034
						Sample Date	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20	28-Jun-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	26	<10	**33**	<10	29	<10	15	<10	18
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**1,100**	**340**	**1,200**	40	**910**	**160**	**790**	79	**650**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	190	170	190	79	140	260	240	120	190
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	52	<50	<50	<50	76	190	73	<50	72
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	450	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	1,316	510	1,423	119	1,079	NA	1,045	199	858

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-6-SURFACE	LFA-6-SUB	LFA-7-SURFACE	LFA-7-SUB	LFA-8-SURFACE	LFA-8-SUB	LFA-9-SURFACE	LFA-9-SUB	LFA-10-SURFACE
						BVL Sample ID	NAK656	NAK657	NAK658	NAK659	NAK660	NAK661	NAK662	NAK663	NAK664
						BVL Job Number	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034
						Sample Date	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	22	<10	**36**	<10	**49**	<10	**49**	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	130	**690**	**160**	**1,100**	100	**1,200**	**160**	**1,200**	150
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	150	160	100	110	110	140	120	160	97
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	53	<50	<50	<50	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	280	872	260	1,246	210	1,389	280	1,409	247

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-10-SUB	LFA-11-SURFACE	LFA-11-SUB	LFA-12-SURFACE	LFA-12-SUB	LFA-1-SURFACE	LFA-1-SUB	LFA-2-SURFACE	LFA-2-SUB
						BVL Sample ID	NAK665	NAK666	NAK667	NAK668	NAK669	NNZ747	NNZ748	NNZ749	NNZ750
						BVL Job Number	C0G6034	C0G6034	C0G6034	C0G6034	C0G6034	C0M9173	C0M9173	C0M9173	C0M9173
						Sample Date	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	29-Jun-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**34**	<10	<10	<10	<10	<10	<10	<10	20
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**1,100**	52	**510**	54	**480**	41	**640**	**470**	**1,000**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	140	120	170	120	160	93	140	170	180
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	53	60	61
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	1,274	172	680	174	640	134	780	640	1,200

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-3-SURFACE	LFA-3-SUB	LFA-4-SURFACE	LFA-4-SUB	LFA-5-SURFACE	LFA-5-SUB	LFA-6-SURFACE	LFA-6-SUB	LFA-7-SURFACE
						BVL Sample ID	NNZ751	NNZ752	NNZ753	NNZ754	NNZ755	NNZ756	NNZ757	NNZ758	NNZ759
						BVL Job Number	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173
						Sample Date	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	57	**190**	**210**	**480**	80	**240**	120	**500**	**570**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	100	100	120	150	110	130	110	160	150
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	52	<50	<50	<50	60	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	157	290	330	630	190	370	230	660	720

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-7-SUB	LFA-8-SURFACE	LFA-8-SUB	LFA-9-SURFACE	LFA-9-SUB	LFA-10-SURFACE	LFA-10-SUB	LFA-11-SURFACE	LFA-11-SUB
						BVL Sample ID	NNZ760	NNZ761	NNZ762	NNZ763	NNZ764	NNZ765	NNZ766	NNZ767	NNZ768
						BVL Job Number	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173	C0M9173
						Sample Date	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20	28-Aug-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**170**	140	**260**	120	91	150	150	**300**	90
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	110	110	130	130	110	100	77	190	**490**
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	52	<50	<50	<50	58	260
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	750
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	280	250	390	250	201	250	227	490	NA

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-12-SURFACE	LFA-12-SUB	LFA-1-SURFACE	LFA-2-SURFACE	LFA-3-SURFACE	LFA-4-SURFACE	LFA-5-SURFACE	LFA-6-SURFACE
						BVL Sample ID	NNZ769	NNZ770	NSF801	NSF802	NSF803	NSF804	NSF805	NSF806
						BVL Job Number	C0M9173	C0M9173	C0O8791	C0O8791	C0O8791	C0O8791	C0O8791	C0O8791
						Sample Date	28-Aug-20	28-Aug-20	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]								
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**170**	**270**	**180**	**350**	80	**230**	68	**440**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	140	140	140	150	94	120	110	140
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	51	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	310	410	320	500	174	350	178	580

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-7-SURFACE	LFA-8-SURFACE	LFA-9-SURFACE	LFA-10-SURFACE	LFA-11-SURFACE	LFA-12-SURFACE	LFA-1-SURFACE
						BVL Sample ID	NSF807	NSF808	NSF809	NSF810	NSF811	NSF812	QGB241
						BVL Job Number	C0O8791	C0O8791	C0O8791	C0O8791	C0O8791	C0O8791	C1L4387
						Sample Date	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20	18-Sep-20	19-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria[a]**	**Criteria[b]**	**Criteria[c]**	**Criteria[d]**							
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**260**	**670**	**260**	150	140	95	24
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	160	150	160	130	130	130	70
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	51	<50	52	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	70
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	420	820	420	280	270	225	NA

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-1-SUB	LFA-2-SURFACE	LFA-2-SUB	LFA-3-SURFACE	LFA-3-SUB	LFA-4-SURFACE	LFA-4-SUB	LFA-5-SURFACE	LFA-5-SUB
						BVL Sample ID	QGB242	QGB243	QGB244	QGB245	QGB246	QGB247	QGB248	QGB249	QGB250
						BVL Job Number	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387
						Sample Date	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]									
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**490**	83	**230**	28	**160**	49	140	15	50
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	150	90	130	70	130	74	120	100	110
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	51	<50	<50	<50	51
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	70	NA	NA	NA	100	161
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	640	173	360	NA	290	123	260	NA	NA

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-6-SURFACE	LFA-6-SUB	LFA-7-SURFACE	LFA-7-SUB	LFA-8-SURFACE	LFA-8-SUB	LFA-9-SURFACE	LFA-9-SUB
						BVL Sample ID	QGB251	QGB252	QGB253	QGB254	QGB255	QGB256	QGB257	QGB258
						BVL Job Number	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387	C1L4387
						Sample Date	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]								
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	33	76	120	120	13	45	81	110
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	83	94	93	110	100	120	93	94
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	83	NA	NA	NA	100	120	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	NA	170	213	230	NA	NA	174	204

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 1
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type A Landfarm

						Sample ID	LFA-10-SURFACE	LFA-10-SUB	LFA-11-SURFACE	LFA-11-SUB
						BVL Sample ID	QGB259	QGB260	QGB261	QGB262
						BVL Job Number	C1L4387	C1L4387	C1L4387	C1L4387
						Sample Date	19-Jul-21	19-Jul-21	19-Jul-21	19-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria[a]**	**Criteria[b]**	**Criteria[c]**	**Criteria[d]**				
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	59	64	24	39
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	110	100	95	110
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	95	110
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	169	164	NA	NA

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 2
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type B Landfarm

						Sample ID	LFB-1	LFB-2	LFB-3	LFB-4	LFB-5	LFB-6	LFB-7	LFB-8	LFB-9	LFB-10	LFB-11
						BVL Sample ID	KUX756	KUX757	KUX758	KUX759	KUX760	KUX761	KUX762	KUX763	KUX764	KUX765	KUX766
						BVL Job Number	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972	B9Q1972
						Sample Date	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19	13-Sep-19
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]											
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**38**	28	30	**34**	<10	**55**	<10	<10	<10	**49**	25
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**2,100**	**2,100**	**2,400**	**2,100**	**730**	**2,500**	**650**	**780**	**930**	**2,000**	**1,800**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	**540**	**540**	**470**	**400**	170	**380**	170	170	170	**410**	**550**
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	120	100	85	57	<50	<50	<50	<50	<50	66	110
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	2,678	2,668	2,900	2,534	900	2,935	820	950	1,100	2,459	2,375

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 2
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type B Landfarm

						Sample ID	LFB-12	LFB-1	LFB-2	LFB-3	LFB-4	LFB-5	LFB-6	LFB-7	LFB-8	LFB-9	LFB-10
						BVL Sample ID	KUX767	NAK558	NAK559	NAK560	NAK561	NAK562	NAK563	NAK564	NAK565	NAK566	NAK567
						BVL Job Number	B9Q1972	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021	C0G6021
						Sample Date	13-Sep-19	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20	26-Jun-20
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria**[a]	**Criteria**[b]	**Criteria**[c]	**Criteria**[d]											
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**39**	24	12	**31**	24	10	**46**	10	10	10	**42**
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**1,900**	**1,300**	**830**	**1,600**	**1,700**	**500**	**1,600**	**630**	**720**	**390**	**1,700**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	**570**	**510**	**480**	**370**	**310**	160	**340**	250	200	160	**480**
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	110	84	110	50	50	50	50	50	50	50	75
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	2,509	1,834	1,322	2,001	2,034	670	1,986	890	930	560	2,222

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 2
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type B Landfarm

						Sample ID	LFB-11	LFB-12	LFB-1-SUB	LFB-2-SUB	LFB-3-SUB	LFB-4-SUB	LFB-5-SUB	LFB-6-SUB	LFB-7-SUB	LFB-8-SUB	LFB-9-SUB
						BVL Sample ID	NAK568	NAK569	QGB520	QGB521	QGB522	QGB523	QGB524	QGB525	QGB526	QGB527	QGB528
						BVL Job Number	C0G6021	C0G6021	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414
						Sample Date	26-Jun-20	26-Jun-20	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria[a]**	**Criteria[b]**	**Criteria[c]**	**Criteria[d]**											
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	**31**	**37**	15	<10	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**1,400**	**1,300**	**1200**	**440**	**280**	**1100**	**370**	**350**	**910**	**1300**	**290**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	**510**	**410**	**400**	**320**	**390**	**410**	**420**	**440**	**390**	**400**	250
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	89	64	57	51	59	57	61	67	<50	53	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	1,941	1,747	1,615	760	670	1,510	790	790	1,300	1,700	540

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

Table 2
Summary of Soil Analytical Results - Petroleum Hydrocarbons
Type B Landfarm

						Sample ID	LFB-10-SUB	LFB-11-SUB	LFB-12-SUB	LFB-13-SUB	LFB-14-SUB	LFB-15-SUB	LFB-16-SUB
						BVL Sample ID	QGB529	QGB530	QGB531	QGB532	QGB533	QGB534	QGB535
						BVL Job Number	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414	C1L4414
						Sample Date	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21	21-Jul-21
						Sample Depth[e]	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Parameters	**Units**	**RDL**	**Criteria[a]**	**Criteria[b]**	**Criteria[c]**	**Criteria[d]**							
Benzene	mg/kg	0.0050	0.03	0.03	n/g	n/g	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Toluene	mg/kg	0.010	0.37	0.37	n/g	n/g	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	mg/kg	0.010	0.082	0.082	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Total Xylenes	mg/kg	0.020	11	11	n/g	n/g	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
F1 (C6-C10) - BTEX	mg/kg	10	30	320	n/g	n/g	<10	<10	<10	<10	<10	<10	<10
F2 (C10-C16 Hydrocarbons)	mg/kg	10	150	260	11,000	n/g	**360**	**720**	**480**	**830**	**790**	**1100**	**480**
F3 (C16-C34 Hydrocarbons)	mg/kg	50	300	1,700	20,000	n/g	260	290	**310**	**320**	300	**320**	250
F4 (C34-C50 Hydrocarbons)	mg/kg	50	2,800	3,300	n/g	n/g	<50	<50	<50	<50	<50	<50	<50
Type A (F3+F4)	mg/kg	NA	n/g	n/g	20,000	5,000	NA	NA	NA	NA	NA	NA	NA
Type B (F1+F2+F3)	mg/kg	NA	n/g	n/g	n/g	5,000	620	1,010	790	1,150	1,090	1,420	730

Notes:

[a] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, agricultural/wildland land use (GN 2009).

[b] Government of Nunavut Environmental Guideline for Contaminated Site Remediation, Tier 1 criteria for PHC in surface soil, industrial land use (GN 2009).

[c] Abandoned Military Site Remediation Protocol (AMSRP), Protection of Human Health (INAC 2008a,b).

[d] Abandoned Military Site Remediation Protocol, Management Limit, below 0.5 m depth (INAC 2008a,b), applied to Type A and Type B hydrocarbons.

[e] Assuming depth of 0.50 mbgs for final placement of soil.

Bold/Underlined - value exceeds proposed AMSRP guideline of 5,000 mg/kg

Bold/Red - value exceeds GN industrial and agricultural/wildland criteria

Bold/Orange - value exceeds GN agricultural/wildland criteria

BTEX - benzene, toluene, ethylbenzene, xylenes

BVL - Bureau Veritas Laboratories

F1, F2, F3, F4 - petroleum hydrocarbon fractions 1, 2, 3, 4

mbgs - metres below ground surface

mg/kg - milligrams per kilogram

n/g - no guideline

NA - not applicable

PHC - petroleum hydrocarbon

RDL - reportable detection limit

> - greater than

< - less than

golder.com