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SRK JOB NO.: 1CT022.019

FILE NAME: 1CT022.019_Boston_LFM&MP_Overview_rev01.dwg

TMAC
RESOURCES

Hope Bay Project

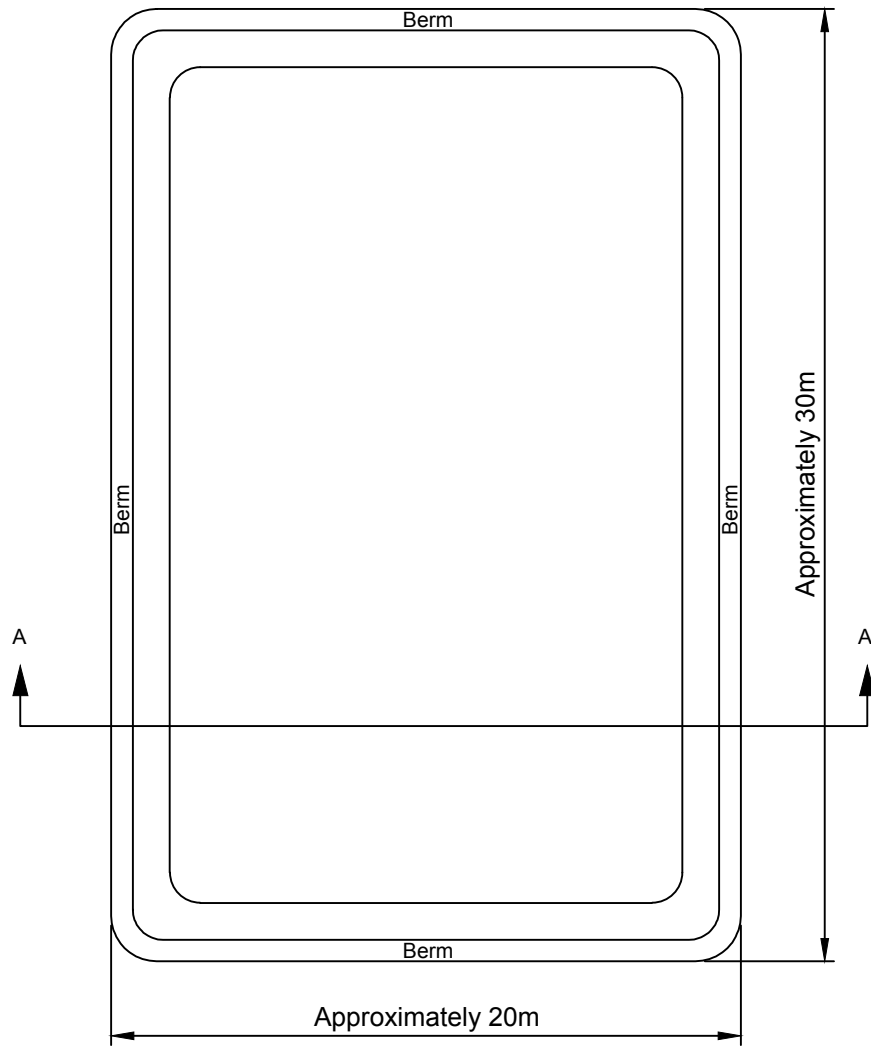
Landfarm Management and Monitoring Plan
Module B: Boston

Boston Location

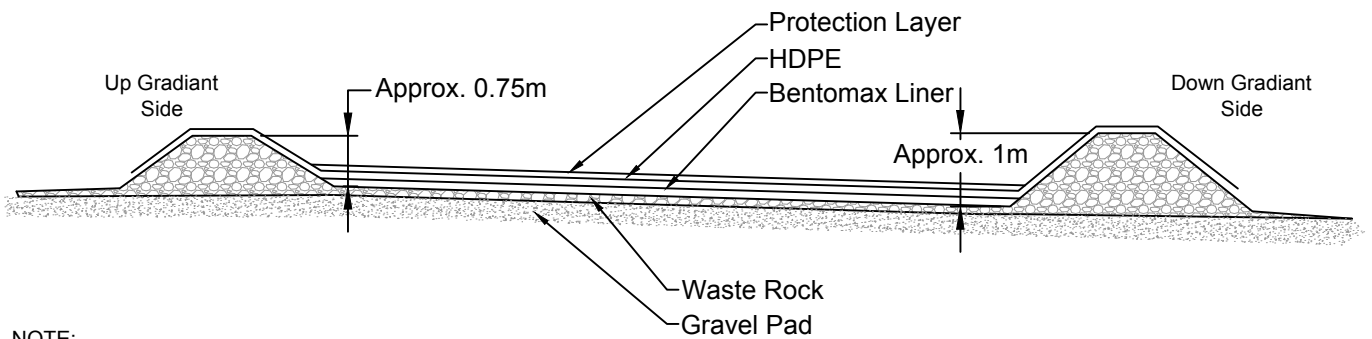
DATE:
January 2017

APPROVED:
EMR

FIGURE:
2



Plan View



NOTE:
Bentomax Liners and HDPE Material shown seperately for clarity

Cross Section A-A'



Landfarm Management and Monitoring Plan
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Land Treatment Area Details

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FIGURE:
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2. LAND TREATMENT AREA MANAGEMENT

2.1. SOIL MANAGEMENT

Hydrocarbon contaminated materials will be temporarily stored at the Boston LTA. Prior to placement in the LTA, the contaminated materials will be characterized to determine if the contaminated soil is suitable for treatment at the Doris Landfarm, is required to be disposed of underground in the Doris Mine, or packaged for off-site disposal at a licenced remediation/disposal facility.

The Landfarm Management and Monitoring Plan presents the type of analyses recommended for contaminated soil characterization.

The material currently contained within the Boston LTA was placed by Miramar in 2003 after three diesel spills that occurred at the camp. This material will be relocated to Doris Mine as described in this Plan. The emptied facility will become the LTA.

Placement of Contaminated Material Land Treatment Area

New hydrocarbon contaminated materials should when possible be transported directly to the Doris Mine where they will be stored underground, or temporarily stored in Doris Landfarm. If this is not possible, the material must be transported to, and temporally stored in the Boston LTA.

The Site Superintendent will maintain a record of the amount of contaminated material placed in the LTA and the location of each batch of contaminated material by contaminant type and date of deposition. Copies of these records must be readily available for internal and external audits and for inspectors.

Recovery of Contaminated Material from Land Treatment Area

Recovery of contaminated material must be undertaken with adequate care and supervision such that the LTA liner is not damaged.

Immediately following recovery of contaminated material from the LTA, the LTA liner should be inspected for damage. Any damage should be repaired prior to additional placement of contaminated materials and prior to the spring freshet.

2.2. WATER MANAGEMENT

Precipitation

The precipitation and temperature profile for the Boston area was taken from the baseline meteorology data compiled for the Doris project. The average monthly air temperature is typically above 0°C between June and September with the peak in July and below freezing between October and May with the coldest temperatures usually occurring in February. The mean annual precipitation adjusted for under-catch is approximately 207 mm with 41% occurring as rain between May and October and 59% as snow through the remainder of the year (Miramar, 2007).

The Boston LTA has a footprint of approximately 600 m² (including the berm footprint) providing a total precipitation collection area of 600 m² from which water must be collected and treated. Mean precipitation ranges from 94 mm to 207 mm, with only about 41% falling as rain. Annual lake evaporation (typically occurring between June and September) is about 220 mm. Consequently, the mean annual volume of precipitation runoff expected to be collected is as follows:

$$56 \text{ m}^3 \text{ to } 124 \text{ m}^3 = (600 \text{ m}^2 \text{ (LTA area)} \times (\text{mean precipitation in mm}/1,000))$$

The majority of this runoff will be lost through wind movement of snow, sublimation and evaporation. For the purposes of estimating the maximum potential volume of water to be treated through the oil adsorption system; these losses have not been considered. Offsetting sublimation and evaporation losses from within the liner of the tank farm and LTA treatment facilities will be contaminated snow brought to the facility for remediation (estimated at approximately 3 m³ per year) (Miramar, 2007).

Snow should be removed from the facility prior to spring freshet. A minimum of 10 cm of snow cover should remain on the surface to avoid removing surficial contaminated material or potentially contaminated contact snow. If the soil surface in the LTA is very even, making it difficult to remove snow carefully, snow should not be removed using equipment. Shovels may be used to carefully remove drifts if necessary.

The LTA does not have a sump; therefore, precipitation collects in the lowest areas. This pooled water will be removed to a temporary holding tank or the containment pond, if required, for treatment through the oil adsorption treatment system.

Water Sampling and Monitoring

Prior to the discharge of water from the LTA, a water sample will be collected and analyzed for comparison to the water licence BOS-6 discharge criteria for pH, total suspended solids, total oil and grease, benzene, toluene, ethylbenzene and lead as per the existing and or future revisions of the Type B Water Licence discharge criteria for BOS-06. This sample can be collected pre- and/or post-Oil Adsorption Treatment. If discharge criteria are met, INAC will be notified and discharge will commence ten days after notification or upon receipt of INAC approval.

The water sampling records will be kept by the ESR Department and reported to the NWB in the monthly monitoring reports.

3. MONITORING AND EVALUATION

TMAC will implement an inspection and monitoring program for the Boston LTA during frost-free seasons. The objective is to ensure that the facility is functioning properly.

3.1. ANNUAL INSPECTIONS

Maintenance of the LTA is essential for ensuring its effectiveness. Table 2 shows the items to be inspected.

Table 2: Inspection Components for the Boston Land Treatment Area

Item	Responsibility	Purpose	Frequency	Required Records
LTA Operations Inspection	Site Superintendent	Record keeping of treatment operations and berm performance for due diligence	During spring freshet, or after rainfall events.	<ul style="list-style-type: none"> Inspection checklist and field notes including date, weather, and facility condition including any repairs required, odour noted, quantity of water accumulated and amount of freeboard. Record of berm performance with emphasis on observations of cracking or any signs of instability.
Water Sampling Prior to Discharge	ESR or delegate	To conform to Water License requirements	As required prior to discharge	<ul style="list-style-type: none"> Document notification of INAC Inspector (written notification at least ten days prior to discharge). Record depth of water in LTA. Calculate approximate water volume to be discharged. Laboratory-issued reports including QA/QC and summary tabulation of results. Record of any unauthorized discharges or deposits and follow-up action taken. Photographic record.
Geotechnical Inspection	SRK Geotechnical Engineer	To identify any maintenance requirements	Annually	<ul style="list-style-type: none"> Inspection of geotechnical performance of facility. Document recommendations of any repair/maintenance work. Record of any repair work made to the facility.

3.2. DOCUMENTATION AND REPORTING

As required by Part J, Section 23 (or equivalent) of the Water Licence, a Monthly Program summary report shall be submitted to the NWB for review within thirty (30) days following the month being reported and shall include sample analysis from Station BOS-6.

As required by Part B, Section 7 (or equivalent) of the Water Licence, an Annual Report must be filed by March 31 of the following year that includes:

- The annual quantities in cubic meters of all contaminants and soil types from all locations that are placed within the landfarm facility; and
- Tabular summaries of all data generated under the Monitoring Program.

3.3. QA/QC PROCEDURES FOR WATER SAMPLING

Quality assurance and quality control (QA/QC) procedures for water sampling are outlined in the Landfarm Management and Monitoring Plan.

Detailed QA/QC procedures are available in the Quality Assurance and Quality Control Plan (TMAC 2017).

4. CONTINGENCIES

Should additional new contaminated material require storage at Boston, that exceeds the capacity of the LTA, a temporary lined facility may be required to store the excess material. This is considered unlikely as the primary management is transport to Doris and only when this is unavailable should new material be stored at Boston LTA.

In the event that the LTA is at capacity, temporarily storing contaminated materials awaiting transport to Doris, and water levels rise rapidly as a result of unprecedented snowmelt or precipitation, excess water will be pumped to the Lined Settling Pond.

5. LAND TREATMENT AREA CLOSURE

The Boston LTA will be decommissioned at mine closure, upon closure of the existing Boston Camp, or upon construction of a new LTA. The liner system will be removed and the berms graded to promote positive drainage across the site. Remaining contaminated soils will be transported to Doris for treatment or disposal.

Details of LTA and Boston facilities closure is available in the Boston Closure and Reclamation Plan (SRK 2017).

6. REFERENCES

Government of Nunavut. 1995. Consolidation of Mine Health and Safety Act (Nunavut). S.N.W.T. 1994, c.25; In force December 15, 1995; SI-014-95. As Amended by Northwest Territories Statutes: S.N.W.T. 1996, c.9; In force April 16, 1996. As Amended by Statutes Enacted Under Section 76.05 of Nunavut Act: S.N.W.T. 1998, c.34; In Force April 1, 1999.

Miramar. 2007. Landfarm Management Plan Doris North Project, Nunavut. April.

SAIC. 2006. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Science Applications International Corporation. March. Project No. 11953.B.S08.

SRK Consulting (Canada) Inc. 2016. Hope Bay Project Groundwater Management Plan. Report prepared for TMAC Resources Inc. August 2016.

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TMAC Resources Inc. 2017. Quality Assurance and Quality Control Plan, Hope Bay, Nunavut. January 2017.

2BB-BOS1217 – *Boston Type B Water Licence*.