TECHNICAL MEMORANDUM

Issue Date:	July 25, 2025	**Reference/Project No.:**	2025-8842-00
To:	**Michel Gamache, P.Ag.**	**Previous Issue Date:**	
From:	Jennifer Brown, P.Eng., MEERL, Senior Hydrogeologist		
Client:	KBL Projects Ltd. (Leduc)		
Project Name:	Cambridge Bay Land Farm - Hydrogeological Support		
Subject:	Opinions and Recommendations to Support Groundwater Monitoring		

KBL Projects Ltd. (KBL) retained Associated Environmental Consultants Inc. (Associated) to provide opinions and recommendations to support groundwater monitoring at the Cambridge Bay soil and water treatment facility project in Cambridge Bay, NU (the facility). The treatment facility is operated by Kitikmeot Environmental Ltd. and authorized by the Nunavut Water Board (NWB) under Type B water use licence (WUL) 1BR-CST2328, issued on April 5, 2023, for industrial undertakings.

1 SUMMARY BACKGROUND INFORMATION

The facility is designed to treat petroleum hydrocarbons in soil, water, and snow from off-site sources. The facility comprises a biotreatment facility, water/snow storage pond, and mobile water treatment plant.

KBL has installed three groundwater monitoring wells (CST-2, CST-3, and CST-4). Attachment A includes a figure that shows the approximate monitoring well locations relative to the facility. Groundwater monitoring and sampling was previously unsuccessful due to shallow permafrost conditions (less than 60 cm below ground surface),[1] a short period for the above-permafrost active layer, and wells that remained frozen year-round. Associated reviewed the WUL (Attachment B) and the operations and maintenance plan (Attachment C) to assess potential monitoring and sampling solutions for WUL compliance.

1.1 Monitoring Conditions in the Water Use Licence

Part I of the WUL lists the conditions that apply to the monitoring program. There are four monitoring program stations, named CST-1, CST-2, CST-3, and CST-4. The stations are described as the final discharge point from the facility (CST-1), and monitoring stations upgradient (CST-2) and downgradient (CST-3 and CST-4) from the facility. The monitoring program stations are to be sampled and analyzed for routine parameters (pH, conductivity, total hardness, total alkalinity, sodium, magnesium, chloride, potassium, calcium, sulphate, nitrate + nitrite), total phenols, total suspended solids, total metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, benzene, toluene, ethylbenzene, xylene, ammonia nitrogen, oil and grease, 5-day biochemical oxygen demand, and total coliforms. Section I, Item 4, requires the collection of a representative composite sample from at least 5% of the total volume to be released from the final discharge point, at CST-1. Conditions for Part D, Item 3, also states that the effluent being discharged at CST-1 should not exceed the maximum allowable concentrations listed.

The WUL specifies discharge effluent sampling but does not specify groundwater sampling or monitoring as a requirement. Part F permits drilling for the installation of groundwater monitoring wells. The WUL also does not specify water monitoring frequency or water quality criteria for groundwater quality monitoring.

[1] Michel Gamache, Project Manager, KBL Projects Ltd. May 7, 2025.Personal communication (telephone conversation) with Associated's Jennifer Brown.

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1.2 Water Monitoring Plan

Section 3.8 of the treatment facility's operations and maintenance plan discusses the water monitoring plan (WMP) for the facility. The WMP commits Kitikmeot Environmental Ltd. to an annual groundwater monitoring program to assess changes in groundwater. It also describes the methods for collecting field parameters, samples for laboratory analysis, and samples for quality assurance and quality control. The sampling results are to be compared to the Federal Interim Groundwater Quality Guidelines (FIGQG) for the monitoring parameters provided in the WUL.

2 PROFESSIONAL OPINION

Associated has the following professional opinions based on the material provided for review and based on other work experience in the North:

- Groundwater sampling may be possible if it is appropriately timed and if the temperature remains consistently warm for a period after freshet and before winter freeze to allow conditions for the uppermost permafrost to thaw and become active (active layer). The active layer is shallow groundwater that typically follows the topography for the top of the permafrost. If temperatures remain consistently above 0°C and during periods of 24-hour sunshine, the active layer may become thick enough to allow collection of groundwater samples for laboratory analysis.
- Based on the shallow permafrost and assumed active layer, the permafrost active layer at the facility will likely be between late-July and late-August. The timing for the active layer may be unpredictable, ranging from days to weeks, depending on the weather and temperatures during summer months. Overall, the timing window for active groundwater flow is expected to be short and likely limited to the possibility of a single annual sampling event.
- Permanent groundwater monitoring wells in Arctic weather conditions have a very limited life because freeze/thaw cycles cause the wells to heave up and out of the ground or cause damage that makes the wells unreliable and inconsistent for repeat groundwater monitoring events.
- The topography for the top of permafrost may differ from the ground surface topography and the active layer may flow in a different direction than anticipated, based on surface topography.
- Due to the shallow nature of the permafrost at the facility, it is possible surface water flow can be sampled instead of groundwater to assess potential contamination migration from the facility. The WUL does not specify groundwater sampling for the facility and therefore should not have been provided as a monitoring option in the WMP.
- The WUL lists total parameters (i.e., total metals), which are not comparable to the FIGQG values and therefore the FIGQG is not the criteria for comparison for the facility.
-

3 RECOMMENDATIONS

Associated provides the following recommendations:

- Coordinate a virtual or in-person meeting with the NWB to discuss options to update the operations and maintenance plan and remove groundwater monitoring from the WMP. One suggested option would be to monitor surface water runoff that flows away from the facility during freshet or heavy rain periods. GPS coordinates should be recorded for each sampling location; if possible, samples should be collected at the same or similar locations during future sampling events.

- After meeting with the NWB, request approval from the NWB in writing for modifications to the monitoring program.
- If groundwater sampling is required, install temporary stainless steel direct-push, or drive-point, piezometers (25 mm [1-inch]) at each sampling location annually. After each sampling event, clean the piezometers with an environmental cleaning solution (e.g., Alconox) and store them in properly labelled, dedicated containers for each piezometer (each piezometer should be stored separately), to be reused annually and to minimize potential cross-contamination from other locations.
- Update Section 3.8 in the operations and maintenance plan to accurately reference the WUL conditions, water quality criteria, and methods to be used for the WMP. Groundwater monitoring should be removed from the WMP, and active layer or surface water runoff monitoring should be added, depending on approval from NWB.
- Collect effluent samples at CST-1 before any discharge; the water quality results must meet the maximum allowable concentrations listed in the WUL and be compared to the appropriate guidelines.
- Do not use the FIGQG as the water quality criteria for the facility.
- Do not excavate to sample the active layer; excavating the soil and insulating materials above permafrost can impact permafrost and increase permafrost degradation.

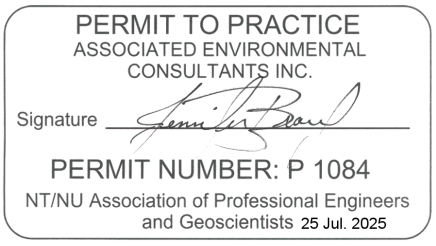
4 CLOSURE

Associated Environmental Consultants Inc. prepared this memo for KBL Projects Ltd. to provide recommendations to support groundwater monitoring at the soil land farm located in Cambridge Bay, NU. We trust that this provides the information you currently require.

Associated Environmental Consultants Inc.

Prepared by:





Jennifer Brown, P.Eng., MEERL
Senior Hydrogeologist

JB/bs/ag/sr

ATTACHMENTS

Attachment A: Figure
Attachment B: Water Use Licence 1BR-CST2328
Attachment C: Operations and Maintenance Plan

Attachment A: Figure



N

30 15 0 30

Meters

SITE MAP

Source: ESRI

KBL

Scale:	1:1500
Date:	2020-08-07
File #:	4300
Drawn By:	DLS
Designed By:	DLS
Reviewed By:	KO

KBL Environmental LTD.

Cambridge Bay
Soil Treatment Facility

Attachment B: Water Use Licence 1BR-CST2328

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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File No: **1BR-CST2328**

April 5, 2023

Kitikmeot Environmental Ltd.
P.O. Box 6
30B Mitik Street
Cambridge Bay, NU
X0B 0C0

Email: regulatory@kblenv.com

RE: NWB Replacement Water Licence No: 1BR-CST2328

Dear Kitikmeot Environmental Ltd.:

Please find attached Water Licence No: **1BR-CST2328** issued to Kitikmeot Environmental Ltd. by the Nunavut Water Board (NWB or Board) pursuant to its authority under Article 13 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in Right of Canada* (*Nunavut Agreement*). The terms and conditions of the attached Licence related to the use of Water and the deposit of Waste are an integral part of this approval.

If the Licensee contemplates the continuing of this Undertaking after the Water Licence expires, it is the responsibility of the Licensee to apply to the NWB for a renewal water licence. The past performance of the Licensee, new documentation and information, and issues raised during a public hearing, if the NWB is required to hold one, will be used to determine the terms and conditions of the renewal Water Licence. Note that if the Licence expires before the NWB issues a new one, then the use of Water and the deposit of Waste must cease, or the Licensee may be in contravention of the *Nunavut Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRTA or Act)*. However, the expiry or cancellation of a licence does not relieve the holder from any obligations imposed by the licence. The NWB recommends that an application for the renewal of this Licence be filed at least **three (3) months** prior to the Licence expiry date.

It should be noted that in accordance with s. 75(1)(a) of the *Nunavut Planning and Project Assessment Act* (*NuPPAA*), the Board is not allowed to issue a permit or authorization for any project proposal that has not been submitted to the Nunavut Planning Commission (NPC) in accordance with s. 76 of *NuPPAA*.

If the Licensee contemplates or requires an amendment to this Licence, the NWB may decide, in the public's interest, to hold a public hearing. The Licensee should submit application for amendment as soon as possible to give the NWB sufficient time to go through the amendment

process. The process and timing may vary depending on the scope of the amendment, however, a minimum of **sixty (60) days** is required from time of acceptance by the NWB. It is the responsibility of the Licensee to ensure that all application materials have been received and are acknowledged by the Manager of Licensing.

The NWB strongly recommends that the Licensee consult the comments received by Crown-Indigenous Relations and Northern Affairs Canada (CIRNA) and Environment and Climate Change Canada (ECCC) on issues identified. This information is attached for your consideration.[1]

Sincerely,

Lootie Toomasie
Nunavut Water Board,
Chair

LT/ak/rh

Enclosure: Replacement Licence No: **1BR-CST2328**

Comments—CIRNA, ECCC

Cc: Distribution List—Kitikmeot

[1] Crown-Indigenous Relations and Northern Affairs (CIRNA), March 3, 2023; Environment and Climate Change Canada (ECCC), March 3, 2023.

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DECISION

LICENCE NUMBER: 1BR-CST2328

This is the decision of the Nunavut Water Board (NWB or Board) with respect to an application dated December 21, 2022 for a renewal of a Water Licence made by:

KITIKMEOT ENVIRONMENTAL LTD.

to allow for the use of Water and the deposit of Waste during operation of the proposed Cambridge Bay Soil and Water Treatment Facility located within the Kitikmeot Region, Nunavut, generally located at the geographical coordinates as follows:

Project Extents:

Latitude: 69° 07' 44" N	Longitude: 105° 02' 46" W
Latitude: 69° 07' 44" N	Longitude: 105° 02' 27" W
Latitude: 69° 07' 38" N	Longitude: 105° 02' 27" W
Latitude: 69° 07' 36" N	Longitude: 105° 02' 47" W

DECISION

After having been satisfied that the Application is for a proposal that falls outside of an area with an approved land use plan, and, as such, a conformity determination is not required and is exempt from the requirements for screening as described within s. 12.4.3 / Schedule 12-1 of the *Nunavut Agreement* as determined by the Nunavut Planning Commission (NPC)[1], the NWB decided that the Application could proceed through the regulatory process. In accordance with s. 55.1 of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (*NWNSRTA* or *Act*) and Article 13 of the *Nunavut Agreement*, public notice of the Application was given and interested persons were invited to make representations to the NWB.

After reviewing the submission of the Applicant and considering the representations made by interested persons, the NWB, having given due regard to the facts and circumstances, the merits of the submissions made to it and to the purpose, scope and intent of the *Nunavut Agreement* and of the *Act*, waived the requirement to hold a public hearing, and determined that:

Replacement Licence No: 1BR-CST2328 be issued subject to the terms and conditions contained therein. (Motion #: 2022-B1-024)

Signed this 5th day of April, 2023 at Gjoa Haven, NU.

Lootie Toomasie
Nunavut Water Board, Chair
LT/ak/rh

[1] Nunavut Planning Commission, Conformity Determination, February 6, 2023.

I. BACKGROUND

The Cambridge Bay Soil and Water Treatment Facility (Facility) is located approximately 700 metres northwest of the Hamlet of Cambridge Bay and adjacent to the Hamlet's sewage lagoon. The Facility consists of three sections consisting of a landfarm for remediation of petroleum-hydrocarbon contaminated soil, a pond for contaminated snow, and a storage area of used drums. Contaminated water and/or snow is treated on-site using a mobile wastewater treatment plant.

II. PROCEDURAL HISTORY

The previous Type "B" Water Licence No: 1BR-CST1723 was issued on March 23, 2017 to Kitnuna Environmental Ltd. The Board set a six-year licence term resulting in the licence expiring on March 23, 2023. On May 22, 2020, an Assignment of Water Licence No: 1BR-CST1723 was granted by the NWB from Assignor Kitnuna Environmental Ltd. to Assignee Kitikmeot Environmental Ltd.

On December 21, 2022, a licence renewal application (Application) was received from Kitikmeot Environmental Ltd. by the NWB, requesting that the licence be renewed for a five-year term.

On February 6, 2023, the Nunavut Planning Commission (NPC) confirmed that the Project proposal falls outside of an area with an approved land use plan, and, as such, a conformity determination is not required. In addition, the NPC determined that the Project proposal is exempt from the requirements for screening by the Nunavut Impact Review Board (NIRB).

The Board distributed the Application for public review on February 10, 2023, once the Board received the conformity determination from the NPC.

On March 3, 2023, the NWB received comments submissions on the Application from Crown-Indigenous Relations and Northern Affairs (CIRNA) and Environment and Climate Change Canada (ECCC). On March 28, 2023, KEL provided responses and necessary updates to its management plans as recommended by the interveners.

III. GENERAL CONSIDERATIONS

On the basis of the Application, the written materials filed with the Board, and submissions of the parties, the Board has decided to issue Type "B" Water Licence No: 1BR-CST2328 (the Licence) subject to the terms and conditions set out below. The Licence authorizes the Kitikmeot Environmental Ltd. (KEL or Licensee) to continue the deposit of waste for an Industrial Undertaking as defined under Schedule 1 of the *Nunavut Waters Regulations*, and also contains terms and conditions necessary to protect the environment and provide appropriate safeguards in respect of the deposit of waste in accordance with the Application.

In accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRTA)* s. 45, the NWB may issue a licence for a term not exceeding twenty-five years. The Applicant requested a five-year term for this Licence, which the NWB believes is appropriate for the Project. The Board has, therefore, granted the five-year term requested by KEL.

A. Scope, Definitions and Enforcement

Scope

The Licence allows for the deposit of Waste in support of an Industrial Undertaking.

Definitions

Several definitions were added to the list of definitions in this Licence to reflect the actual status of the Facility.

Enforcement

To ensure that the Licensee complies with the terms and conditions of the Licence, inspectors designated and empowered by the Minister of Northern Affairs Canada may inspect or examine works, activities, and undertakings associated with the use of waters and/or the deposit of waste for the purposes of exercising their powers in accordance with the *NWNSRTA*. [2]

Compliance

KEL should note that compliance with the terms and conditions of this Licence does not necessarily absolve the Licensee from the responsibility to comply with all other applicable legislation, guidelines, and directives.

B. General Conditions

Part B of the Licence addresses the general terms and conditions that apply to the Undertaking, such as annual report submission, protocols for handling documents related to the Licence, posting of signage at sites associated with the undertaking, and more.

C. Conditions Applying to Water Use

No water use is authorized under this Licence.

D. Conditions Applying to Waste and Waste Management

The Board has approved the Plan entitled "Waste Management Plan" dated March 2022 that was submitted as additional information with the Application.

Under this Licence, the original effluent discharge criteria have been revised as per the feedback from ECCC, with which the Licensee agreed. The revisions include removing the Effluent limit for oil and grease and including the limit for total petroleum hydrocarbons.

The Board has approved the Plan entitled "Operations and Maintenance Plan" dated March 2022 and submitted as additional information with the Application. However, the Licensee is required to submit an update to the Plan addressing in full ECCC's recommendations regarding the quality

[2] Sections 85-88 of the *NWNSRTA*.

assurance and quality control procedures for sampling. The recommendations were provided by ECCC on March 3, 2023 as the result of the public review of the Application.

E. Conditions Applying to Modifications and Construction

The Applicant is required to obtain permission from the NWB for modifications that do not meet the definition of modifications or the criteria of Part G, Item 2 of the Licence. Changes that do not meet the definition of a Modification under the Licence or the requirements of Part G may be considered amendments to the Licence.

F. Conditions Applying to Drilling

The Licensee is authorized to drill for the purposes of installing monitoring instrumentation, including monitoring wells and thermistors.

G. Conditions Applying to Spill Contingency Planning

The Board has approved the Plan entitled "Spill Contingency Plan" dated March 2022 that was submitted as additional information with the Application.

H. Conditions Applying to Closure and Reclamation or Temporary Closure

The Board has approved the Plan entitled "Closure and Reclamation Plan" dated March 2022 that was submitted as additional information with the Application.

I. Conditions Applying to the Monitoring Program

All of the monitoring requirements under the expired licence were carried over to this Licence.

NUNAVUT WATER BOARD
WATER LICENCE

Licence No: 1BR-CST2328

Pursuant to the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and the *Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*, the Nunavut Water Board, hereinafter referred to as the Board, hereby grants to

KITIKMEOT ENVIRONMENTAL LTD.

(Licensee)

P.O. BOX 6, 30B MITIK STREET, CAMBRIDGE BAY, NU X0B 0C0

(Mailing Address)

hereinafter called the Licensee, the right to alter, divert or otherwise use water or dispose of Waste for a period subject to restrictions and conditions contained within this Licence Renewal-Amendment:

Licence Number/Type:	**1BR-CST2328 / TYPE "B"**
Water Management Area:	**SOUTHERN VICTORIA ISLAND WATERSHED (8)**
Location:	**CAMBRIDGE BAY SOIL AND WATER TREATMENT FACILITY PROJECT KITIKMEOT REGION, NUNAVUT**
Classification:	**INDUSTRIAL UNDERTAKING**
Purpose:	**DIRECT DEPOSIT OF WASTE**
Quantity of Water use not to Exceed:	**WATER USE IS NOT AUTHORIZED**
Date of Licence Issuance:	**APRIL 5, 2023**
Expiry of Licence:	**APRIL 4, 2028**

This Licence replacement, issued and recorded at Gjoa Haven, Nunavut, includes and is subject to the annexed conditions.

Lootie Toomasie
Nunavut Water Board, Chair

PART A: SCOPE, DEFINITIONS AND ENFORCEMENT

1. **Scope**

This Licence allows for the deposit of Waste for an Industrial Undertaking classified as per Schedule 1 of the *Regulations* at the Cambridge Bay Soil and Water Treatment Facility Project, located within the Hamlet of Cambridge Bay in the Kitikmeot Region, Nunavut.

a. This Licence is issued subject to the conditions contained herein with respect to the taking of Water and the deposit of Waste of any type in any Waters or in any place under any conditions where such Waste or any other Waste that results from the deposits of such Waste may enter any Waters. Whenever new Regulations are made or existing *Regulations* are amended by the Governor in Council under the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, or other statutes imposing more stringent conditions relating to the quantity or type of Waste that may be so deposited or under which any such Waste may be so deposited, this Licence shall be deemed, upon promulgation of such Regulations, to be subject to such requirements; and

b. Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of all applicable Federal, Territorial and Municipal legislation.

2. **Definitions**

"**Act**" means the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"**Addendum**" means the supplemental text that is added to a full plan or report usually included at the end of the document and is not intended to require a full resubmission of the revised report;

"**Amendment**" means a change to original terms and conditions of this Licence requiring correction, addition or deletion of specific terms and conditions of the Licence; modifications inconsistent with the terms of the set terms and conditions of the Licence;

"**Applicant**" means the Licensee;

"**Appurtenant Undertaking**" means an undertaking in relation to which a use of Water or a deposit of Waste is permitted by a licence issued by the Board;

"**Board**" means the Nunavut Water Board established under the *Nunavut Agreement* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act;*

"**Cambridge Bay Soil and Water Treatment Facility**" means the engineered facility designed and constructed to manage petroleum hydrocarbon contaminated soil, contaminated snow/water, used drums, and hazardous material as described in the Application dated December 21, 2022;

"**Closure and Reclamation Plan**" means a Plan developed to reach the closure goal and taking in account the "Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories" 2013;

"**Effluent**" means treated or untreated liquid Waste material that is discharged into the environment from a structure such as a settling pond, landfarm or a treatment plant;

"**Engineer**" means a professional engineer registered to practice in Nunavut in accordance with the *Consolidation of Engineers and Geoscientists Act S. Nu 2008, c.2* and the *Engineering and Geoscience Professions Act S.N.W.T. 2006, c.16 Amended by S.N.W.T. 2009, c.12*;

"**Greywater**" means all liquid Wastes from showers, baths, sinks, kitchens and domestic washing facilities, but does not include toilet Wastes;

"**High Water Mark**" means the usual or average level to which a water body rises at its highest point and remains for sufficient time so as to change the characteristics of the land (ref. Department of Fisheries and Oceans Canada, Operational Statement: Mineral Exploration Activities);

"**Inspector**" means an Inspector designated by the Minister under Section 85 (1) of the *Act*;

"**Licensee**" means the holder of this Licence;

"**Modification**" means an alteration to a physical work that introduces a new structure or eliminates an existing structure and does not alter the purpose or function of the work, but does not include an expansion;

"**Nunavut Agreement**" means the *"Agreement Between the Inuit of the Nunavut Settlement Area and Her Majesty the Queen in right of Canada*", including its preamble and schedules, and any amendments to that agreement made pursuant to it;

"**Regulations**" means the *Nunavut Waters Regulations* SOR/2013-69 18th April, 2013;

"**Secondary Containment**" means an impermeable structure, external to and separate from primary containment, which prevents unplanned spills of hazardous materials and provides a minimum capacity of 110% of the original vessel. Where multiple vessels are stored within the containment, it must provide a minimum capacity equal to the sum of the largest vessel and 10% of the aggregate volume of all other vessels located in the containment. This structure shall also provide containment and control of hoses and nozzles;

"**Sewage**" means all toilet Wastes and greywater;

"**Spill Contingency Plan**" means a Plan developed to deal with unforeseen petroleum and hazardous materials events that may occur during the operations conducted under the Licence;

"**Sump or Sumps**" means a structure or depression that collects, controls, and filters liquid Waste before it is released to the environment. This structure should be designed to prevent erosion while allowing percolation of liquid Waste;

"**Toilet Wastes**" means all human excreta and associated products, but does not include greywater;

"Treatment Objective" means the treatment objective for the Landfarm, which is based on the Canadian Council of Ministers of the Environment (CCME) *Canada – Wide Standard for Petroleum Hydrocarbon in Soil*; and as determined by the Government of Nunavut, Environmental Protection Service based on the *Environmental Guideline for Site Remediation*; refer to Table 1;

"**Type A Soil**" means soil contaminated with hydrocarbons in which the primary petroleum product present in the soil as determined by laboratory analysis consists of lubricating oil and grease in the F3 and F4 fraction;

"**Type B Soil**" means soil contaminated with hydrocarbons in which the primary petroleum product present in the soil as determined by laboratory analysis consists of fuel oil and/or diesel fuel and /or gasoline in the F1 and F2 fraction;

"**Waste**" means, as defined in s. 4 of the *Act*, any substance that, by itself or in combination with other substances found in water, would have the effect of altering the quality of any water to which the substance is added to an extent that is detrimental to its use by people or by any animal, fish or plant, or any water that would have that effect because of the quantity or concentration of the substances contained in it or because it has been treated or changed, by heat or other means;

"**Water**" **or** "**Waters**" means waters as defined in section 4 of the Act.

3. Enforcement

a. Failure to comply with this Licence will be a violation of the *Act*, subjecting the Licensee to the enforcement measures and the penalties provided for in the *Act*;

b. All inspection and enforcement services regarding this Licence will be provided by Inspectors appointed under the *Act*; and

c. For the purpose of enforcing this Licence and with respect to the use of water and deposit or discharge of Waste by the Licensee, Inspectors appointed under the *Act,* hold all powers, privileges and protections that are conferred upon them by the *Act* or by other applicable law.

PART B: GENERAL CONDITIONS

1. The Licensee shall file an Annual Report on the Appurtenant Undertaking with the Board no later than March 31st of the year following the calendar year being reported, containing the following information:

    a. A summary report of Waste disposal activities;
    b. Quantity of Waste disposed of on on-site Waste disposal facility;
    c. Quantity of Waste backhauled to approved facility for disposal;
    d. A list of unauthorized discharges and a summary of follow-up actions taken;
    e. Any revisions to the management plans, as required by Part B, Item 6, submitted in the form of an Addendum;
    f. A description of all progressive and or final reclamation work undertaken, including photographic records of site conditions before, during and after completion of operations;
    g. A summary of all information requested and results of the Monitoring Program;
    h. Details pertaining to locations of sump(s) and drill holes;
    i. A summary, including photographic records before, during and after any relevant construction activities or Modifications and/or major maintenance work carried out on facilities under this Licence and an outline of any work anticipated for the next year;
    j. Detailed discussion on the performance, installation, and evaluation, including the use of photographic record, of the primary and secondary containment functions used in fuel storage to safeguard impacts to freshwaters;
    k. A summary of public consultation/participation, describing consultation with local organizations and residents of the nearby communities, if any were conducted;
    l. Any other details on Water use or Waste disposal requested by the Board by the 1st November of the year being reported.

2. The Licensee shall notify the NWB of any changes in operating plans or conditions associated with this Project at least thirty (30) days prior to any such change.

3. The Licensee shall, where applicable, install flow meters or other such devices, or implement suitable methods required for measuring the volume of Effluent generated by the undertaking, as required under Part I, Item 2 of this Licence.

4. The Licensee shall, for all Plans submitted under this Licence, include a proposed timetable for implementation. Plans submitted, cannot be undertaken without subsequent written Board approval and direction. The Board may alter or modify a Plan if necessary to achieve the legislative objectives and will notify the Licensee in writing of acceptance, rejection or alteration of the Plan.

5. The Licensee shall, for all Plans submitted under this Licence, implement the Plan as approved by the Board in writing.

6. The Licensee shall review the Plans referred to in this Licence, as required by changes in operation and/or technology, and modify the Plan accordingly. Revisions to the Plans

shall be submitted in the form of an Addendum to be included with the Annual Report.

7. Every Plan to be carried out pursuant to the terms and conditions of this Licence shall become a part of this Licence, and any additional terms and conditions imposed upon approval of a Plan by the Board become part of this Licence. All terms and conditions of the Licence should be contemplated in the development of a Plan where appropriate.

8. The Licensee shall ensure a copy of this Licence is maintained at the site of operations at all times. Any communication with respect to this Licence shall be made in writing to the attention of:

(a) Manager of Licensing:
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Telephone: (867) 360-6338
Fax: (867) 360-6369
Email: licensing@nwb-oen.ca

(b) Inspector Contact:
Manager of Field Operations, CIRNAC
Nunavut District, Nunavut Region
P.O. Box 100
Iqaluit, NU X0A 0H0
Telephone: (867) 975-4284
Fax: (867) 979-6445

9. The Licensee shall submit an electronic copy of all reports, studies, and plans to the Board. Reports or studies submitted to the Board by the Licensee shall include a detailed executive summary in Inuinnaqtun.

10. The Licensee shall ensure that all documents or correspondence submitted by the Licensee to the NWB are received and acknowledged by the Manager of Licensing.

11. This Licence is assignable as provided for in Section 44 of the *Act*.

12. The expiry or cancellation of this Licence does not relieve the Licensee from any obligation imposed by the Licence, or any other regulatory requirement.

PART C: CONDITIONS APPLYING TO WATER USE

1. The Licensee is not authorized to use Water under the terms and conditions of this Licence.

2. The Licensee shall not conduct any work below the ordinary High Water Mark of any water body unless approved by the Board in writing.

3. The Licensee shall not cause erosion to the banks of any water body and shall provide necessary controls to prevent such erosion.

4. Sediment and erosion control measures shall be implemented prior to and maintained during the undertaking to prevent entry of sediment into Water.

PART D: CONDITIONS APPLYING TO WASTE DISPOSAL

1. The Board has approved the Plan entitled "Waste Management Plan" dated March 2022 that was submitted as additional information with the Application.

2. The Licensee shall treat, to the Treatment Objective, Type B Soil in the Landfarm, or as otherwise approved by the Board.

3. Effluent discharged from the Cambridge Bay Soil and Water Treatment Facility at Monitoring Station CST-1 shall not exceed that the following discharge limits:

Parameter	Maximum Allowable Concentration (mg/L)
pH	6 to 9 (pH units)
TSS	50
Total Lead	0.001
Benzene	0.37
Toluene	0.002
Ethylbenzene	0.090
Total Petroleum Hydrocarbons (TPH)	5.0

4. If the Effluent associated with Part D, Item 3 does not meet the Effluent limits under Part D, Item 3, it shall be considered hazardous Waste and disposed off-site at an approved facility or as otherwise approved by the Board in writing.

5. The discharge location for all treated Effluent described in Part D, Item 3, shall be at a minimum of thirty-one (31) metres from the ordinary High Water Mark of any water body and where direct flow into a water body is not possible and no additional impacts created.

6. The Licensee shall provide at least ten (10) days written notice to the Inspector prior to any planned discharges from the Cambridge Bay Soil and Water Treatment Facility. The notice shall include an estimated discharge volume, Effluent quality or results of monitoring under Part I, Item 5, and the proposed location for the discharge.

7. The Board has approved the Plan entitled "Operations and Maintenance Plan" dated March 2022 and submitted as additional information with the Application.

8. The Licensee shall, within sixty (60) days of issuance of the Licence, submit to the Board for review an updated Plan referred to in Part D, Item 7, addressing the issues on quality assurance/quality control as discussed during the 2023 licensing process.

9. The Licensee shall implement appropriate measures to minimize erosion during any discharge of Effluent into the receiving environment.

10. The Licensee shall backhaul and dispose of all hazardous Wastes generated through the course of the operation at a licensed Waste disposal site.

11. The Licensee shall maintain records of all Waste backhauled and records of confirmation of proper disposal of backhauled Waste. These records shall be made available to an Inspector upon request.

12. The Licensee shall dispose of soils containing contaminants in excess of the Treatment Objectives off site at an approved treatment facility or as otherwise approved by the Board in writing.

13. The Licensee shall, prior to the removal of any treated soil from the Cambridge Bay Soil and Water Treatment Facility confirm with the Government of Nunavut, Environmental Protection Service that the soils have been treated to meet all legislatively-required treatment objectives.

14. The Licensee shall not mix or blend soils for the expressed purpose of attaining the specific limits of the relevant quality criteria.

15. The Licensee shall dispose of any material coated with Polychlorinated Biphenyl (PCB) amended paints, hazardous materials and soils containing contaminants in excess of *Canadian Environmental Protection Act* (CEPA) Guidelines, with the exception of asbestos, off site at an approved treatment facility, in accordance with relevant regulations.

16. The Licensee shall maintain the Cambridge Bay Soil and Water Treatment Facility to the satisfaction of the Inspector.

PART E: CONDITIONS APPLYING TO MODIFICATIONS AND CONSTRUCTION

1. Licensee shall, at least sixty (60) days prior to commencing construction activities for the facility approved under this Licence, provide to the Board for review and acceptance for-construction drawings and design plans and specifications.

2. The Licensee may, without written consent from the Board, carry out Modifications to the Cambridge Bay Soil and Water Treatment Facility provided that such Modifications are consistent with the terms of this Licence and the following requirements are met:

    a. the Licensee has notified the Board in writing of such proposed Modifications at least sixty (60) days prior to beginning the Modifications;
    b. such Modifications do not place the Licensee in contravention of the Licence or the *Act*;

c. such Modifications are consistent with the NIRB Screening Decision;
d. the Board has not, during the sixty (60) days following notification of the proposed Modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and
e. the Board has not rejected the proposed Modifications.

3. Modifications for which all of the conditions referred to in Part G, Item 2 have not been met can be carried out only with written approval from the Board.

4. The Licensee shall provide as-built plans and drawings of the construction and Modifications referred to in this Licence within ninety (90) days of completion of the Modification or construction. These plans and drawings shall be stamped by an Engineer.

5. The Licensee shall conduct all activities in such a way as to minimize impacts on surface drainage and the Licensee shall immediately undertake corrective measures in the event of any impacts on surface drainage.

6. With respect to access road, pad construction or other earthworks, the deposition of debris or sediment into or onto any water body is prohibited. These materials shall be disposed a distance of at least thirty-one (31) metres from the ordinary High Water Mark in such a fashion that they do not enter the Water.

7. The Licensee shall not mobilize heavy equipment or vehicles unless the ground surface is capable of fully supporting the equipment or vehicles without rutting or gouging. Overland travel of equipment or vehicles shall be suspended if rutting occurs.

8. Stream crossing shall be a minimum of five hundred (500) meters from spawning areas.

9. The Licensee shall design and construct all stream crossings to minimize erosion and/or deposition of Waste into Water.

10. Granular materials and rock rip-rap used for any temporary stream crossings, approaches or as may be required for bank stabilization must be obtained from a source approved by an Inspector, and be clean and free of contaminants. Such material must not be removed or gathered from below the ordinary High Water Mark of any Water body.

PART F: CONDITIONS APPLYING TO DRILLING OPERATIONS

1. The Licensee is authorized to drill for the purposes of installing monitoring instrumentation, including monitoring wells and thermistors.

2. The Licensee shall not conduct any land-based drilling within thirty-one (31) metres of the ordinary High Water Mark of any water body, unless otherwise approved by the Board in writing.

3. The Licensee shall dispose of all drill waste, including Water, chips, muds and salts ($CaCl_2$) in any quantity or concentration, from land-based drilling, in a properly

constructed Sump or an appropriate natural depression located at a distance of at least thirty-one (31) metres from the ordinary High Water Mark of any adjacent water body, where direct flow into a water body is not possible and no additional impacts are created.

4. If artesian flow is encountered, drill holes shall be immediately sealed and permanently capped to prevent induced contamination of groundwater or salinization of surface Waters. The Licensee shall report all artesian flow occurrences within the Annual Report, including the location (GPS coordinates) and dates.

PART G: CONDITIONS APPLYING TO SPILL CONTINGENCY PLANNING

1. The Board has approved the Plan entitled "Spill Contingency Plan" dated March 2022 that was submitted as additional information with the Application.

2. The Licensee shall prevent any chemicals, petroleum products or Wastes associated with the project from entering Water. All Sumps and fuel caches shall be located at a distance of at least thirty-one (31) metres from the ordinary High Water Mark of any adjacent water body and inspected on a regular basis.

3. The Licensee shall conduct any equipment maintenance and servicing in designated areas and shall implement special procedures (such as the use of drip pans) to manage motor fluids and other Waste and contain potential spills.

4. If during the term of this Licence, an unauthorized discharge of Waste occurs, or if such a discharge is foreseeable, the Licensee shall:

    a. Employ the approved Spill Contingency Plan;
    b. Report the spill immediately to the NWT/NU 24-Hour Spill Line at (867) 920-8130 and to the Inspector at (867) 975-4295; and
    c. For each spill occurrence, submit to the Inspector, no later than thirty (30) days after initially reporting the event, a detailed report that will include the amount and type of spilled product, the GPS location of the spill, and the measures taken to contain and clean up the spill site.

5. The Licensee shall, in addition to Part H, Item 4, regardless of the quantity of releases of harmful substances, report to the NWT/NU 24-Hour Spill Line if the release is near or into a water body.

PART H: CONDITIONS APPLYING TO CLOSURE AND RECLAMATION OR TEMPORARY CLOSURE

1. The Board has approved the Plan entitled "Closure and Reclamation Plan" dated March 2022 that was submitted as additional information with the Application.

2. The Licensee shall complete all restoration work prior to the expiry of this Licence.

3. The Licensee shall carry out progressive reclamation of any components of the project no longer required for the Licensee's operations.

4. The Licensee shall backfill and restore all sumps to the pre-existing natural contours of the land.

5. The Licensee shall remove from the site, all infrastructure and site materials, including all fuel caches, drums, barrels, buildings and contents, docks, water intakes, pumps and lines, material and equipment prior to the expiry of this Licence.

6. The Licensee shall remove any culverts and restore the drainage to match the natural channel. Measures shall be implemented to minimize erosion and sedimentation.

7. In order to promote growth of vegetation and the needed microclimate for seed deposition, all disturbed surfaces shall be prepared by ripping, grading, or scarifying the surface to conform to the natural topography.

8. Areas that have been contaminated by hydrocarbons shall be reclaimed to meet objectives as outlined in the Government of Nunavut's Environmental Guideline for Site Remediation, 2010. The use of reclaimed soils for the purpose of back fill or general site grading may be carried out only upon consultation and approval by the Government of Nunavut, Department of Environment and an Inspector.

9. The Licensee shall restore all drill holes and disturbed areas to natural conditions. The restoration of drill holes must include the removal of any drill casing materials and if having encountered artesian flow, the capping of holes with a permanent seal. Where drill casings cannot be removed the Licensee shall cut off the casings at ground level and identify with signage.

10. The Licensee shall contour and stabilize all disturbed areas to reduce erosion and sedimentation to Water upon completion of the undertaking and as per Part I, Item 3.

PART I: CONDITIONS APPLYING TO THE MONITORING PROGRAM

1. The Licensee shall establish and maintain at least the following Monitoring Program Stations at locations described in the Table below or as otherwise approved by the Board in writing:

Monitoring Program Station ID	Description	Status
CST-1	Final discharge point from the Cambridge Bay Soil and Water Treatment Facility	Active (Volume & Quality)
CST-2	Monitoring Station located up-gradient of the discharged from the	Active (Volume & Quality)

CST-3	Monitoring station located down-gradient of the Cambridge Bay Soil and Water Treatment Facility	Active (Volume & Quality)
CST-4	Monitoring station located down-gradient of the Cambridge Bay Soil and Water Treatment Facility	Active (Volume & Quality

2. The Licensee shall measure and record, in cubic metres, the daily quantities of Effluent discharged from the Cambridge Bay Soil and Water Treatment Facility.

3. The Licensee shall determine the GPS co-ordinates (in degrees, minutes and seconds of latitude and longitude) of all locations where Wastes associated with the undertaking are deposited.

4. The Licensee shall monitor compliance with respect to Part D, Item 3 by collecting a representative composite sample from a minimum of 5% of the total volume to be released from the Final Discharge Point of the Cambridge Bay Soil and Water Treatment Facility at Monitoring Program Stations CST-1.

5. The Licensee shall sample Monitoring Program Stations CST-1, CST-2, CST-3, and CST-4 and analyze the samples collected for the following parameters:

pH	Conductivity
Total Suspended Solids	Ammonia Nitrogen
Nitrate – Nitrite	Oil and Grease (visual)
Total Phenols	Sulphate
Total Hardness	Total Alkalinity
Sodium	Potassium
Magnesium	Calcium
Chloride	Total Cadmium
Total Copper	Total Chromium
Total Iron	Total Lead
Total Mercury	Total Nickel
Total Zinc	Total Phosphorous
Total Aluminum	Total Manganese
Total Cobalt	Total Arsenic
Total Petroleum Hydrocarbons (TPH)	BOD_5
Polycyclic Aromatic Hydrocarbons (PAH)	Total Coliform
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	

6. The Licensee shall sample soil being treated in the Landfarm no less frequently than once every four (4) months during the period of active land treatment to monitor contaminant levels until analytical results are below acceptable levels as determined under Part D, Item 13.

7. The Licensee shall determine the GPS coordinates of all locations where remediated soil

is deposited.

8. The Licensee shall record the date, amount, soil quality and final destination of all treated soil removed from the Cambridge Bay Soil and Water Treatment Facility under Part D, Item 13.

9. Modifications to the Monitoring Program may be made only upon written request and subsequent approval of the Board in writing.

10. All sampling, sample preservation and analyses shall be conducted in accordance with methods prescribed in the current edition of *Standard Methods for the Examination of Water and Wastewater*, or by such other methods approved by the Board in writing.

11. All analyses shall be performed in a laboratory accredited according to ISO/IEC Standard 17025. The accreditation shall be current and in good standing.

12. The Licensee shall include in the Annual Report required under Part B, Item 1 all data, monitoring results and information required by this Part.

13. An Inspector may impose additional monitoring requirements.

TABLES

Table 1 Remediation Requirements

	Soil Texture	Agricultural Land Use	Residential/Parkland Land Use	Commercial Land Use	Industrial Land Use
Fraction 1	Fine	210 (170[a])	210 (170[a])	320 (170[a])	320 (170[a])
	Coarse	30[b]	30[b]	320 (240[a])	320 (240[a])
Fraction 2	Fine	150	150	260 (230[a])	260 (230[a])
	Coarse	150	150	260	260
Fraction 3	Fine	1300	1300	2500	2500
	Coarse	300	300	1700	1700
Fraction 4	Fine	5600	5600	6600	6600
	Coarse	2800	2800	3300	3300
Benzene	Fine	0.0068	0.0068	0.0068	0.0068
	Coarse	0.03	0.03	0.03	0.03
Toluene	Fine	0.08	0.08	0.08	0.08
	Coarse	0.37	0.37	0.37	0.37
Ethylbenzene	Fine	0.018	0.018	0.018	0.018
	Coarse	0.082	0.082	0.082	0.082
Xylene	Fine	2.4	2.4	2.4	2.4
	Coarse	11	11	11	11
Lead	Fine	70	140	260	600
	Coarse				
Polychlorinated biphenyls	Fine	0.5	1.3	33	33
	Coarse				

Notes: All values are in parts per million (ppm).
a = Where applicable, for protection of potable groundwater.
b = Assumes contamination near residence

Data from CCME *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil,* (2001) revised January 2008 and the Government of Nunavut *Environmental Guideline for Site Remediation* (2009).

Attachment C: Operations and Maintenance Plan

Operations and Maintenance Plan

Cambridge Bay Soil and Water Treatment Facility

Kitikmeot Environmental Ltd.



OPERATIONS AND MAINTENANCE 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 KEL operates and maintain the soil and water treatment facility (SWTF) in Cambridge Bay, Nunavut (the Hamlet). The facility is comprised of one bermed and lined area for soils contaminated with petroleum hydrocarbons, a lined water and snow retention/storage area and a lined and bermed hazardous waste storage area. Soil is treated by a mechanized process combined with the potential application of amendments to the soil to facilitate microbial activity to break down the pollutants. Once treated, soil is reused as alternate daily cover at the Hamlet's Landfill or re-purposed as permitted. Water is treated using an onsite water treatment plant and once treated is used to increase moisture at the soil treatment facility or discharged as per requirements outlined within the issued water license. The waste storage area is used to temporarily store waste that requires containerization and/or shipment to an authorized location. Any soil or water that cannot be treated at the facility is transported to a licensed waste receiving facility for disposal.

REVISION HISTORY

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

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For further information, please contact:

Kitikmeot Environmental Ltd.
regulatory@kblenv.com
780.452.7779

1.0 INTRODUCTION

Kitikmeot Environmental Ltd. (KEL) operates a soil and water treatment facility (the Facility) located adjacent to the Hamlet of Cambridge Bay sewage lagoon.

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.

Facility operations and maintenance contacts:

Corporate Office:

Kitikmeot Environmental Ltd.
30 Mitik Street
Cambridge Bay, NU
X0B 0C0

Operator Contacts:

Dino Forlin
Director of Business Development
Kitikmeot Environmental Ltd.
dforlin@ginig.com
867.983.2200
Primary Contact

Katie Oliver
Environmental Consulting Manager
KBL Environmental Ltd.
koliver@kblenv.com
780.452.7779
780.893.3305 (cell)
Secondary Contact

The purpose and scope of this Plan is to outline the methodology for operating and maintaining the SWTF. The location drawing can be found in Appendix B and the design drawing of the facility in Appendix C.

KEL manages operations responsibly and will comply with all licenses, permits and applicable territorial and federal laws and regulations related to Facility operations and maintenance. The following table lists regulations and guidelines applied to and referenced for Facility operations.

1.1. Project Description

The purpose of this project is to continue to operate a permanent SWTF in Cambridge Bay, Nunavut. Following bioremediation, treated soil meeting landfill criteria is reused as Alternative Daily Cover (ADC) at the town landfill or re-purposed. Soil not meeting reuse criteria is transported off site for disposal at a suitable facility. Water is treated using an onsite water treatment plant and once treated is analyzed and discharged as per territorial regulations.

The Facility includes: one engineered cell consisting of three sub-cells: one cell 50 m x 40 m, for receipt, storage and treatment of petroleum hydrocarbon-contaminated soil; one cell designed for storage of up to 170 m^3 of petroleum hydrocarbon-contaminated snow and water; one cell 19 m x 14 m designed for storage of hazardous waste awaiting shipment; one small package treatment plant to treat petroleum hydrocarbon-contaminated water; one or two above ground storage tank(s) (AST) for treated water storage; one small shed for storage of supplies, documentation and health and safety equipment.

2.0 ENVIRONMENTAL MANAGEMENT

The Facility is located within the hamlet limits on an existing lease adjacent to the hamlet of Cambridge Bay sewage lagoon. Land disturbance as a result of the operation of the Facility is minimal and not greatly alter existing site condition. Based on facility design, operating principles and monitoring plan the environmental impacts associated with this facility is minimized.

3.0 SOIL AND WATER TREATMENT FACILITY

The Facility is designed to treat petroleum hydrocarbons. Materials received at the site for treatment include petroleum hydrocarbon-contaminated soil and/or 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 which may include sampling and field testing to determine suitability for treatment. Soil meeting acceptance criteria is deposited into an engineered cell, operated as a Soil Treatment Facility.

Once the bioremediation process has been given adequate time, soil is sampled and tested to confirm it meets discharge/beneficial reuse criteria (as presented in Appendix A). Soil meeting reuse criteria is hauled as cover material at the Hamlet's landfill or re-purposed as permitted.

The Facility also includes an engineered pond to accept petroleum hydrocarbon contaminated snow and water. Snow and water is profiled for acceptance either by analytical testing and/or MSDS sheet and be accompanied by a movement document prior to acceptance at the site. Runoff water from the soil treatment facility and contact water from the hazardous waste storage area will also be deposited into the water storage pond. Once snow melts, water from the storage pond is treated using an onsite water treatment plant and then tested to analyze for the discharge guidelines set forth in the license.

3.1. Facility Design

The facility has been designed to receive up to 3,000 m3 (a drawing of the Facility Plan and Section is provided in Appendix B). The cell is 50 m by 40 m, surrounded by a soil berm approximately 1.5 m tall with 2:1 side slopes measured from existing grade. The base of the cell is graded to a 1.0% slope on the long axis, away from the entrance ramps to control and direct interior drainage towards the water storage cell.

At least 0.2 m of soil fill <8mm in diameter, debris, and organics (protective fill) covers the base of the cell and the sides of the berm to protect the overlaying geomembrane against punctures. A Solmax 460ST 60 mm single textured high density polyethylene (HDPE) liner (or equivalent) covers the cell floor, overlaps the crest of each berm, and is anchored into the side of the perimeter berms. A 16 oz non-woven geotextile overlays the geomembrane as a precaution against punctures, and is anchored into the perimeter berms. Approximately 500 mm of fill free from debris and organics overlays the geotextile on the base of the cell, for torsion protection from turning vehicles. At least 300 mm of fill overlays the interior side slopes of the berms.

3.2. Biotreatment Facility Operation

All soil transported to site requires a waste profile including analytical testing and suitable movement documents prior to receipt on-site. An example of a typical waste profile form is included in Appendix E. If this information is absent or incomplete, or materials do not meet the acceptance criteria listed in Appendix A, soil is not received into the Facility and will remain the responsibility of the generator. In some cases, such as spills and emergency response, soil may be accepted into the facility and samples collected after receipt. Department of Environment (DOE) and Crown Indigenous Relations and Northern Affairs Canada (CIRNAC) representatives is notified in this situation.

Once quality and quantity of soil are approved for receipt at site, soil is end-dumped into a designated area of the cell, and placed in biopiles in a fashion to facilitate segregation and ease of access for equipment or technical staff to complete required sampling and treatment campaigns. Soil is managed in biopiles with an average height of up to 3.0 m using a hydraulic excavator or dozer. Once placed, each biopile is labelled with a unique identifier and documented. Each waste shipment is managed and treated separately. Efforts are made to avoid comingling of wastes and dilution of contaminated soils with cleaner soils.

Typically, two or three treatment events occur each year over the summer season. Treatment may occur using a track hoe equipped with an Allu bucket or by manual aeration using an excavator. Materials are quickly churned and aerated by thorough mixing, blending and aeration while all unwanted debris is removed manually. The final waste soil matrix is a finely processed material suitable for beneficial reuse.

Treatment does not occur when the ambient air temperature is below 5oC. The mean expected residency of soil undergoing bioremediation in the Soil Treatment facility is one year however soils with recalcitrant contaminants may require longer treatment times.

There may be times throughout operations wherein it may be necessary to add amendments to the soil to promote effective and efficient breakdown of hydrocarbon constituents. Typical amendments include fertilizer to stimulate natural microflora activity, water to adjust moisture content, and lime to modify pH. In more extreme circumstances other soil conditioners such as surfactants can liberate hydrocarbon from soil particle adsorption to promote bioavailability, or peroxides to promote oxidation of chemical constituents. In the event that any of these are required, MSDS is provided, located in a small storage shed on site and be accessible to all workers. Any amendments is procured for immediate use; no long term storage on site is expected. Over the short term, amendments is stored within appropriate containment in the locked shed on site. All soil amendment application, is conducted by KEL personnel experienced in

waste facility management and operation.

Prior to commencement of operations for the year, KEL staff and contractors working at the Facility is given an orientation on operations, safety and routine practices at the site.

3.3. Soil Sampling

To assess the progress of remediation, a photoionization detector (PID) may be used or grab samples collected and tracer tests carried out during the first or second treatment campaign. Once it is determined that a remediation end point has likely been reached, formal soil sampling occurs to determine compliance with reuse criteria. Following the sampling protocol outlined below, along with avoiding comingling of soils between biopiles, efforts are made to ensure that confirmatory sampling is unbiased and representative, and contaminated soils are not diluted with cleaner soils.

Sampling involves establishing sample points in each biopile: one representative sample is collected for the volume of remediated soil specified; this is consistent with confirmatory sampling for soil removal from landfarms in Yukon Territory (Environment Yukon 2011) and confirmatory sampling of ex situ stockpiles in BC (BC Ministry of Environment 2009). Each representative sample collected is composed of five sub-samples. Each sub-sample is collected from one of five areas or 'cells' within each, wherein each of the five cells is equivalent to 20% of the soil volume specified in the sampling protocol found in Appendix A. Multiple specimens from within the cell can be collected for each sub-sample, reducing the "nugget effect" that can arise when small sample volumes are collected from a stock pile; this is consistent with BC's Technical Guidance on Contaminated Sites for Site Characterization and Confirmation Testing (BC Ministry of Environment 2009). Samples is collected by trained personnel using either handheld implements such as a hand auger or shovel or with the assistance of mechanical equipment such as an excavator.

Quality Assurance/Quality Control (QA/QC)

All samples are collected in laboratory prepared containers, stored in temperature-controlled coolers, transported and submitted to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory for analysis of contaminants of concern. KEL follows appropriate chain of custody control mechanisms during transportation of samples to the laboratory.

Samples are collected and submitted for QA/QC purposes including collection of: 10% blind duplicates; one field blank per day; one travel blank per shipment. For each sample collection personnel use new latex or Nitrile gloves for collecting each sample and augers and shovels are washed to avoid potential cross contamination. At the time of sampling, on-site activities and observations are documented including field testing results, soil pile stability or suspected leachate issues.

Upon receipt, the laboratory conducts internal QA/QC sampling. If results from either field or lab QA/QC analysis are considered significantly different, re-sampling will occur.

3.4. Soil Reuse and Disposal

Once remediated soil has been analysed, it is classified as either meeting reuse criteria, requiring additional treatment or requiring off-site disposal. Soil suitable for industrial reuse has analytical results meeting the criteria outlined in Appendix A. Material meeting re-use criteria is used as cover material at the Hamlet's landfill or re-purposed as permitted.

Soil is removed from the cell using an excavator and dump truck and is hauled to the landfill working face. If it is determined that soil for which no acceptance analytical was collected is untreatable or unacceptable at the facility, it is managed in the same way as soil that needs to have final disposal at an alternate approved facility.

All materials removed from site is accompanied by appropriate movement documents. Volumes and soil sampling results is provided in annual reports distributed to DOE, CIRNAC and the Nunavut Water Board (NWB).

3.5. Maintenance

Site inspections include a visual inspection for erosion, subsidence, exposure of liner, leakage, wildlife disturbance and security breach. The Soil Treatment facility liner is inspected annually, after soil turning and soil removal. Any tears detected during visual inspection is repaired and documented immediately. Inspections are conducted by trained personnel. Inspection logs are maintained on site is provided upon request. An example of the inspection form can be found in Appendix D.

3.6. Water/Snow Storage Pond

The water storage area is 19m x 14m lined pond located in the corner of the treatment pad. 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. Snow and water transported to site requires confirmation of contaminants of concern from the spill source, MSDS and/or results of analytical testing and a suitable movement document prior to receipt on site. It is not anticipated that the facility will receive water or snow contaminated with anything other than petroleum hydrocarbons. The capacity of the retention pond is anticipated to be 170m^3.

Water is transported to town using a dedicated pumper truck and disposal into the pond is done by hose. Snow that is delivered to the site is placed into the pond by dump truck or loader. Care is taken to ensure that snow does not spill over the berms of the pond. If required, an excavator is used to knock down larger piles and level out any snow that has been piled. Care is taken to ensure that any contaminated snow is not tracked out of the facility by scraping tracks clear of any contaminated snow that it contacted.

An above ground storage tank (AST) or a vacuum truck is used onsite in the event that water levels are anticipated to increase beyond the storage capacity of the pond. Regularly scheduled site inspections during snow free months will monitor the water levels, exposure of liner, and retention pond volumes.

Inspection logs is maintained onsite at all times.

As water levels increase in the retention pond, samples is collected and analyzed for the parameters listed on Table A3 in Appendix A. If the samples do not meet the guidelines, the water from the storage pond is treated using an onsite water treatment plant and transferred to a storage tank onsite. Once results are received and meet the guidelines set forth by the issued license, the water is discharged to surface. Analytical results and notification is reported to the DOE and CIRNAC prior to the planned discharge. In the event that water does not meet discharge criteria it will undergo further treatment or be transported to an authorized disposal location.

3.7. 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. Sampling prior to, and after discharge is required in order to determine treatment efficacy. Additional media may be obtained for treatment of specific contaminants of concern. Once it is confirmed that water meets the guidelines set forth by GN and NWB in the license, representatives from DOE and CIRNAC is 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 is given.

Once it is confirmed that water meets the applicable guidelines, it is discharged to surface in a manner which follows natural site drainage and avoids erosion. Treated effluent is batch discharged to the ground surface through a dedicated hose wherein the water will flow overland to natural drainage. If it is determined that erosion is occurring, a splash pad is constructed using riprap. The details and design is discussed with stakeholders prior to construction. All discharged water and groundwater will respect Section 36(3) of the Fisheries Act (EC, 1985) year round, ensuring that at “no person shall deposit of deleterious substance of any type in water frequented by fish”. Discharging is documented and submitted in the annual report.

Treated effluent water meeting discharge criteria (detailed in the Water Licence and in Table A4) is either beneficially reused or discharged to the environment. Depending on conditions on the biotreatment pad, treated effluent can be applied to the soil lifts to aid in bioremediation and promote dust suppression. Remaining treated effluent is released to the environment adjacent to the Facility. It is expected that discharge from the WTP will occur between July 1 and Sept 30. Discharge volumes will not exceed 10 m^3/day; given reuse options, typical discharge volumes are expected to be much less.

Depending on conditions on the biotreatment pad, treated effluent not meeting discharge criteria can be applied to the soil lifts to aid in bioremediation and promote dust suppression. Material requiring disposal, including untreated water, soil that could not be treated, spent filter media, and spent spill response

materials is disposed of at approved waste facility locations.

3.8. Water Monitoring Program

In addition to visual inspections, a groundwater monitoring program (GMP) is in effect to detect any changes in groundwater quality. The GMP will include annual monitoring and sampling of the groundwater wells. Groundwater wells is analyzed and compared to the Federal Interim Groundwater Quality Guidelines (Environment Canada, 2012) and the monitoring parameters set out in Part K (Conditions Applying to Monitoring Program), Item 5 of the water licence.

Each monitoring well will be assessed during each groundwater sampling event to determine its overall state and condition. Any issues will be noted, and if necessary, repairs will be completed.

Monitoring wells will be measured for depth and the depth to groundwater from the top of the well casing using an interface probe. Measurements will be taken before any purging or sampling, and the interface probe will be cleaned with a solution such as Alconox after measuring each well.

Before sample collection, wells will be purged to remove stagnant water. This will be completed by removing three well volumes of water from the well to ensure that representative groundwater has entered the well casing. The volume of water purged will be recorded and reported in the annual report. Purging will be completed using dedicated equipment such as bailers, polyethylene tubing or low flow bladder pump with tubing.

Field parameters (pH, EC, Temperature, DO) will be analyzed using a portable multimeter and recorded in the field along with field notes (e.g., weather conditions, water conditions) to be incorporated into the final report. Any visual observations (sediment, sheen, etc.) will also be noted and recorded.

Following purging and collecting field parameters, groundwater samples will be collected from the monitoring wells using dedicated sampling equipment and placed into laboratory-supplied sample containers.

An effort will be taken to avoid collecting any suspended solids in each sample which could alter the analytical results. Specific sampling requirements, including field filtering and preserving, will be reviewed with the laboratory to ensure that all samples are collected correctly in the field.

Field personnel will avoid cross-contamination when switching between monitoring well locations and will ensure to wear new, clean disposable gloves before collecting each sample.

Samples will be placed on ice and packaged for transportation and delivery to the laboratory for analysis. While in transport, the samples will be under a Chain of Custody that will be signed and received upon arrival at the laboratory. For the required analysis, samples will be submitted to a laboratory accredited by the Canadian Association for Laboratory Accreditation (CALA). The analyses will be performed per approved methods as recognized by CALA.

Additional samples will be collected and submitted to the laboratory for quality assurance and quality control (QA/QC). A blind field duplicate from one of the sample locations will be submitted under a different name and completed for the full suite of parameters to evaluate the precision of the laboratory.

A laboratory QA/QC program consisting of method blanks, spiked blanks and matrix spikes shall also be

checked to ensure appropriate QA/QC results are obtained.

Results from the monitoring and sampling events is issued in the annual report along with accompanying laboratory certificates of analysis.

Corrective Actions
Corrective Actions shall be evaluated and/or implemented if one of the following occurs:

- Measurable LNAPL detected in any of the groundwater monitoring wells;
- An unplanned or accidental release of waste material (untreated soil or water) from the Facility; and
- Groundwater concentrations of one or more of the monitored parameters exceeded Action Level.

Step 1

During Step 1 of Corrective Actions, the action level exceedance will be evaluated to determine the likelihood that it occurred from the Facility's operation. If the exceedance occurs from a contaminant present at the Facility, additional sampling shall occur to determine the trend of the exceedance. If an unplanned release of waste material occurs, samples will be collected to determine if any impacts have been caused to the groundwater. Based on the nature of the unplanned release, sample quantity and follow-up needs will be determined and provided to the Inspector.

If an Action Level exceedance is deemed anomalous based on subsequent sampling, then no further remedial action will be taken, and monitoring will continue biannually as outlined in this Plan. If subsequent sampling indicates a stable or increasing trend, then Step 2 of Corrective Actions will be implemented.

As part of Step 1 Corrective Actions, operations and maintenance practices will be reviewed to determine conditions that triggered the exceedance and to assess the probability that the exceedance is directly related to the operation of the Facility and not due to other factors which may have the ability to affect the general groundwater in the area. The outcome of this assessment will be discussed with the inspector if it is believed an action level was triggered for a reason other than the Facility's day-to-day operations.

Step 2

If it is believed that exceedances occur from operations of the Facility and subsequent sampling during Step 1 indicates that concentrations are stable or increasing, then KBL will prepare a Remedial Action Plan (RAP) to investigate the impacts or LNAPL detection further. The RAP will be submitted to the MVLWB for review, comment and approval. KEL will implement the RAP once it is approved. If necessary, KEL will implement immediate actions to help mitigate impacts while awaiting a formal RAP

3.9. Wind Erosion Mitigation

Strong winds can carry soil from stockpiles to areas outside the soil storage area. A contingency plan is required to mitigate soil erosion and the potential spread of contaminants. The main factors influencing wind erosion from soil stockpiles are the threshold wind speed, stockpile contents and surrounding conditions.

Wind erosion can be effectively controlled through maintaining moisture content within soil piles.

Moisture is also an important factor in the bioremediation process therefore it is necessary to maintain adequate moisture content for microbial activity. Wind erosion control through moisture control is satisfied by topical applications of water from the retention pond. As required, water from the pond is sprayed over the soil stockpiles at a rate sufficient enough to minimize erosion by wind and minimal enough so as not to create ponding within the storage area.

If wind conditions are such that substantial dust is created during soil handling and treatment, activities is shut down until conditions stabilize. Where possible, operations may shift to another area within the facility that is more sheltered.

To ensure that snow in the water/snow storage pond is not susceptible to being wind swept, a snow fence is erected surrounding the pond. This will serve to decrease the effects of wind on the pond and its contents, along with serving as a barrier to people and animals.

3.10. Containment of Impacted Soil

Equipment working in and around the biotreatment pad presents a risk of spreading contaminated material from machinery tracks or tires as equipment is moving at the edges of the biotreatment pad or when soil is being handled for discharge. In addition, other conditions may also result in soil moving beyond the biotreatment pad such as unstable piles and inadequate soil berms. In order to minimize the spread of impacted soil, the following measure is implemented:

1. Operators of track mounted equipment working in the biotreatment pad is required to shovel/remove soil off the tracks prior to leaving the area.
2. Trucks delivering contaminated soil to the Facility is required to use a spotter or other indicator to ensure they are not back into the treatment pad further than necessary.
3. Soil piles and windrows should be stably built with piles at or near the angle of repose.
4. Soil berms should be high enough and at an adequate distance to prevent soil which has rolled off piles from leaving the biotreatment pad.
5. Any soil tracked or dropped outside the treatment cell is immediately scraped up and put back into the biotreatment pad.

3.11. Hazardous Waste Storage Area

A portion of the bermed and lined soil treatment pad is used for the storage of hazardous waste containers (drums, bags etc.) that are awaiting transportation to authorized facilities. These types of waste could include fuels, oils, solvents and glycols which require consolidation, containerization and temporary storage onsite while awaiting shipment to authorized facilities. Used water treatment plant media or used spill response items may also be stored at this location awaiting final disposal.

4.0 DOCUMENTATION AND REPORTING

A daily log of activities is kept detailing personnel onsite, activities undertaken, weather conditions and water pond freeboard. Inspections are conducted and documented. An annual report is submitted to the Nunavut Water Board (NWB) and all stakeholders in accordance with the terms and conditions of the license approval and permits assigned to the Facility. In conjunction with annual reporting, this Plan is to be reviewed annually and updated as needed to maintain compliance. Analytical test results, as required under the anticipated water license, are submitted to DOE and CIRNAC in a timely manner. A copy of all licenses and permits is maintained on site.

5.0 SAFETY AND EMERGENCY RESPONSE

The operations at the facility will involve the use of heavy equipment to process the soil stored for treatment and for the movement of soil into and out of the treatment pad. The soils handled at site have varying levels of petroleum hydrocarbon contamination.

All operations is performed in conjunction with KEL Health and Safety Programs and applicable regulations and standards. All personnel on site are required to wear basic personal protective equipment: hard hat, high visibility vest or striping, safety footwear. Other PPE requirements are specific to the tasks undertaken by the employees on site. Refer to the KEL Health and Safety Manual (which is available on site).

Emergency Contact Information for the Cambridge Bay Soil Treatment Facility:

Police 867-983-1111

Fire 867-983-2222

Ambulance 867-983-2531

KEL 867-983-7500

Hamlet of Cambridge Bay 867-983-4650

Department of Environment 867-975-7700

5.1. Fire and Prevention Control

The purpose of this plan in to provide information to KEL employees and contractors in the event that a fire occurs at or near the facility. Specifically, the plan establishes who is responsible for various aspects of the fire control procedure.

DO NOT PANIC, the greatest danger lies not in fighting the fire, but in the panic that arises from a fire. Spend a few minutes getting a grip of the situation. Go through the steps of notifying the appropriate authorities and follow the basic steps in the fire control plan.

1. Notify any other nearby employees.
2. Notify the site manger immediately. Follow his instructions.
3. Notify the fire department. Tell them the location and type of fire and whether it looks like it will spread out of the immediate area.
4. Notify surrounding property owners, particularly if it appears that the fire could spread beyond the facility.
5. When the fire department arrives, follow their instructions.
6. Do not fight the fire alone.
7. Do not place yourself or others in danger while fighting the fire.

5.2. Spill Response Plan

For the purpose of this plan, a spill is the accidental or purposeful discharge of a liquid waste (listed herein) or contaminated soil in a location or manner that will allow it being washed, carried, or flow into a natural or man-made watercourse that could potentially result in groundwater or surface water contamination now or in the future.

Most potential spill sources will only be present during normal facility working hours. As a result, adequate personnel and equipment is available to respond to any spill-related emergency. With equipment at the facility, it is possible to respond immediately to the site of any spill for necessary spill containment and cleanup. The immediate requirement is to construct temporary earth berms around the spill area to control and allow implement cleanup measures as directed by the Site Manager and the Hazardous Materials Response Team (if applicable).

The facility is operated in conjunction with KEL's Spill Contingency Plan (KEL 2017) along with KEL's Waste Management Plan (KEL 2017). The Spill Contingency Plan addresses spills of:

1. Fuel and oils from operating equipment.
2. Soils contaminated with petroleum hydrocarbons.
3. Liquids from the storage pond.

6.0 TRAINING

Personnel managing waste are certified in Workplace Hazardous Material Information System (WHMIS) and Transportation of Dangerous Goods (TDG). Any waste shipment requiring a Federal Movement Document (FMD) will need to have FMD filled out by an individual holding a valid certificate in TDG.

Personnel responsible for operation and maintenance of the SWTF will receive training in the principles of soil treatment along with safe operating procedures.

7.0 FACILITY CLOSURE

Final closure of the facility will involve the decommissioning of the lined bioremediation cell, the lined water pond and the removing of all fencing and security installations associated with the site. The used liners is disposed of at the hamlet landfill and the site is regraded back to natural drainage. Long term monitoring will continue once the facility has been decommissioned and prior to any future use for the land. No long-term effects are anticipated following facility decommissioning.

8.0 REFERENCES

Transportation of Dangerous Goods Regulations. SOR/2012-245

BC Ministry of the Environment. 2009. Technical Guidance on Contaminated Sites, Site Characterization and Confirmation Testing.

Canadian Council for the Ministers of the Environment (CCME). 2014. Canadian Environmental Quality Guidelines, Water Quality Guidelines for the Protection of Aquatic Life. Accessed on Jan 31, 2014.

Environment Canada (EC). 2012. Federal Interim Groundwater Quality Guidelines.

Environment Yukon. 2001. Protocol 11 – Sampling Procedures for Land Treatment Facilities.

Government of Nunavut (GN). 2014. Environmental Guidelines for the Management of Contaminated Sites. Department of Environment.

Crown Indigenous Relations and Northern Affairs Canada (CIRNAC). 2007. Guidelines for Spill Contingency Planning

Kitikemeot Environmental Ltd. (KEL) 2022. Cambridge Bay Soil and Water Treatment Facility, Emergency Response Plan.

Kitikemeot Environmental Ltd. (KEL) 2022. Cambridge Bay Soil and Water Treatment Facility, Spill Contingency Plan.

Kitikemeot Environmental Ltd. (KEL) 2022. Cambridge Bay Soil and Water Treatment Facility, Waste Management Plan.

Science Applications International Corporation (SAIC). 2006. Federal Guidelines for Landfarming Petroleum Hydrocarbon Contaminated Soils. Presented to Contaminated Sites Division and Emergencies Engineering Technologies Office (EETO), Environmental Technology Centre, Environment Canada.

TABLES

Table A1. Acceptance and Re-Use criteria for Petroleum Hydrocarbons to be met prior to industrial use of treated contaminated soils

PHC Reuse Criteria	ADC Fine-Grained Soil (mg/kg)	ADC Coarse-Grained Soil (mg/kg)	Facility Acceptance Criteria (mg/kg)
Benzene	5	5	N/A
Toluene	0.8	0.8	N/A
Ethylbenzene	20	20	N/A
Xylenes	20	20	N/A
PHC (F1)	320	320	12500
PHC (F2)	260	260	10000
PHC (F3)	2500	1700	5000
PHC (F4)	6600	3300	7500

* If testing for particle size is not completed to determine if the soil is Coarse or Fine – grained, soil must be treated to achieve the Coarse-grained soil criteria

Sources:
1: CCME's Canada-Wide Standards for Petroleum Hydrocarbons in Soil
2: Government of Nunavut's Environmental Guidelines for the Management of Contaminated Sites.

Table A2. Acceptance and Re-Use criteria for Metals to be met prior to industrial use of treated contaminated soils

Parameter	Units	CCME Industrial Guidelines for Metals in Soil (mg/kg)	Facility Acceptance Criteria (mg/kg)
Antimony	mg/kg	40	40
Arsenic	mg/kg	12	12
Barium	mg/kg	2000	2000
Beryllium	mg/kg	8	8
Boron	mg/kg	N/A	N/A
Cadmium	mg/kg	22	22
Chromium (total)	mg/kg	87	87
Chromium, hexavalent (Cr(VI))	mg/kg	1.4	1.4
Cobalt	mg/kg	300	300
Copper	mg/kg	91	91
Lead	mg/kg	600	600
Mercury	mg/kg	50	50
Molybdenum	mg/kg	40	40
Nickel	mg/kg	89	89
Selenium	mg/kg	2.9	2.9
Silver	mg/kg	40	40
Thallium	mg/kg	1	1
Tin	mg/kg	300	300
Uranium	mg/kg	300	300
Vanadium	mg/kg	130	130
Zinc	mg/kg	360	360

Sources:
1: CCME's Canada-Wide Standards for Petroleum Hydrocarbons in Soil
2: Government of Nunavut's Environmental Guidelines for the Management of Contaminated Sites.



Table A3: Discharge Criteria for Water as per Government of Nunavut (Department of Environment)

Parameter	Maximum Concentration of any grab sample (mg/L)
Total Extractable Hydrocarbons (TEH)*	15 and no visible sheen
Total Lead	0.05[1]
Benzene	0.37[2]
Toluene	0.002[3]
Ethylbenzene	0.09[3]

Sources:
1: B.C. Reg. 168/94: Petroleum Storage and Distribution Facilities Storm Water Regulation
2: GN Department of Environment Environmental Guideline for Industrial Waste Discharges
3: CCME Water Quality Guidelines for the Protection of Aquatic Life

Table A4. Treated Water Discharge Guidelines

Parameters	Units	Site-Specific Guidelines
Benzene	mg/L	0.37
Toluene	mg/L	0.002
Ethylbenzene	mg/L	0.09
Xylenes	mg/L	0.03
F1 (C6-C10)	mg/L	0.15
F2 (C10-C16)	mg/L	0.11
F3 (C16-C34)	mg/L	-
F4 (C34-C50)	mg/L	-
Aluminum (Al)	mg/L	0.005-0.1[a]
Arsenic (As)	mg/L	0.005
Beryllium (Be)	mg/L	-
Boron (B)	mg/L	1.5
Cadmium (Cd)	mg/L	0.00009
Chromium, Hexavalent (Cr6)	mg/L	0.001
Chromium, Trivalent (Cr3)	mg/L	0.0089
Cobalt (Co)	mg/L	0.0025
Copper (Cu)	mg/L	0.002-0.004[b]
Iron (Fe)	mg/L	0.3

Table A4. Treated Water Discharge Guidelines

Parameters	Units	Site-Specific Guidelines
Lead (Pb)	mg/L	0.001-0.007[b]
Manganese (Mn)	mg/L	-
Mercury (Hg), Total	mg/L	0.000026
Molybdenum (Mo)	mg/L	0.073
Nickel (Ni)	mg/L	0.025-0.15[b]
Phosphorus (P)	mg/L	Calculation
Selenium (Se)	mg/L	0.001
Silver (Ag)	mg/L	0.00025
Strontium (Sr)	mg/L	-
Vanadium (V)	mg/L	-
Zinc (Zn)	mg/L	0.03

- Parameters without guidelines indicated by "-"

a pH-dependent parameter

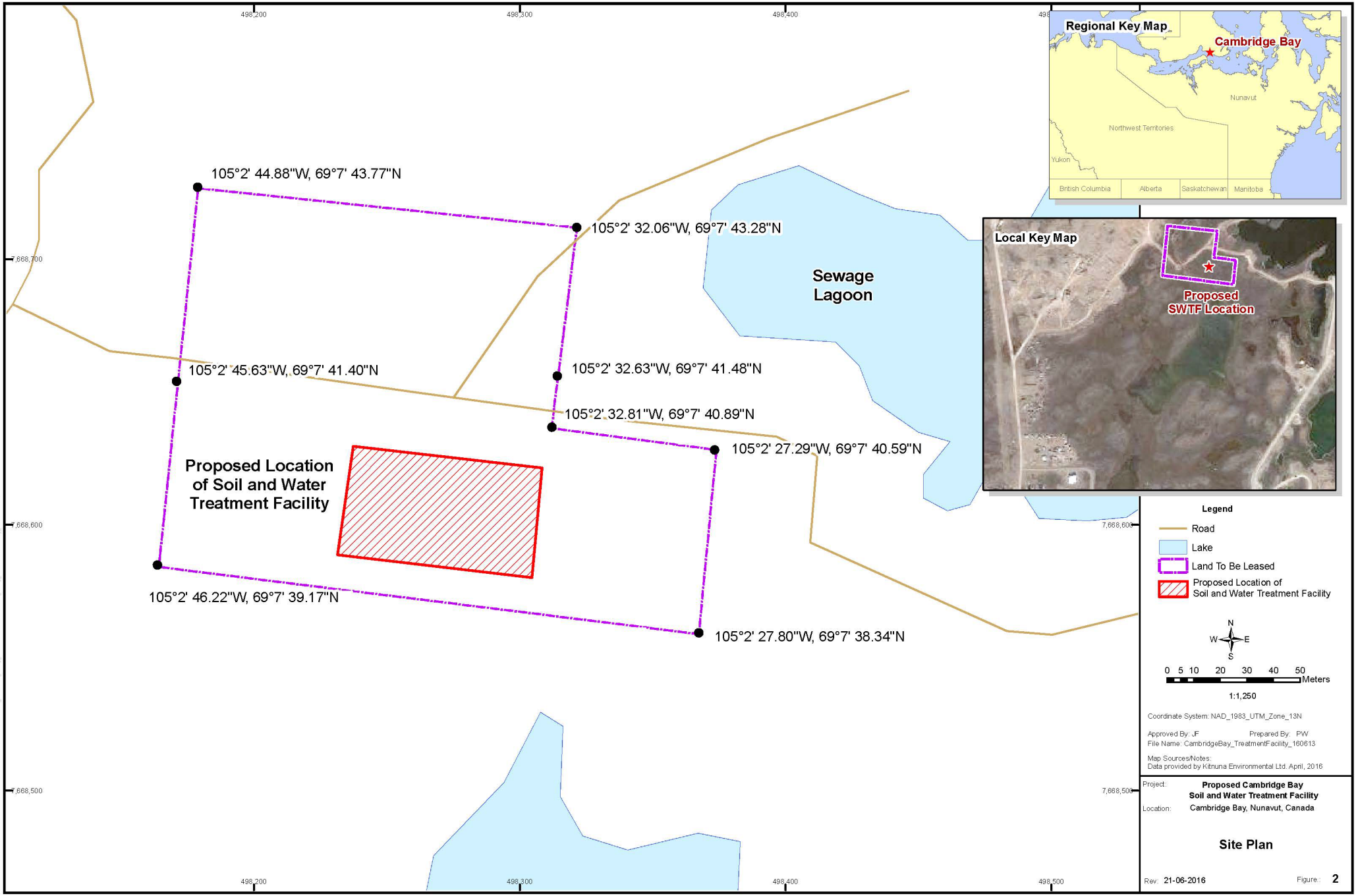
b hardness-dependent parameter

- Canadian Environmental Quality Guidelines,Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME CWQGs; CCME, 1999)

Where no guideline exists, parameter is analyzed for ongoing trend analysis

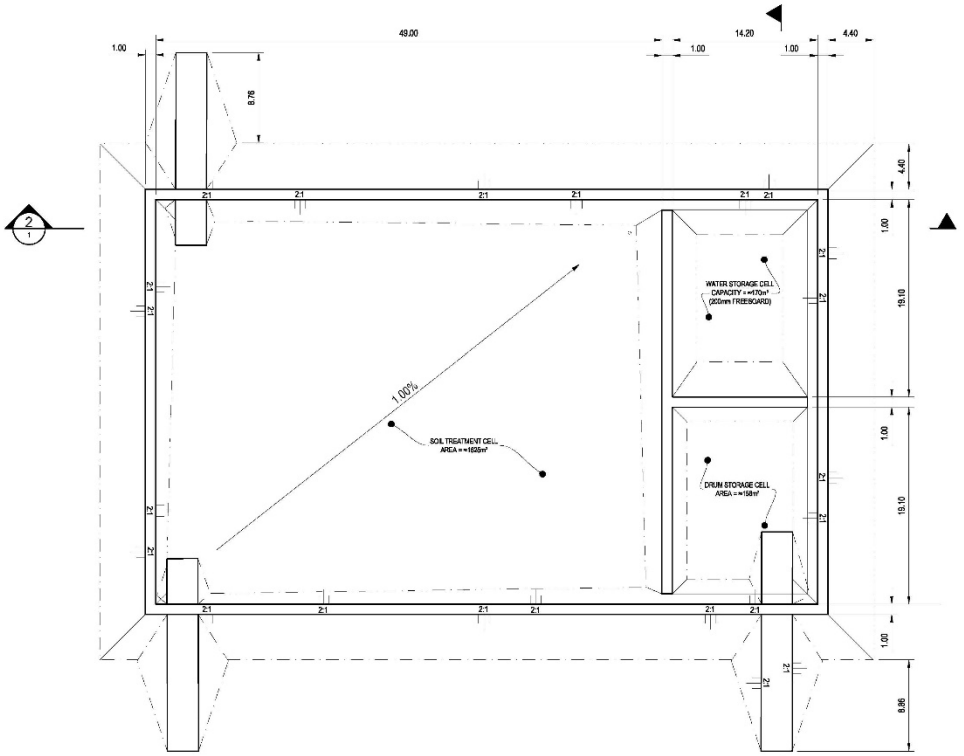
APPENDIX A

General Location of Soil and Water Treatment Facility

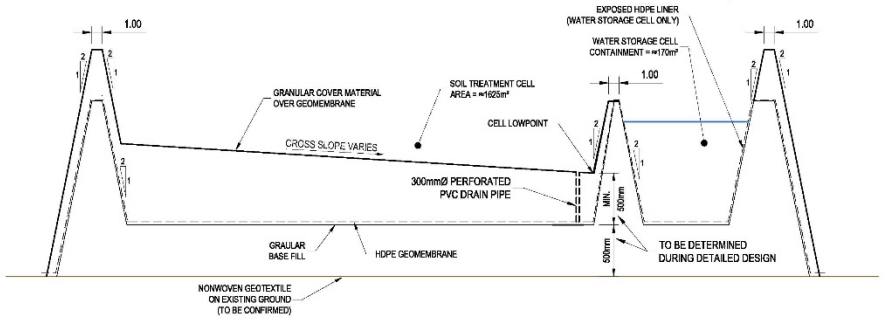

498,200
498,300
498,400
498,500
7,668,700
7,668,600
7,668,500
105°2' 44.88"W, 69°7' 43.77"N
105°2' 32.06"W, 69°7' 43.28"N
105°2' 45.63"W, 69°7' 41.40"N
105°2' 32.63"W, 69°7' 41.48"N
105°2' 32.81"W, 69°7' 40.89"N
105°2' 27.29"W, 69°7' 40.59"N
105°2' 46.22"W, 69°7' 39.17"N
105°2' 27.80"W, 69°7' 38.34"N
Sewage Lagoon
Proposed Location of Soil and Water Treatment Facility
Regional Key Map
Cambridge Bay
Nunavut
Northwest Territories
Yukon
British Columbia
Alberta
Saskatchewan
Manitoba
Local Key Map
Proposed SWTF Location
Legend
Road
Lake
Land To Be Leased
Proposed Location of Soil and Water Treatment Facility
N
W
E
S
0 5 10 20 30 40 50
Meters
1:1,250
Coordinate System: NAD_1983_UTM_Zone_13N
Approved By: JF
Prepared By: PW
File Name: CambridgeBay_TreatmentFacility_160613
Map Sources/Notes:
Data provided by Kitnuna Environmental Ltd. April, 2016
Project: Proposed Cambridge Bay Soil and Water Treatment Facility
Location: Cambridge Bay, Nunavut, Canada
Site Plan
Rev: 21-06-2016
Figure: 2

APPENDIX B

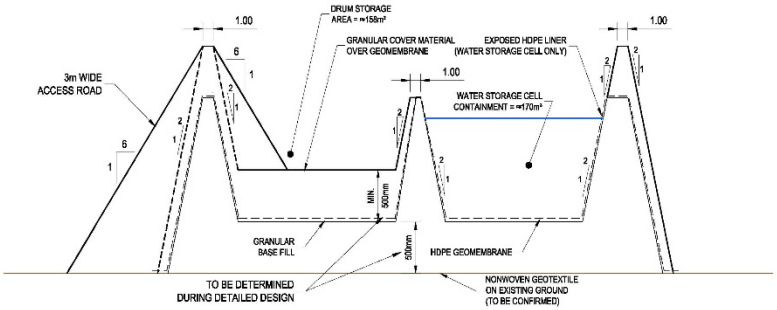
Facility Design Drawing



1 PLAN
1:250



2 SECTION
1:250h 1:25v



3 SECTION
1:250h 1:25v

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.

REDUCED

Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

NOT FOR CONSTRUCTION

DILLON CONSULTING

No.	Issued/Revised	Date	By
01	ISSUED FOR CLIENT REVIEW	04.13.2018	KB

DESIGN	KB
DRAWN	TPW
CHECKED	KB
APPROVED	KB
DATE	APRIL 2018
SCALE	AS NOTED

KBL SOIL TREATMENT FACILITY - CONCEPTUAL DESIGN
CAMBRIDGE BAY, NUNAVUT

SITE PLAN AND SECTION

PROJECT NO. 15-2230-1000

SHEET NO. 1

APPENDIX C

Appendix Title

KBL Environmental LTD.

C2: Inspection Checklist

Cambridge Bay Treatment Facility

Date (MM/DD/YY): _____ Time: _____

Inspector: _____ Weather: _____

Current activities on site: _____

Discharging to sump? _____ Freeboard in Sump _____

Water in Cell? _____ Freeboard in Water Cell _____

Soil on Pad? _____ If yes, fill out page 2 (x) _____

Treated water tank in use? _____ # of TW tanks _____

Review Maintenance Log (Y/N) Outstanding work order (Y/N)

Site Conditions		OK (x or N/A)	Needs Attention (x)	Entered into Maintenance Log (Y/N, Initial)	Comment *additonal comments on Page 2
Access	Gate in working order				
	Signage visible				
Spill Kit	On site				
	Lid secured				
	Contents checked				
Storage Shed	Locked				
	PPE available				
	Trash pump in containment				
	Pump fuel in containment				
	Soil amendments in containment				
	Binder 1 available				
	Binder 2 available				
	Binder 3 available				
	Sample kit contents checked				
Wildlife	Observed on site				
	Damage to facility				
Facility Grounds	Evidence of spills				
	Rutting				
	Ice				
Soil Pad	Berm stability				
	Liner visible				
	Ramp 1 stability				
	Ramp 2 stability				
	Drainage system working				
	Dust control				
Water Cell	Berm stability				
	Liner visible				
	Filter cloth on pump intake				
	Tarp intact & secure				
WTP	Flow meter working				
	System function				
Sump	Stability				

*placing an X in a shaded box requires entry into Maintenance Log and follow-up.

Office Back-up: Date (DD/MM/YY) Initial _____

KBL Environmental LTD.

C2: Inspection Checklist

Cambridge Bay Treatment Facility

Soil Currently on Pad

Job #	Status						Job Marker in Place		Biopile Erosion	
	Loading/ unloading	Remediat'n underway	Tilling	Dust Supress'n	Amending	Sampling	Y	N	Y	N

**placing an X in a shaded box requires entry into Maintenance Log and follow-up.*

Comments

Office Back-up: Date (DD/MM/YY) Initial _____

APPENDIX D

Waste Profile Form

KBL Environmental LTD.

Waste Profile Form

Section A: General Information

Customer Name: _____ **Contact:** _____

Address: _____ **City / Town:** _____ **Province:** _____

Postal Code: _____ **Phone:** _____ **Fax:** _____

Cell Number: _____ **Email Address:** _____

Generator Site Location: _____

Billing:

Bill to the address above ☐ **If there is an alternate billing address please provide the information below:**

PO# / AFE or Job#: _____ **Bill to:** _____

Bill to Address: _____ **City:** _____ **Prov:** _____ **Postal Code:** _____

Acct. Contact: _____ **Phone Number:** _____ **Fax Number:** _____

Section B: Waste Description

Description: _____ **Source:** _____

Quantity: _____ ☐ Tonne ☐ Pail ☐ Drum ☐ m^3 **Lab ID #s:** _____

Section G: Certification

I hereby certify that to the best of my knowledge the information contained above is accurate and contains no willful or deliberate omissions. The sample for which the analytical data was provided is representative of the waste and was collected and preserved in a manner consistent with accepted technical standards. The waste described is not hazardous according to EUB or AENV regulations. If it is determined that the waste stream does not conform to this profile, KBL Environmental Services Ltd. reserves the right to re-profile the waste, reject the waste or surcharge the quoted disposal price.

Authorized Signature: _____ **Print:** _____

Title: _____ **Date:** _____

Section H: KBL Environmental Internal Use

Profile Approval: Yes ☐ No ☐ **Project #:** _____

	HAY RIVER	HIGH LEVEL	YELLOWKNIFE	CAMBRIDGE BAY	OTHER:
Facility Destination:	☐	☐	☐	☐	☐

Approval Number: _____ **KBL Representative:** _____

Date: _____ **Landfill Representative:** _____

Acceptance Conditions:

A. **ADC:** ☐ **Credit Approval:** ☐

B. **Treatment:** ☐

C. **Disposal:** ☐