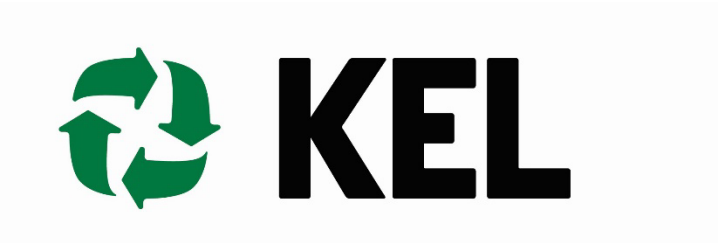
Closure and Reclamation Plan

Cambridge Bay Soil and Water Treatment Facility

Kitikmeot Environmental Ltd.



CLOSURE AND RECLAMATION PLAN

FINAL

Cambridge Bay Soil and Water Treatment Facility
V.2.2
4300CBSTF

March 2022

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EXECUTIVE SUMMARY

This Plan outlines how Kitikmeot Environmental Ltd. will close the facility once it stops operating. Specifically, this document outlines when the facility will stop receiving contaminated soil, water, and snow, and how the facility will be deconstructed. This Plan also describes the steps that will be taken to ensure the facility has not impacted the surrounding environment. Reporting requirements will be outlined in the issued license and submitted to Government of Nunavut (GN), Crown Indigenous Relations and Northern Affairs Canada (CIRNAC) and Nunavut Water Board (NWB) in a timely manner.

REVISION HISTORY

DATE	DOCUMENT VERSION	SUMMARY OF CHANGES MADE	AUTHOR	APPROVER
April 2016	Ver. 1	Initial Issue in Draft	JF	JF
January 2017	Ver. 1	Final Version	JF	JF
December 2022	Ver.2.1	Ownership Change, Contacts & Date Updates	KHF	KO

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1.0 INTRODUCTION

Kitikmeot Environmental Ltd. (KEL) operates a soil and water treatment facility (the Facility) in Cambridge Bay, NU. The proposed Facility is located adjacent to the Hamlet of Cambridge Bay sewage lagoon as seen in Appendix A. KEL will provide the expertise to manage the facility design, comply with the Nunavut Water Board (NWB) approval requirements, keep the facility in compliance and manage treatment operations. KEL will provide the Facility land, contracting services, and necessary equipment to treat contaminated soil.

Coordinates for the Facility are:

69º 07' 40.52" N 105º 02' 35.29"W

The site is accessible by road, from an access road off Natik Street. The footprint of the facility is entirely within the lease area.

Facility operations and maintenance contacts:

Corporate Office:

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The effective date for this Closure and Reclamation Plan (the Plan) is January 1, 2023. The Plan will be effective for a period of five years, after which the Facility is expected to be reclaimed prior to severance of the agreement with the Hamlet of Cambridge Bay and transfer of custody to a subsequent lessee or the land owner. This Plan will be reviewed and updated on an annual basis as required to ensure it remains current.

2.0 ENVIRONMENTAL POLICY

Our commitment to the protection of the environment needs to be demonstrated in how we conduct our day-to-day business operations. The highest standards of care are to be taken by all employees to minimize the environmental impact of all operations. The company management team has the responsibility to take a leadership role and develop policies and procedures that minimize environmental effects. Employees have the responsibility to bring to the attention of their immediate supervisor those procedures and incidents which may impair the environment. Our policy is to:

1) Comply with all applicable government regulations.
2) Consider the environmental effects of our operations.
3) Provide staff with all the necessary information, training and equipment.
4) Develop processes, policies and procedures that minimize the occurrence and consequences of environmental incidents.

Our corporate environmental goal is to minimize the environmental impact of our operations.

3.0 ENVIRONMENTAL MANAGEMENT

The Facility is located near the Hamlet of Cambridge Bay within hamlet limits on an existing lease in an established industrial area. No land will be disturbed during the construction and operation of the Facility.

Environmental impacts associated with soil biotreatment, water treatment and effluent discharge, as described below, are anticipated to be negligible based on facility design, implementation of mitigation measures and adherence to monitoring plans. Mitigation measures and monitoring plans, are presented in the *Cambridge Bay Soil and Water Treatment Facility*, *Environmental Protection Plan (KEL, 2022a)*, *Operations and Maintenance Plan (KEL, 2022b)*.

4.0 PROJECT OBJECTIVES AND SCOPE OF WORK

The purpose of this Plan is to outline the methodology for closure and reclamation of the Facility. This will be required to confirm site conditions at the end of operations, and/or to facilitate transfer of the site to a subsequent lessee, which is expected to be the Hamlet of Cambridge Bay. The scope of this Plan includes closure and reclamation of the Facility. The site was previously occupied by an industrial storage area and will be returned to a condition that permits continued industrial use. This Plan is focused on addressing the SWTF facility, which consists of the biotreatment facility, water treatment facility, hazardous waste storage area, and equipment and traffic areas used by vehicles accessing the SWTF.

KEL will manage the program activities responsibly and will comply with all licenses, permits and applicable territorial and federal laws and regulations related to facility closure and reclamation. The following table lists regulations and guidelines that will be applied and referenced for the Facility closure in Cambridge Bay.

Table 1. Regulations and Guidelines Relevant to Closure and Reclamation of the Cambridge Bay SWTF

Jurisdictional Authority	Regulation or Guideline
Nunavut Water Board	Water License
Government of Nunavut (GN)	*Consolidation of Environmental Protection Act* (EPA), 1988
GN Department of Environment	Guideline for the Management of Contaminated Sites, 2014
Canadian Council for Ministers of the Environment	Canadian Environmental Quality Guidelines – Water Quality Guidelines for the Protection of Aquatic Life, 2014
Federal Contaminated Sites Action Plan (FCSAP)	Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, 2012
Nunavut Water Board	Water License

The Closure and Reclamation Plan shall address:

1. The water treatment and waste disposal sites and facilities;
2. The hazardous waste storage areas;
3. Any site affected by waste spills;
4. The natural runoff waters from the development site;
5. The restoration of natural drainage and the restoration of stream banks at the operation site(s);
6. The potential for groundwater contamination;
7. Any facilities or areas which may have been affected by development such that potential pollution problems exist;
8. A phased approach and implementation schedule; and
9. Maps delineating all disturbed areas, borrow material locations, and site facilities.

5.0 PROJECT DESCRIPTION

The Facility will be operating as a long-term SWTF in Cambridge Bay, under a water license obtained from the Nunavut Water Board. The design and operation of the facility was previously described in detail (KEL, 2022b) and is summarized in subsequent sections of this document.

As outlined in Appendix B, the Facility includes:

1. One engineered cell 50 m x 40 m for receipt, storage and treatment of petroleum hydrocarbon-contaminated soil;
2. One engineered cell designed for storage of up to 170 m3 of petroleum hydrocarbon contaminated snow and water;

3. One small package water treatment plant to treat petroleum hydrocarbon-contaminated water; and
4. One engineered cell (158 m2) for the storage of containerized hazardous waste awaiting shipment to approved facilities.

The facility is intended to extend its operation for a duration of approximately five (5) years commencing January 1, 2023, after which it is anticipated that KEL will review the lease with the Hamlet. Further details pertaining to closure and reclamation planning are presented in subsequent sections of this Plan.

5.1. Biotreatment Facility

The Facility is designed to treat petroleum hydrocarbons. Materials received at the site for treatment include petroleum hydrocarbon-contaminated soil, water and snow from off-site sources including residential, commercial and industrial properties where a hydrocarbon spill or leak has occurred. Prior to receipt on-site, contaminated soil is profiled by sampling and analysis to determine suitability for treatment. Soil meeting acceptance criteria is deposited into an engineered cell for bioremediation.

Once the bioremediation process has been given adequate time, soil is sampled to confirm it meets discharge/beneficial re-use criteria. Soil meeting re-use criteria is hauled off site for use as alternative daily cover at the Cambridge Bay landfill or local beneficial re- use. Potential end users other than the Hamlet of Cambridge Bay will be reviewed by KEL and discussed with the Government of Nunavut Department of Environment on a case by case basis. Soil not meeting beneficial re-use criteria is hauled off site for disposal at an appropriate facility such as an approved Class II landfill in Alberta.

5.2. Water Treatment Facility

The Facility is designed to treat water/snow impacted with petroleum hydrocarbons. An engineered pond is utilized to accept petroleum hydrocarbon-contaminated water and snow from off-site sources including residential, commercial and industrial properties where a petroleum hydrocarbon spill or leak has occurred. All snow and water transported to site requires results of analytical testing and/or MSDS and suitable movement documents prior to receipt on site. If either of these is absent or incomplete, or materials do not meet the acceptance criteria, snow and water is not received into the facility and remains the responsibility of the generator. Water and snow meeting acceptance criteria is deposited into an engineered cell. Effluent generated at the biotreatment pad and contact water from the hazardous materials storage area are directed to the engineered pond via a perforated drain pipe.

Snow and water will remain in the cell until snow has melted, at which time the meltwater is directed to an adjacent on-site a package water treatment plant (WTP). The treatment plant is designed to remove particulate matter, suspended solids and petroleum hydrocarbons. Treated water is stored in a dedicated portable above ground storage tank (AST) on site where it is sampled to confirm it meets discharge criteria. Water meeting discharge criteria is then re-used as a soil amendment on the biotreatment pad, re-used in the adjacent quarry for dust suppression or released to the environment at a designated location. Water not meeting discharge criteria is hauled off site for disposal at an appropriate facility. ASTs

along with pumper trucks are locally available to meet additional treated water storage needs.

5.3. Water Treatment Plant

The mobile water treatment plant consists of a series of inline bag filters designed to remove sediment and suspended solids. Following the filter bag train, effluent enters the bottom of treatment vessels which contain granular activated carbon and an organoclay. Water treatment is designed to occur in a manner to promote contact between the effluent and the media, enhancing treatment success. Treated water would be stored in ASTs and sampled for comparison against the parameters outlined in the license. Performance of the treatment system is dependent on the contaminant. Organic contaminants are likely to be removed easily from the water. Inorganic constituents have been successfully removed by activated carbon and organoclay filtration, however less reliably so.

5.4. Effluent Discharge

Treated water is collected in the AST, downstream of the WTP. Once it is confirmed that water meets the guidelines set forth by GN and NWB in the license, representatives from DOE and CIRNACwill be provided with analytical water quality results. 10 days prior to discharge, disposal or reuse of water from the ASTs or retention pond notice of intent to discharge will be given.

6.0 CLOSURE AND RECLAMATION

The objective of this Closure and Reclamation Plan is to outline the steps required to reclaim the SWTF after it has been decided that the facility will be closed. The site was previously occupied by an industrial storage area and will be returned to a condition that permits continued industrial use. This Plan is focused on addressing the SWTF facility, which consists of the biotreatment facility, water treatment facility and plant, equipment and traffic areas used by vehicles accessing the SWTF.

Upon closure of the SWTF, the following steps will be taken:

1. The facility will stop accepting contaminated soil, snow and water for treatment.
2. Any stored snow or water will be treated and discharged to the soil treatment facility or disposed of.
3. After treatment, soil will be tested to confirm it meets soil re-use criteria and will be used as daily cover at the Cambridge Bay landfill. Soil treatment could take one year or more.
4. The liners will be exposed and inspected for defects. Soil below any observed defects will be sampled and submitted for laboratory analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs and total metals.

5. The liners associated with the soil and water treatment facility will then be removed and disposed of at the Cambridge Bay landfill. The underlying soil will be inspected for staining. Soil samples will be collected from any stained areas and submitted for laboratory analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs and total metals. If no staining is observed, a minimum of four soil samples will be collected from beneath each of the three components of facility. A further eight samples will be collected from the high traffic areas near the access ramps, for a total of 20 soil samples.
6. After soil quality, has been confirmed, the site will be re-graded to restore drainage patterns present prior to construction of the facility.
7. All equipment will be removed from the site.
8. Groundwater samples will be collected from each monitoring well installed to monitor the SWTF. Water quality impacts will be judged based on a comparison to baseline conditions which will be assessed prior to construction. After confirmation that there are no ongoing impacts to water quality arising from SWTF operation, the monitoring wells will be properly decommissioned using bentonite backfill, and the steel casing will be cut flush with ground surface.
9. The lease will expire and the land will be returned to the owner (Hamlet of Cambridge Bay).

Closure of each component of the SWTF is discussed in more detail below.

6.1. Biotreatment Facility

Following termination of operations, the soil remaining within the facility will be tested to confirm that remediation is complete and the re-use criteria have been met. Soil meeting re-use criteria will be re-used as fill or alternative daily cover at the Cambridge Bay landfill. Alternate end users will be reviewed by KEL and the Department of Environment on a case by case basis. Material not meeting re-use criteria will be disposed of at a Class II landfill in Alberta or at a similarly approved facility.

Once the biotreatment facility is empty, soil samples will be collected from the protective soil layer above the geotextile and submitted to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs, and total metals. Soil meeting re-use criteria will be removed and re-used as fill or alternative daily cover at the Cambridge Bay landfill. Alternate end users will be reviewed by KBL and the Department of Environment on a case by case basis. Material not meeting re-use criteria will be disposed of at an approved location.

6.2. Water Treatment Pond

Following decommissioning of the biotreatment facility, any water or snow in the water treatment pond will be treated and the pond will be emptied. Treated water meeting release criteria will be used as dust suppressant or released to the environment, as approved by the Department of Environment. Remaining water not meeting release criteria will be shipped to a waste processing facility in Alberta for further treatment and/or disposal.

Once empty, the pond liner will be inspected for defects. The pond liner will be will be removed and disposed of in the Cambridge Bay landfill. If defects or damage to the liner are found or suspected, or staining to the underlying soil observed, one discrete sample of the upper 0.05 m of soil beneath each liner defect will be sampled and submitted to an accredited laboratory for analysis of petroleum hydrocarbons (F1 to F4), BTEX, PAHs, and total metals. Material not meeting re-use criteria will be disposed of at an approved location.

6.3. Hazardous Waste Storage Area

Following decommissioning of the biotreatment facility, all remaining material stored in the hazardous waste storage area will be shipped to approved disposal facilities. The liner will be removed in the same fashion as the procedures set forth for the biotreatment pad and the water treatment pond.

Once the hazardous waste storage area is empty and the liner removed, soil samples will be collected from the protective soil layer above the geotextile and submitted to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of petroleum hydrocarbon (F1 to F4), BTEX, PAHs, and total metals. Soil meeting re-use criteria will be removed and re-used as fill or alternative daily cover at the Cambridge Bay landfill. Alternate end users will be reviewed by KBL and the Department of Environment on a case by case basis. Material not meeting re-use criteria will be disposed of at an approved location.

6.4. Equipment

The water treatment plant is a package treatment plant that discharges treated effluent to an above ground storage tank (AST). Upon completion of closure and reclamation activities, all equipment will be emptied of treated water and removed from the site. Spent filter media from the water treatment plant will be disposed of at an appropriate facility. Any visually stained soil found beneath the water treatment plant will be sampled, analyzed, and treated or disposed as required, according to the methodology outlined in preceding sections of this document.

7.0 POST-CLOSURE MONITORING AND REPORTING

KEL is committed to monitoring the facility after closure for a period of one year, or until the Hamlet of Cambridge Bay chooses an alternate use for the land, whichever happens first. Post-closure monitoring will involve collection of two complete sets of groundwater samples during the first summer season after the facility has stopped accepting soil, snow and water. Groundwater samples will be submitted for analysis of petroleum hydrocarbons (F1 to F4), BTEX, oil and grease, extractable petroleum hydrocarbons, total metals, dissolved metals and general chemistry. Groundwater quality results will be compared to baseline conditions to determine if the underlying groundwater has been impacted by operation of the SWTF. The post-closure monitoring will follow the same baseline sampling protocol used prior to

construction.

After confirming that groundwater quality in the vicinity of the SWTF has not degraded relative to baseline conditions, the groundwater monitoring wells will be decommissioned by backfilling the boreholes and monitoring wells with bentonite and removing the steel casing.

Ongoing monitoring and remediation would be provided, as required, if post-closure groundwater monitoring results indicate elevated parameter concentrations. Response options to address the potential scenario that groundwater quality is degraded relative to baseline conditions are dependent on the contaminant of concern, levels observed, and source of contamination. KEL would engage a third-party hydrogeologist to review the results and make recommendations in the event further action is required, which may include further monitoring, remediation, or treatment options.

8.0 SCHEDULE

It is anticipated that the majority of closure activities will take place during summer months and can likely be completed within two years after the soil treatment facility has stopped accepting soil, snow and water. The approximate schedule provided in Table 2 assumes that one full summer is required to treat hydrocarbon impacted soils prior to closure.

Table 2. Approximate Schedule of Closure Activities

Activity	Pre-Closure (Year 1)		Biotreatment (Year 2)				Facility Closure (Year 3)			
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Stop receiving soil	■									
Stop receiving water and snow							■			
Biotreatment of soil		■	■	■	■	■	■			
Facility closed							■			
Confirm remediation/ treatment criteria met								■		
Remove treated soil and treat/release								■		
Inspect liners for defects									■	
Remove and dispose of liners and equipment									■	

Sample soil under liners and equipment										
Step-out soil sampling										
Contaminated soil removal as needed										
Site re-grading										
Post-closure groundwater										
Groundwater well closure										
Lease terminated										

9.0 RECLAMATION COSTS

A detailed closure cost estimate has not been prepared, but a security calculator assessment has been completed and submitted to the Nunavut Water Board.

10.0 SUMMARY

This Plan outlines how KEL will close the facility once it stops operating. Specifically, this document outlines when the facility will stop receiving contaminated soil, water and snow, and how the facility will be deconstructed. This Plan also describes the steps that will be taken to ensure the facility has not impacted the surrounding environment.

11.0 REFERENCES

Northwest Territories Waters Act (S.C. 1992, c. 39)

Environmental Protection Act, RSNWT (Nu) 1988, c E-7

Canadian Council for the Ministers of the Environment. 2014. Canadian Environmental Quality Guidelines, Water Quality Guidelines for the Protection of Aquatic Life. Accessed in December 2014.

Environment Canada (EC). 2012. Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, November 2012.

Government of Nunavut. 2014. Environmental Guidelines for the Management of Contaminated Sites Remediation, Department of Environment

Kitikmeot Environmental Ltd. (KEL) 2022a. Environmental Protection Plan. November, 2022.

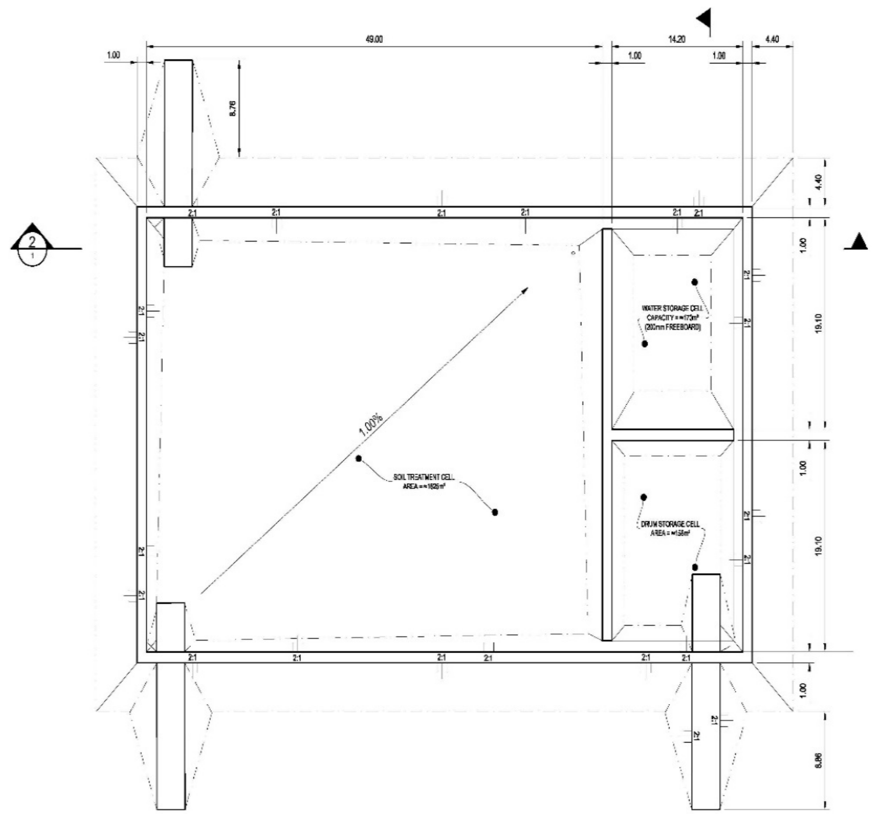
Kitikmeot Environmental Ltd. (KEL) 2022b. Operations and Maintenance Plan. November, 2022.

APPENDIX A

Facility Location

APPENDIX B

Facility Design



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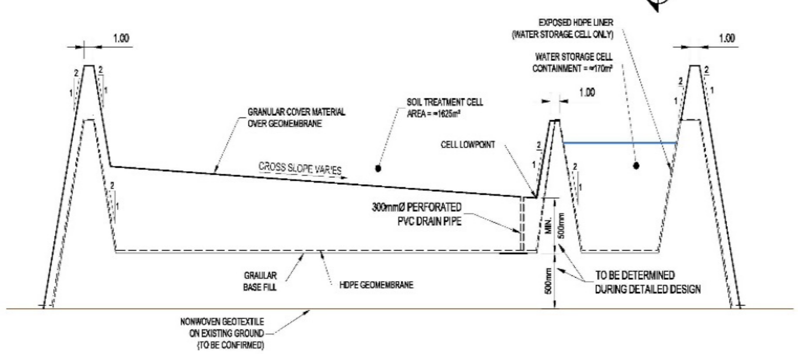

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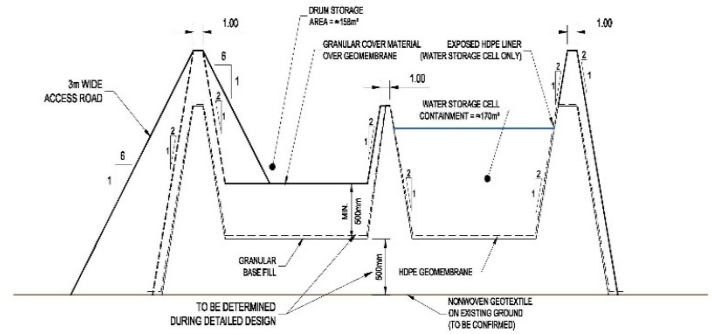

3 SECTION
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NOTES:

1. FIGURE IS IN SUPPORT OF KBL'S, APPLICATION FOR A DEVELOPMENT PLAN FOR A SOIL TREATMENT FACILITY IN CAMBRIDGE BAY, NU.
2. FIGURES PRESENT GENERAL LAYOUTS AND CONCEPTUAL DESIGNS. FINAL DESIGNS AND CONSTRUCTION WILL DEPEND ON FIELD CONDITIONS AND LOCALLY AVAILABLE CONSTRUCTION MATERIALS.
3. SCALES AND DIMENSIONS ARE APPROXIMATE.
4. EXISTING GRADE IS ASSUMED TO BE FLAT AND LEVEL. ACTUAL CONFIGURATION WILL MAKE USE OF ADVANTAGEOUS NATURAL SLOPE ORIENTATIONS.
5. BERM HEIGHT MAY BE INCREASED TO ACCOMMODATE FIELD CONDITIONS.
6. GEOMEMBRANE INSTALLATION QUALITY CONTROL AND QUALITY ASSURANCE SHALL BE CONDUCTED THROUGHOUT INSTALLATION ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
7. BERMS AND BASE SHALL BE COMPACTED TO 98% STANDARD PROCTOR DENSITY IN LIFTS OF UP TO 300 MILLIMETRES.
8. PERMAFROST INSULATION LAYER AND GRADING FILL IS TO BE GRADED AND PROOF ROLLED WITH SMOOTH DRUM ROLLER OR SMOOTH PLATE PRIOR TO PLACEMENT OF GEOTEXTILE AND GEOMEMBRANE.
9. BERM SLOPES TO BE CONFIRMED DURING DETAILED DESIGN.
10. MINIMUM DEPTH OF BASE FILL ABOVE EXISTING GROUND TO BE CONFIRMED DURING DETAILED DESIGN.

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Designed: KB | Reviewed by: KS
Drawn: TPW | Checked: KS
Date: APRIL 2016
Scale: AS NOTED

KBL SOIL TREATMENT FACILITY - CONCEPTUAL DESIGN
CAMBRIDGE BAY, NUNAVUT

SITE PLAN AND SECTION

Project: 15-2230-1000

Sheet: 1

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