# Appendix 54

# Meadowbank Landfarm Design and Management Plan Version 6

AGNICO EAGLE

MEADOWBANK MINE

# Landfarm Design and Management Plan

In Accordance with Water License 2AM-MEA1530

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 6
March, 2025

## EXECUTIVE SUMMARY

The Landfarm Design and Management Plan for the Meadowbank Mine describes the design features and operational procedures of the landfarm constructed for the storage and treatment of petroleum hydrocarbon contaminated soils.

On-site storage and remediation have been established as the preferred method for treatment of light petroleum hydrocarbon contaminated soil that may be generated on the mine site. The landfarm is designed to receive soil, rock, snow, and ice contaminated with light hydrocarbons such as diesel and gasoline, and antifreeze. Additional contingency options are also considered applicable for contaminated soil management in operations and closure.

The landfarm is located within the South Cell Tailings impoundment of the Tailing Storage Facility. This location was chosen due to its proximity to the Tailings Storage Facility and due to its distance from surface watercourses. As per the Water License 2AM-MEA1530 Part F, Item 19; “Water accumulating in the landfarm shall be contained within the landfarm and not be discharged to the environment”. The water will be managed and contained within the landfarm and discharged to the TSF if required. The monitoring station ST-14 will be sampled as per requirement of the Water License.

The landfarm has an impervious liner and no impacts on shallow groundwater are anticipated.

Soils contaminated with light petroleum hydrocarbons will require an estimated four (4) full summer seasons for complete remediation. When remediated, the soil will be removed from the facility and can be used for construction purposes or placed in the Waste Rock Storage Facility.

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

## IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA1530, Part B, Item 11, the proposed implementation schedule for this Plan is effective immediately (March 2024) subject to any modifications proposed by the NWB as a result of the review and approval process.

## DISTRIBUTION LIST

Agnico Eagle – Environmental Superintendent
Agnico Eagle – Environmental Coordinator
Agnico Eagle – General Mine Manager
Agnico Eagle – Energy and Infrastructure Superintendent
Agnico Eagle – Field Services Supervisor
Agnico Eagle – Engineering Superintendent

## DOCUMENT CONTROL

| Version | Date | Section | Page | Revision |
|---|---|---|---|---|
| 1 | 08/10/08 | 2 | | Remediation guidelines used and the parameters measured |
| | | 7 | | Details on storage and treatment options for metals, solvents, glycol and heavy oils; Measures to prevent damage to the liner during mechanical operation |
| | | 4 | | Contingency plans for exceedances in the amounts of contaminated soil and/or snow/ice |
| | | 5 | | Details describing the design components/specifications of the spillway |
| | | 8 | | Contingency planning and monitoring of sump volumes during the snowmelt period |
| 2 | 12/10/22 | All | All | Comprehensive revision to original plan |
| 3 | 13/02/28 | All | All | Further detail and rationale provided |
| 4 | 17/02/20 | All | All | Comprehensive review. Add detail regarding the Landfarm #2 |
| 5 | 24/03/20 | 3.3.1, 4.7, 5 | 12, 19, 21 | Add details regarding closure and contingency options |
| 6 | 25/03/19 | 5.2 | 21,22 | Add details regarding closure and contingency options |

Prepared By: Meadowbank Environment Department

Approved By: Eric Haley
Superintendent- Environment and Critical Infrastructures

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## ACRONYMS

| | |
|---|---|
| Agnico Eagle | Agnico Eagle Mines Limited |
| CIRNAC | Crown-Indigenous Relations and Northern Affairs Canada |
| GN | Government of Nunavut |
| LDMP | Landfarm Design and Management Plan |
| NIRB | Nunavut Impact Review Board |
| NPAG | Non-Potentially Acid Generating |
| NWB | Nunavut Water Board |
| PAG | Potentially Acid Generating |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PHC | Petroleum Hydrocarbon |
| PID | Photoionization Detector |
| RMMS | Responsible Mining Management System |
| TSF | Tailings Storage Facility |
| WRSF | Waste Rock Storage Facility |

# 1 INTRODUCTION

## 1.1 Background

The original landfarm design was submitted by Agnico to the Nunavut Water Board in October 2012 and was in use until 2016. As presented in Figure 1 below, the original landfarm (Landfarm 1) was located on the north-west side of the South Tailings Cell impoundment (within the Tailing Storage Facility – TSF). Knowing that this landfarm area would eventually become flooded with reclaim water, Agnico decided to find an alternate location for a new landfarm in 2016 (Landfarm 2). Landfarm 2 was constructed in October 2016 within the South Cell Tailings impoundment. As presented on Figure 1, Landfarm 2 is located on the northeast side of the South Tailing Cell, north of the Central Dike. Similar to Landfarm 1, Landfarm 2 is designed with one soil remediation/storage cell.

## 1.2 Objectives

The Landfarm Design and Management Plan (LDMP), which is a component of the Responsible Mining Management System (RMMS), 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 Mine and Meliadine Gold Project sites. Onsite storage and remediation have been established as the preferred method for treatment of petroleum hydrocarbon (PHC) contaminated soil that may be generated at the Project site. Specifically, remediation through landfarming has been identified as the primary treatment option and, as such, is the focus of this Plan.

The objectives of this plan are to:

- Provide an overview of the contaminated soil management at the Mine;
- Describe the 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; and
- Describe contingency options for alternate treatment/storage of PHC soil.

# 2 SPILL PREVENTION

## 2.1 Spill Management Documentation

Spill prevention is the first stage in contaminated soil management at the Meadowbank site. Three documents describe spill prevention, management and response at this facility: the Spill Contingency Plan, the Emergency Response Plan, and the Oil Pollution Emergency Plan. Specifically, Section 2.1 of the Spill Contingency Plan describes spill prevention measures and can be referred to for further detail. All are updated regularly. General spill prevention methods include:

- Regular inspections of fuel/chemical storage areas for leaks
- Training in safe handling procedures
- Keep containers sealed
- Use methods of secondary containment
- Keep over pack drums nearby to contain leaking drums
- Keep storage area secure from unauthorized access, and protected from weathering and damage
- Segregate incompatible materials
- Regular meetings with site departments

# 3 LANDFARM DESIGN

## 3.1 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 Project. Any PHC contaminated soils generated during the construction, operation, and closure phases will be adequately managed. Soils contaminated with light PHCs, such as diesel, will be treated on-site in the landfarm. This method involves spreading, mechanical mixing, and placing the contaminated soil in windrows within a containment area and promoting conditions favorable for the volatilization and aerobic microbial degradation of hydrocarbons.

Materials contaminated with heavy hydrocarbons (e.g. grease), will need to be segregated, packaged, and shipped south for treatment and/or disposal.

A landfarm options analysis prepared for Agnico Eagle by Golder (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 stops between 0 to -5 degrees Celsius (°C)

restricting biodegradation to the months of June to September[1]. Nevertheless, degradation was reported at 90% over two summers on Resolution Island (Paudyn et al. 2008).

### 3.2 Location

The overall site plan for the Meadowbank Mine and the location of the landfarm facilities are shown in Figure 1. This central location was chosen to minimize the waste footprint on site and the transport distance of contaminated material from spill locations. All of the waste generated at Meadowbank in the form of tailings, wasterock and the site landfill is in close proximity. The location of the original landfarm facility (Landfarm 1) is directly north of the South Cell Tailings Facility. In 2016, Landfarm 1 was extended due to operational work required at the buttress of the Stormwater Dike. The Landfarm 1 extension as-built drawing is presented in Figure 2.

In 2016, a second landfarm facility (Landfarm 2) was constructed in the same general location within the South Cell Tailings impoundment, since the Landfarm 1 facility is planned to be flooded by reclaim water in mid-2017. Landfarm 2 is located on the northeast side of the South Tailing Cell, north of the Central Dike. Specifications of the Landfarm 2 design are presented in the as-built drawing, Figure 3. As with the original landfarm, the Landfarm 2 facility is designed with one soil remediation/storage cell.

Landfarm 1 continued to be used until mid-2017. At that point, any un-remediated soil as moved to Landfarm 2

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

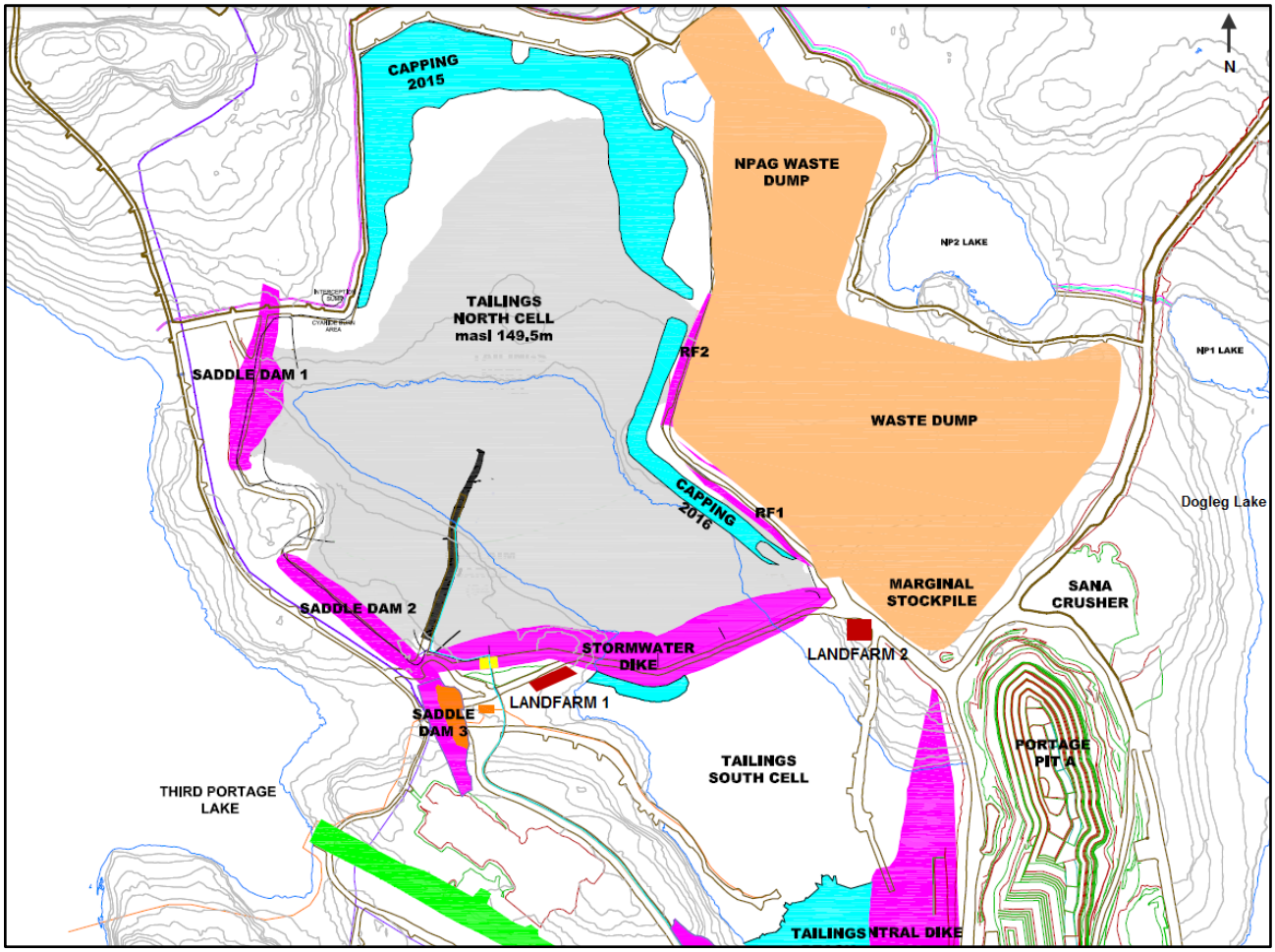


**Figure 1. General location of Landfarm 1 and Landfarm 2.**

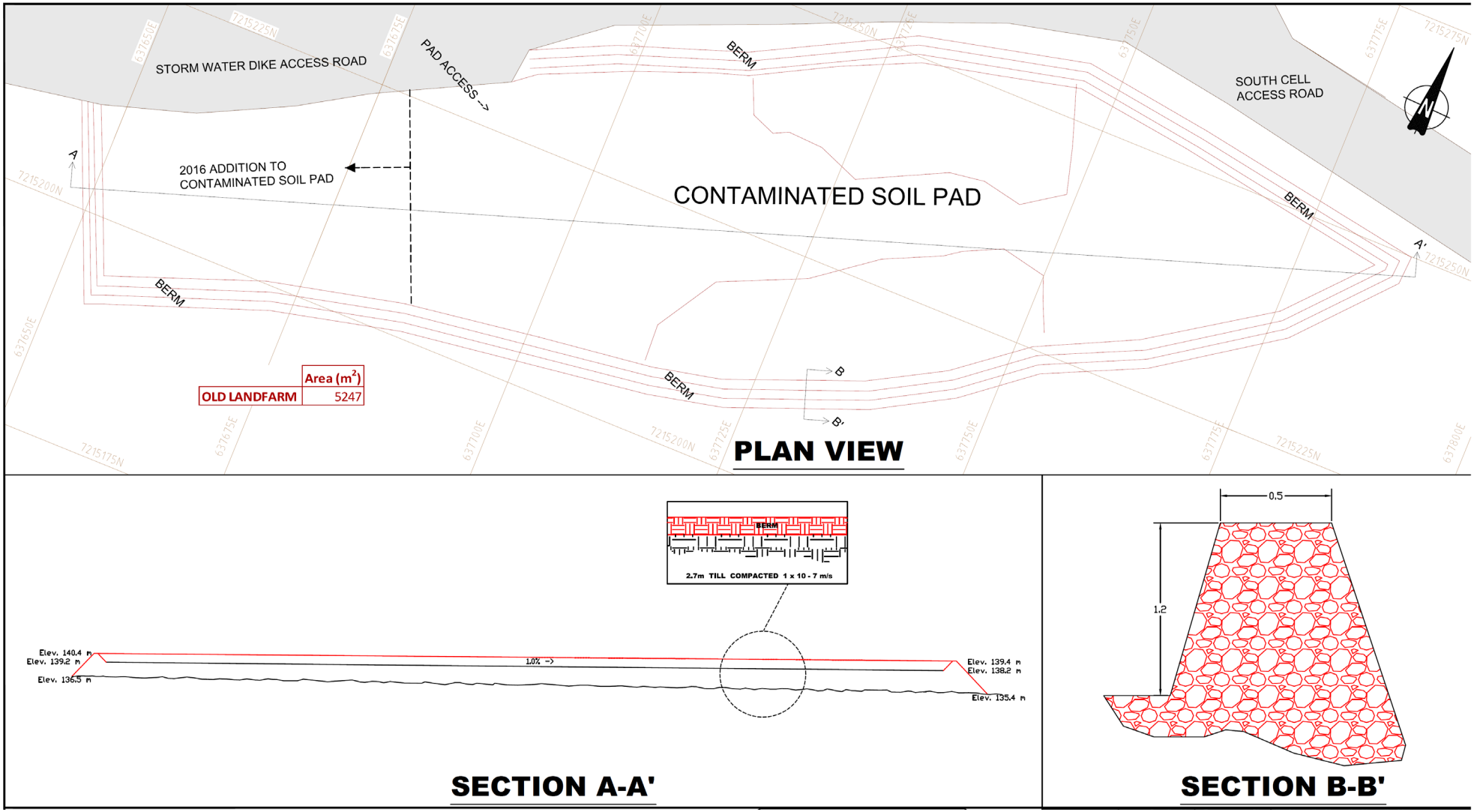


**Figure 2. Landfarm 1 as-built design**

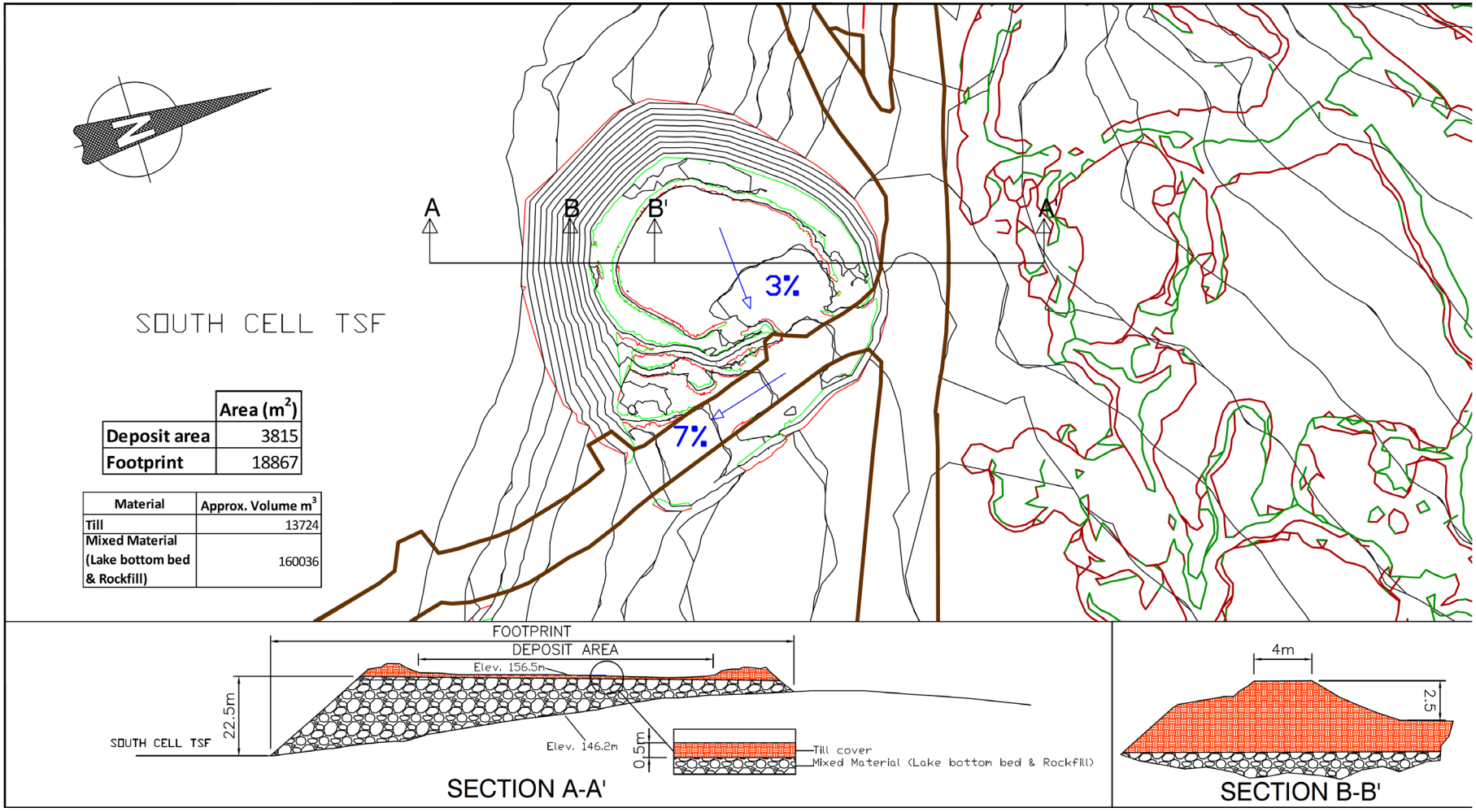


**Figure 3. Landfarm 2 as-built design**

### 3.2.1 Proximity of Surface Water

Landfarm 1 was located 300 m from the nearest water body, Third Portage Lake (TPL) and immediately adjacent to the North Cell Tailings Storage Facility (TSF). Surface drainage in this area is easterly, towards the TSF and away from TPL.

Landfarm 2 is 900 m west of the nearest water body (Dogleg Lake). Surface drainage in the area of Landfarm 2 is westerly, towards the South Tailings Cell and away from surface watercourses.

### 3.2.2 Proximity of Groundwater

In the Meadowbank area, the shallow groundwater is estimated to be 1.5 m below surface (active layer July – October), at the average depth of thaw. In order to prevent movement of contaminants from the landfarm facility into groundwater, Environment Canada (SAIC, 2006) recommends implementation of a barrier with $10^{-7}$ m/s hydraulic conductivity at a thickness of 0.6 m. The Meadowbank Landfarm 1 facility pad was constructed of 2.7 m of compacted till with a hydraulic conductivity of $10^{-7}$ m/s. The Landfarm 2 cell is constructed with a 0.5 m thick layer of compacted till base with hydraulic conductivity estimated of $10^{-7}$ m/s, over a constructed pad which varies between 6 m and 22.5 m in thickness. Therefore, no impacts to groundwater are anticipated.

## 3.3 Design

The landfarm facilities are designed with one soil remediation/storage cell. The design volumes of the cells are based on allowances for the materials to be treated. This calculation is described in the following section.

### 3.3.1 Soil Volume Requirements Landfarm 2

Based on surveys conducted by Meadowbank's Engineering Department the volume of the landfarm 2 in December 2023 was 5,934 $m^3$. In 2023, it is estimated that 400 $m^3$ of soil was added to Landfarm 2 from spill events around the Meadowbank site. The remaining capacity of the landfarm 2 is estimated at 5,511 $m^3$. The available landfarm volume should not be exceeded within the expected life of mine.

During the early stages of the mine closure in comparison to operation, additional contaminated soil may be generated following demolition of infrastructures, reclamation and remediation of infrastructures pads and roads.

### 3.3.2 Design Specifications

Specifications of the landfarm designs are shown in Figure 2 and 3. Landfarm 1 is constructed with a 1.5 m high berm and a 2.7 m deep compacted till base with hydraulic conductivity of $1x10^{-7}$ m/s. The slope of the base is 1.5%.

Landfarm 2 is constructed with a 2.5 m high berm and a 0.5 m thick compacted till base with hydraulic conductivity estimated of $10^{-7}$ m/s. The slope of the base is 3% towards the east side, and 7% towards the South Tailings Cell. The pad under the till layer on top of the tundra varies from 6 – 22.5 m thick.

Based on the available area, maximum windrow size will be 15 m wide at base x 4 m high x 50 m long, but smaller piles will be used as space allows maximizing rates of biodegradation and volatilization.

# 4 LANDFARM OPERATION AND MAINTENANCE

Agnico Eagle will be responsible for managing and implementing the operation plan.

## 4.1 Acceptable Materials

### 4.1.1 Contaminants

The landfarm facility will only treat and/or store petroleum hydrocarbon contaminated soils that have been generated through mine-related activities at the Meadowbank Gold, Project Meadowbank exploration camp and the Amaruq Road. Material from other sites will not be accepted without approval from the Nunavut Water Board, CIRNAC Resources Management Officers and the Kivalliq Inuit Association.

The following products may be treated in the landfarm if used onsite and spilled on soil:

- Diesel fuel
- Gasoline
- Aviation fuel (Jet A)
- Hydraulic oil
- Other light oil e.g. engine oil, lubricating oil

In the event that the contaminant source is unknown, soil samples will be analyzed for petroleum hydrocarbons 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. Concentrations of contaminants will be compared to the site background values (for metals) and/or criteria in the GN Guidelines for Contaminated Site Remediation (March, 2009). If this analysis indicates soil contamination above background or GN guidelines with any substances not approved for landfarming (i.e. non-PHC contaminants), the spill material will not be placed in the landfarm. This is to ensure PHC contaminated soils are not contaminated with other products.

Spills of > 100 L of non-PHC material (e.g. solvents, glycol) will be placed in drums and stored in the site Hazmat area for shipment south to approved facilities during barge season. Spills of non-PHC material < 100 L will be placed in the TSF.

### 4.1.2 Grain Size

While very coarse-grained larger soil material does not readily retain moisture and nutrients, inhibiting bioremediation, 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: surface area ratio, and can typically be screened out prior to landfarming (SAIC, 2006). A 2010 study at Meadowbank (Qikiqtaaluk Environmental, 2010) indicated increasing concentrations of PHC with decreasing grain size in one group of samples with soil fractions of

0.5, 0.5-1 and >1” (two other groups sampled were below detection at all grain sizes) (see Section 4.3.1).

## 4.2 Contaminated Soil Additions

### 4.2.1 Spill Excavation

Soil contaminated with the above-described petroleum hydrocarbon materials will be excavated from the source and transported to the landfarm facility in dump trucks or by roll- off containers. Care will be exercised to ensure that the entire spill is excavated (verified by visual assessment, by using a PID meter or sampling if necessary) and that none of the contaminated material is lost during transport.

## 4.3 Contaminated Snow

For spills < 100 L, PHC-contaminated snow will be placed in a designated area of the landfarm and treated as contact water after snowmelt.

For spills > 100 L, PHC-contaminated snow will be excavated and stored in labeled drums or at the TSF. After snowmelt, the contaminated water will be pumped through the site’s oil-water separator (carbon filter) to remove PHC residue. The treated water will be sampled per Part F, Item 7 of the Water License, and discharged to the Stormwater Management Pond if criteria are met. If criteria are not met, water will be treated as hazardous material and shipped south or placed into the Tailings Storage Facility (TSF). Also, after snowmelt, visible products will be cleaned up with absorbent pads or booms.

## 4.4 Remediation

Remediation of fine-grained PHC-contaminated soil in landfarms occurs naturally through volatilization and aerobic microbial degradation. Soil aeration and nutrient amendment are recognized as methods of improving rates of remediation. To this end, remedial operations at the Meadowbank site include soil mixing (aeration) and a pilot project utilizing onsite nutrient additions. While it is recognized that pH, salinity, moisture content and microbial population density also contribute to rates of degradation, these factors will not be explicitly investigated or managed unless remediation rates are too slow to meet the site closure time period (see Section 5.2).

### 4.4.1 Contaminated Soil/Rock Screening

Contaminated soil and rock being disposed of at the landfarm will need to be free of any debris such as spill matting, rags, gloves. To treat contaminated soils, the finer soils will be separated from coarse material by using a screen sieve. Material that is larger than 2.5 cm will be sorted and handled separately from material smaller than 2.5 cm. Once the materials have been screened, the finer material will be placed into windrows. Coarser material will be placed into

separate windrows and will be assessed by the Environmental Department to determine when/if the material can be brought to the Waste Rock Storage Facility.

#### 4.4.2 Coarse-Grained Soils

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. Used absorbent materials will be brought to the site Hazmat area for shipment south to approved facilities during barge season.

#### 4.4.3 Aeration

To promote aerobic conditions throughout the windrows, soil will be mixed mechanically with earth-moving equipment. This turnover of soil piles will occur at least once per year, during the summer months. The presence of coarse material also helps create gaps within the piles which will increase aeration and help degradation of PHC.

#### 4.4.4 Soil Moisture

Prior to aeration, 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 a freshwater supply will be used. If the windrows are saturated, aeration will be delayed until the moisture content is reduced.

#### 4.4.5 Nutrient Amendment

The use of sewage sludge as a nutrient amendment does not only provide 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. Sewage sludge will be placed in the landfarm on an as needed basis.

### 4.5 Removal of Soil from the Landfarm

When PHC vapors are no longer detected, coarse-grained material will be removed to the site waste rock disposal area and disposed of as potentially acid generating (PAG) material. PAG will be covered with a minimum of 2 m of non-potentially acid generating (NPAG) material to closure, such that freeze-back occurs and any potentially remaining contaminants are not mobile in the environment.

#### 4.5.1 Remediation Guidelines

Prior to removal of the finer grained soil from the landfarm, soil samples will be analyzed to

ensure they meet GN guidelines, as described below. 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 4-1 presents the applicable Tier 1 criteria for coarse-grained soil, assuming agricultural/wildlife or industrial land uses, and Table 4-2 presents remediation criteria for PAHs contaminants in soil as presented in the Environmental Guideline for Contaminated Site Remediation.

**Table 1 Summary of relevant GN Tier 1 Soil Remediation Criteria for Surface Soil**

| Parameter | 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 |

**Table 2 Summary of relevant remediation criteria for PAHs**

| Parameter | Land Use Criteria (mg/kg soil) | |
|---|---|---|
| | Agricultural/Wildlife | Industrial |
| Benzo-a-pyrene | 0.1 | 0.7 |
| Naphthalene | 0.1 | 22 |

Source: Government of Nunavut Environmental Guideline for Contaminated Site Remediation Table A4-1 (Canadian Soil Quality Guidelines)

### 4.5.2 Sampling and Analysis

Landfarm windrows will be sampled annually 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.

Degradation rates are assessed regularly to estimate the total remediation time required for PHC-contaminated soil under these conditions. If remediation to GN guidelines is feasible within the timeframe, landfarm operations will continue, with aeration and nutrient amendments as described above. If rates of TPH degradation are not sufficient through this method, alternative options will be further investigated (see Section 5).

### 4.5.3 Soil Removal

Coarse-grained material will be assessed after segregation from mechanical screening has been started, by Environment Department technicians for PHC product and odors. A PID monitor may be employed to assist in petroleum-hydrocarbon based vapor detection. When PHC vapors are no longer detected, this material will be removed to the Portage Rock Storage Facility (WRSF) and disposed of as PAG material.

When sample analysis of fine-grained material indicates that concentrations of contaminants are below Government of Nunavut 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.

Soil remediated to agricultural/wildland criteria will be appropriately delineated by Environment Department staff, and stockpiled outside the landfarm for use in site works or reclamation activities.

Soil remediated to industrial-use criteria will be removed from the landfarm and placed in the (WRSF) as PAG material. This material will be capped with a minimum of 2 m of NPAG at closure, allowing freeze-back and permanent encapsulation to occur.

## 4.6 Water and Snow Management

Since the landfarm facility is uncovered to facilitate natural weathering, water accumulating inside the bermed area may come into contact with contaminated material. The management plan for handling this potentially contaminated water is described below.

### 4.6.1 Snow Management

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 (no less than 10 cm) in place. After 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 snow melt to minimize migration into the facility substrate.

### 4.6.2 Water Management

Monitoring will be conducted for seepage of contact water through the perimeter berm, or accumulation of water within the containment berm through visual inspection by the Environment Department. This will be conducted on a weekly basis, after freshet, from July through October when water is likely to be present. In the event of water accumulation or seepage, the ponded water will be analyzed for Group 4 monitoring parameters, as described in Table 2 – Monitoring programs of the Water License prior to discharge to the adjacent Tailings Storage Facility (monitoring stations ST-14 and ST-14b). Alternatively, ponded water will be sprayed on the

windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged to the environment as per Part F, Item 18 of the water license.

### 4.7 Landfarm Closure and Reclamation

The landfarm facility will be decommissioned during mine closure. Remaining contaminated soil could be placed directly in the TSF or in the WRSF, as presented in Section 5. Prior to abandonment/closure of the landfarm, the berm and base will be sampled on a 10 m grid, including at a depth of 1 m in representative locations, to determine if these soils are free from PHC contamination. Results of this analysis will be compared to GN criteria. Since this area will form part of the TSF at closure, no excavation is necessary if industrial criteria are not met. Agnico Eagle's Closure Plan notes that the tailings facilities will be capped with at least 2 m of NPAG to ensure freeze-back encapsulation. Monitoring of tailings freeze-back is ongoing at the site, and to date the results indicate that tailings are already freezing as planned.

### 4.8 Summary of Activities

A summary of landfarm activities including monitoring of the physical condition and potential environmental impacts of the landfarm facility is provided in Table 2. A report will be prepared annually, indicating the volume of material added to the facility, amount of material removed and 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 Annual Report to the NWB.

**Table 3 - Summary of landfarm activities and records to be kept.**

| Activity | Analysis | Frequency | Record |
|---|---|---|---|
| Excavation of spill and transport of contaminated material | If unsure of full excavation - F1-F4, BTEX | As needed | Date and time of excavation; estimated quantity of excavated soil; storage/disposal location of excavated soil, if applicable; any evidence of remaining product |
| Contaminated soil additions to landfarm | If contaminant source unknown, F1-F4, BTEX, metals, oil and grease, VOCs (at discretion of Environment Department) | Prior to soil addition at facility | Date and time; quantity of soil; original location; landfarm location; spill/excavation record # or storage container label |
| Soil aeration | N/A | Min. once during summer | Date and time; location; soil condition (moisture, odour, 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; location in landfarm |
| Ponded contact water | BTEX, oil and grease, lead – as per Part F, Item 6 of Water License | Prior to any dewatering; if re-used in landfarm, no sampling necessary | Date and time, location, laboratory report, Annual Report |
| 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 | N/A | Date and time; location; quantity of soil removed; final location |
| Identification of maintenance requirements | Visual inspection of facility | Twice annually during summer | Inspected areas; condition of berm and base; previously unidentified safety concerns |

# 5 CONTINGENCY OPTIONS

The following sections describe the contaminated soil management plan, should a large spill event occur, and if landfarm treatment is not successful or feasible based on site conditions and resources. Those contingency options are considered applicable for contaminated soil management in operations and closure.

## 5.1 Large Spill Event

Considering that the landfarm is built to hold nearly 5x as much contaminated soil as is expected to be produced, a large spill event producing a quantity of soil that cannot be contained in the landfarm is unlikely. Nevertheless, in this event, soils will be placed in a temporary storage area. A temporary stockpile area would be set up in the WRSF or at another location as approved by the NWB and CIRNAC. The soil would then be placed in the landfarm as soon as practical. Through extensive spill prevention measures discussed earlier in this Plan Agnico Eagle is minimizing the probability of this scenario occurring.

## 5.2 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 period, or due to operational constraints, the following alternative treatment options will be considered during operations and closure.

### 5.2.1 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 (see SAIC, 2006). In addition, the height of soil windrows could be reduced to maximize air exposure if space in the facility allows.

### 5.2.2 Tier 2 – Modified Criteria Approach

According to the Government of Nunavut Environmental Guideline for Contaminated Site Remediation (Appendix A), 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. In the case of the Meadowbank site, landfarmed soils are to be encapsulated in the WRSF rather than used in surface applications, as assumed in Tier 1, reducing the likelihood of exposure to any remaining contamination. Therefore, the Tier 2 approach could be warranted if Tier 1 criteria cannot be met. Any consideration for this approach would be based on soil sampling results and science-based information.

### 5.2.3 Thermal Desorption

In the thermal desorption process, excavated soils are heated in a chamber to rapidly volatilize PHCs. Gases produced are consumed in an oxidation unit, and particulate matter removed (baghouse). Soil, free of any contamination, can then be replaced, or used in site reclamation or construction processes. The other advantage of this approach is that this equipment is mobile and could be brought to any spill site for remediation activities (e.g. spills along the AWAR). This method is described by Environment Canada (2002).

### 5.2.4 Direct Placement in the TSF or WRSF

Another option for management of contaminated soil would be the direct placement of this material in the Tailings Storage Facility, including in-pits, or Waste Rock Storage Facility if bioremediation is not effective or for operational reasons. The quantity of PHC-contaminated soil created onsite is small in comparison to the quantity of tailings or waste rock. 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. Over time, this material would undergo natural degradation. Consideration of this option will be included in the management of contaminated soil in closure, and will include a suitable monitoring program, which will be incorporated into the Closure and Reclamation Plan.

# 6 PLAN REVIEW AND CONTINUAL IMPROVEMENT

The Landfarm Design and Management Plan will be reviewed regularly by the Environmental and Critical Infrastructures Superintendent, and updated, when needed.

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