DILLON CONSULTING

CITY OF IQALUIT

Environmental Protection Plan (Revised Final) Construction Phase

Landfill and Waste Transfer Station

January 2020 | 19-9543 – Version 3.0

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1.0 Introduction

1.1 Purpose of This Document

This Environmental Protection Plan (EPP) has been prepared as part of an overarching Environmental Management Plan (EMP) and describes the environmental protection measures to be implemented during the **Construction Phase** of the City of Iqaluit's (the City's) proposed Waste Transfer Station (WTS) and Landfill. The purpose of the EPP is to be a resource for the City and its contractors during the Construction Phase to avoid or mitigate potential adverse environmental effects to various receptors. This EPP is based on a desktop review of publically available records and site assessments conducted for the Landfill and Transfer Station locations, completed by EXP Services Inc. (Delvin, 2018a; Delvin 2018b; EXP, 2018).

This EPP includes instructions for carrying out construction activities, outlines environmental protection measures (as they relate to the project activities), and provides a reference for environmental inspection staff to support decision-making during the construction phase of the project. **Once the construction phase of the project is complete, refer to the Operations, Closure, and Post-Closure Phases Environmental Protection Plan for phase-specific protection and mitigation measures**.

Key project contacts (as of January 2020) are provided in **Appendix A**.

1.2 Regulatory Context

The environmental regulatory framework that the project falls under includes:

1. *Fisheries Act;*
2. *Species at Risk Act;*
3. *Canadian Environmental Protection Act;*
4. *Nunavut Wildlife Act;*
5. *Nunavut Environmental Protection Act;* and
6. *Nunavut Waters and Nunavut Surface Rights Tribunal Act.*

2.0 Project Roles and Responsibilities

The following section outlines the roles and responsibilities of the City and its assigned contractors. These responsibilities include reporting, notifications, guidelines on documentation and incident reporting. The responsibilities of all parties are outlined below.

City of Iqaluit – Owner (All Project Phases)
As the Operator of the Landfill and Transfer Station, the City will be responsible for ensuring that its employees and third party representatives are made aware of the EPP and associated plans and that the commitments contained therein are implemented. The City is responsible for ensuring that the requirements of construction and associated regulations are met. The City will also provide guidance and technical support to on-site personnel with respect to environmental compliance.

Contractor (Construction Phase Only)
As a component of its contractual obligations, the Contractor (for initial and future construction initiatives) will be responsible for developing and implementing an Environmental Protection Plan specific to its personnel and project activities. In the event of a spill during construction phases of the project, the Contractor's site supervisor will ensure that the City and Environmental Inspector (EI) are made aware of the spill and measures are taken to address the environmental impacts.

Dillon Consulting Limited - Owner's Representative (Construction Phase Only)
The Owner's representative will be a third party consultant (e.g., Dillon Consulting Limited), responsible for corroborating that the EPP is implemented by the Contractor, in accordance with procedures outlined in this document, and compliance obligations are met. The Owner's representative will confirm that reporting, documentation procedures and requirements stipulated in the EPP are completed by the Contractor.

The Owner's representative will, at a minimum, and as directed by the Owner:

- Serve as an independent (third party); and
- Provide technical services associated with the completion of the project.

3.0 Environmental Considerations

The environmental setting of the project areas (**Figure 3-1**) was assessed using a desktop review of publically-available records and site assessments completed by EXP Services Inc. (Delvin, 2018a; Delvin 2018b; EXP, 2018). The two sites are located in the Meta Incognita Peninsula Ecoregion, which is characterized by rock outcroppings interspersed with sandy morainal veneers and frozen organic deposits, static cryosols with turbic and organic cryosol soils, and continuous permafrost with mainly medium ice content (Ecological Framework of Canada, 2019).

The Landfill site is approximately 22 ha in size, consisting predominantly of rolling hills with some bedrock outcrops in the south central region, small glacio-fluvial terraces in the northwest region, and boulder fields in the northwest and central portions of the site (EXP, 2018). The Transfer Station location is an industrial site, within the City, and is approximately 2.4 ha in size, covered by fill consisting of sand and gravel with boulders and cobbles (Delvin, 2018a, Delvin 2018b).

3.1 Vegetation

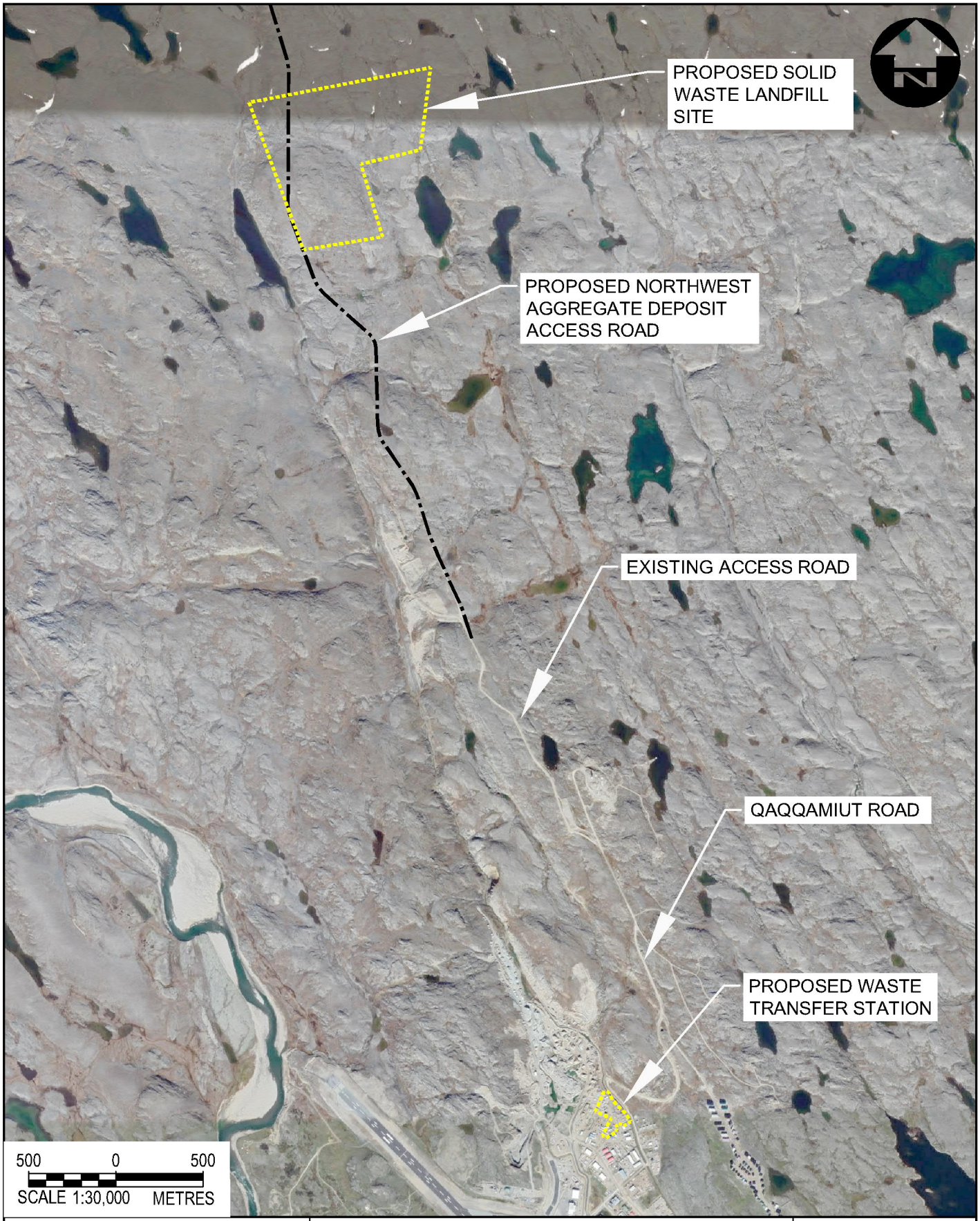
The landscape of the Meta Incognita Peninsula Ecoregion is dominated by tundra shrub vegetation, consisting of Dwarf Birch (*Betula nana)*, Willow (*Salix spp.*), Labrador Tea (*Ledum spp.)*, *Dryas spp.* and *Vaccinium spp* (Ecological Framework of Canada, 2019). The nearby landscape, as characterized by Sylvia Grinnell Territorial Park reports, contains shallow, low-nutrient soils and continuous dwarf vegetation, meaning that vegetation growth is generally less than 30 cm tall (Nunavut Parks, 2019). Traditionally-important plant species found nearby include Mountain Sorrel (*Oxyria digyna*), Crowberry (*Empetrum spp.*), Blueberry (*Vaccinium spp.*), Mountain Cranberry (*Vaccinium spp.*), Arctic Willow (*Salix arctic*), Arctic Cotton (*Eriophorum callitrix*) and Labrador Tea (*Ledum spp.*). Other vegetation includes rock lichens, drought-tolerant vegetation, sedge grasses and the official flower of Nunavut - the Purple Mountain Saxifrage (*Saxifraga oppositifolia*).

Landfill

Twenty-three plant species were observed at the site location, none of which are protected under the federal *Species at Risk Act* (SARA) (EXP, 2018). The dominant and sub-dominant plant species observed included Arctic Willow (*Salix arctica*), Net-vein Willow (*Salix reticulata*), Bog Bilberry (*Vaccinium uliginosum*), Arctic Bell Heather (*Cassiope tetragona*) and Reindeer Lichen (*Cladina spp*.) (EXP, 2018).

Waste Transfer Station

The site is predominately covered with fill but some vegetation, such as grasses, exist along the northern perimeter and along the creek adjacent to the north site boundary (Delvin, 2018a).



DILLON CONSULTING

DATE JANUARY 2020

PROJECT
IQALUIT LANDFILL & WASTE TRANSFER STATION
ENVIRONMENTAL PROTECTION PLAN CONTRUCTION

PROJECT NO. 19-9543

TITLE
SITE LOCATIONS

FIGURE NO. 3-1

FileName:c:\projectwise\working directory\projects 2019\50dbc\dms12727\199543-02-site-con-cover.dwg

3.2 Wetlands and Watercourses

Landfill

There are a number of small ephemeral drainages that cross the site and discharge into a small pond and lake southeast of the site boundary (EXP, 2018). The pond and lake drain into Carney Creek, approximately 200 m west of the site, before discharging into the Koojesse Inlet of Frobisher Bay (EXP, 2018).

Waste Transfer Station

There are no waterbodies reported on the site location; however, there are a few small bodies of water 30 m west of the site, as well as a stream contained within a road ditch located along the north eastern boundary (Delvin, 2018a; Delvin, 2018b). The stream drains into Koojesse Inlet, which is located approximately 2 km southeast of the site.

3.3 Wildlife and Wildlife Habitat

Wildlife that frequent the region, as characterized by species found in Sylvia Grinnell Territorial Park, include Caribou (*Rangifer tarandus)*, Arctic Foxes (*Vulpes lagopus*), Arctic Hares (*Lepus arcticus*), other small mammals; and although infrequent; Polar Bears (*Ursus maritimus*) (Nunavut Parks, 2019). Migratory bird species known to occur within the region include the Common Ringed Plover (*Charadrius hiaticula*), Lapland Longspur (*Calcarius lapponicus*), Snow Bunting (*Plectrophenax nivalis*), Northern Wheatear (*Oenanthe oenanthe*), Red-Throated Loon (*Gavia stellate*), Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), Lesser Golden Plover (*Pluvialis dominica*), Semipalmated Sandpiper (*Calidris pusilla*) and Horned Lark (*Eremophila alpestris*) (Nunavut Parks, 2019).

Landfill

Eleven wildlife species were observed at the site location – three mammals, five birds and three insects – but none are protected under SARA legislation (EXP, 2018). The wildlife species observed at the site included: Lemming (*Lemmus trimucronatus*), Fox (*Vulpes sp.*), Caribou (*Rangifer tarandus*), Savannah Sparrow (*Passerculus trimucronatus*), Red-throated Loon (*Gavia stellate*), Common Raven (*Corvus corax*), Falcon (*Falco sp.*), American Pipit (*Anthus rubescens*), American Copper (*Lycaena phlaeas*), Forest Bumblebee (*Bombus sylvicola*) and Wolf Spider (*Hogna lenta*).

Waste Transfer Station

No reports were found that indicated wildlife populations or wildlife habitat are present within the site boundary.

3.4 Fish and Fish Habitat

Landfill

The waterbodies within the site boundary are unlikely to be accessible to fish; however, the stream that collects surface drainage from the Landfill site contributes to Carney Creek, which connects to a small lake west of the site reportedly providing habitat for Arctic Char (EXP, 2018).

Waste Transfer Station

No reports were found that indicated fish populations or fish habitat are present within the site boundary.

3.5 Species at Risk or Species of Special Status

The following Species at Risk (SAR) or species of special status (see **Table 3-1**) have the potential to be impacted by the proposed project.

Table 3-1: Wildlife Species at Risk

Common Name	Scientific Name	COSEWIC Status	SARA Status	Schedule 1
Caribou (barren-ground population)	*Rangifer tarandus*	Threatened	No Status	No
Harlequin Duck	*Histrionicus histrionicus*	Special Concern	Special Concern	Yes
Polar Bear	*Ursus maritimus*	Special Concern	Special Concern	Yes
Red Knot (rufa subspecies)	*Calidris canutus rufa*	Endangered	Endangered	Yes
Red-necked Phalarope	*Phalaropus lobatus*	Special Concern	No Status	No
Ross's Gull	*Rhodostethia rosea*	Threatened	Threatened	Yes
Wolverine	*Gulo gulo*	Special Concern	Special Concern	Yes

While not all of the listed species were identified at the time the surveys were conducted at the sites, these species are known to live in the area and could be present or visit the sites during the lifespan of this project.

3.6 Heritage and Cultural Resources

Landfill

There are no known designated cultural heritage or archaeological/paleontological features identified within the site boundary; however, the proposed site and adjacent landscape is used for outdoor recreational and traditional activities (EXP, 2018). These reported activities include hunting, fishing, berry picking, camping, winter skiing, picnicking and dog walking (EXP, 2018).

Waste Transfer Station

No reports were found that indicated cultural heritage or archaeological/paleontological features are present within the site boundary.

4.0 Environmental Protection Measures

The purpose of this section is to provide specific mitigation measures for the project team to implement or confirm implementations, in order to avoid or reduce potential environmental impacts. Mitigation measures for the Contractor to implement are outlined for various components of the project in **Tables 4-1** to **4-3** below. Within each table, the mitigation measures are sorted by issue/activity. Revision of specific mitigation measures outlined in the EPP may be required to address unforeseen site-specific conditions or as a result of ongoing consultation.

Applicable Orders, Permits and Licenses for the project are provided in **Appendix B**.

Table 4-1: Mitigation Measures for Planning and Regulatory Requirements

Issue/Activity	Mitigation Measures
Work Progress Schedule	1. Works must be conducted according to regulatory approvals, permits, and licenses obtained for the work. These documents shall be displayed at each work site. 2. Adhere to planned project scheduling as outlined in the applicable regulatory permits and approvals. 3. Schedule and conduct activities to adhere to applicable timing windows and avoid restricted activity periods, where feasible, as follows: • Where possible, pre-clear shrubs and tall grasses prior to the onset of migratory bird nesting period (May 6 – September 1) to discourage nesting on the construction footprint. 4. A copy of this EPP and its included plans, regulatory approvals, permits and/or licenses will be available on-site at all times. 5. As part of pre-construction survey marking, conduct the following: • Clearly flag or stake the boundaries of the project area before construction, including the corners of the work areas. Maintain the corner markings until the work areas are reclaimed. • Clearly flag or stake the boundaries of temporary access roads. • Maintain survey markings until construction and clean-up activities are complete.
Discipline	6. Workers who show careless or wanton neglect of the environment, or disregard requirements put forward in the EPP will be identified, the incident recorded, and the Contractor will take appropriate action.
Environmental Training	7. Prior to the beginning of construction, a pre-job meeting will be held with relevant project personnel (e.g., engineering, safety and environment employees, observers, contractor supervisors) where this EPP, environmental concerns, mitigation measures, and regulations specific to the work, corporate policies and procedures, specific stakeholder conditions, specific conditions on associated permits, and contingency measures will be reviewed with the Contractor. 8. Environmental training will be provided to field level project personnel, as part of the site orientation, prior to starting work. This training, reviewed by the Owner and their representative, will be provided by the Contractor.

Table 4-2: Mitigations Measures for Construction

Issue/Activity	Mitigation Measures
Work Areas	1. Project activities must occur within the approved workspace. 2. Where necessary, the applicable work area boundaries must be clearly staked or marked with flagging tape.
Erosion and Sediment Control* ***: see Appendix C***	3. Erosion and sediment controls shall be installed prior to commencing excavations or work in areas susceptible to erosion. 4. If activities involve ground disturbance within 100 m of any watercourse or wetland, erosion control structures must be installed between the natural areas and the work areas to create separation of the work area, as required. 5. Erosion and sediment control measures are to be left in place, where feasible until all work is complete. 6. Erosion and sediment control measures are to be routinely inspected and maintained in proper working order. 7. Erosion and sediment control measures are not static and may need to be upgraded and/or amended as directed by the Regulators, Owner, or their representative, as site conditions change. 8. The Contractor shall repair failed erosion and sediment control measures as soon as possible. 9. If drifting soil or topsoil loss is evident in areas prone to wind erosion, conduct the following: • Suspend topsoil stripping operations during high winds; • Apply a tackifier to the stripped topsoil pile; and/or • Install wind barriers. 10. Topsoil handling will be suspended during high winds when soil erosion is evident and during heavy rains, if soil becomes saturated. Topsoil will not be handled until winds have decreased and/or topsoil has drained and dried. 11. After final grading, stabilize disturbed steep slopes with permanent erosion control structures, especially if heavy runoff or heavy storms are likely, and there is a risk of substantial erosion. 12. Remove silt fence and erosion control measures only after the site has been stabilized.
Equipment Cleaning and Condition	13. Construction equipment, including tracked equipment and rubber-tired vehicles, shall arrive on the job site clean (i.e., free of soil and vegetative debris) and in good working order with no oil, hydraulic, or other fluid leaks. 14. Machinery and equipment shall be inspected for leaks throughout the duration of construction.
Clearing, Grubbing, and Grading	15. Construction work will be confined to the defined workspace. 16. Soil disturbance will only occur within the designated areas of the project required for surface or subsurface work. 17. Limit the extent of clearing, grubbing and grading to the minimum extent feasible. 18. Store material in discrete piles or windrows. 19. Ensure that stripped or graded soil does not spread outside of the project area. 20. Segregate topsoil from subsoil fill. 21. Consult with the Owner's representative prior to clearing or removing vegetation near watercourses. 22. Prior to any vegetation clearing or soil stripping, the appropriate wildlife and birds nest surveys must be completed prior to the start of clearing operations.

Issue/Activity	Mitigation Measures
Drainage Control	23. Ensure construction activities do not obstruct natural drainage, where possible, and facilitate drainage around the work area when avoidance is not possible. 24. Following construction, grade to re-establish surface drainage patterns and maintain existing site grades. 25. Leave gaps in windrows, at obvious drainages, on side-hill terrain and wherever seepage occurs, to reduce interference with natural drainage patterns. 26. Interceptor ditches and sumps are to be maintained free of accumulated sediment. Inspections are to be carried out regularly; cleaning to occur as required.
Dust and Noise Control	27. Vehicle use on public roads and project access routes will be in accordance with applicable laws and road use agreements (e.g., load restrictions). 28. Vehicles will not exceed speed limits established for the area and will lower speeds in specific conditions, such as areas of high erosion hazard. 29. Personnel will avoid unnecessary wheel spin when travelling or operating on soil. 30. Personnel will not unnecessarily idle vehicles or equipment. 31. Ensure equipment and machinery is in good working order with proper noise abatement equipment (i.e., mufflers or enclosures). 32. Locate stationary equipment, such as compressors and generators, away from noise receptors to limit the transmission of noise off-site. 33. Notify the Owner or their representative of any noise complaints that may be received by project personnel, public agencies, or individuals.
Fuel and Hazardous Material Storage	34. Hazardous materials must be labelled, stored and handled according to Workplace Hazardous Materials Information System regulations. 35. Fuel storage containers and tanks will be appropriately labelled. 36. Adequate spill response materials are available and accessible at the site. 37. Fuel containers and filters must be stored in secondary containment. 38. Jerry cans and other mobile fuel containers must always be stored in secondary containment while being used and returned to the storage area, as soon as feasible following use. 39. Refuelling points and fuel storage tanks, including secondary containment and gas cans, will be inspected regularly. All leaks must be repaired immediately.
Equipment Refueling and Servicing	40. Regularly inspect and maintain all heavy equipment and vehicles used for the project, including fuel transfer hoses and fuel/oil lines, to ensure that the systems are in good condition and free of leaks. Equipment or vehicles with deficiencies will be taken out of service and repaired. 41. Refuelling equipment will be attended at all times while refuelling. 42. Refuelling of equipment will not take place within 30 m of any wetland or watercourse. 43. Drip trays are to be in place while refuelling occurs to contain overfilling, drips and spills. 44. All vehicle servicing with the potential for accidental spills shall take place above an impervious tarp, and servicing will not take place within 30 m of wetlands or watercourses. 45. Spill kits should be accessible while refuelling. 46. Spill mats and/or drip pans/trays will be placed under all mobile fueling containers, equipment, and vehicles, when not in use or parked for longer than two hours.

Issue/Activity	Mitigation Measures
Spill Response, Reporting and Notification	47. The Contractor will notify the Owner or their representative, as soon possible, following the discovery of a spill of any volume. 48. The Contractor will notify Regulatory agencies and community liaisons, where required, to notify them of the spill. 49. A written spill report must be submitted to the Owner and their representative by the Contractor within 24 hours of any spill.
Air Emissions	50. Do not unnecessarily idle vehicles or equipment. 51. Ensure equipment is well maintained. 52. Notify the Owner or their representative of any odour complaints that may be received by project personnel, public agencies, or individuals.
Light Emissions	53. Lighting will be restricted to the minimum required to complete the works safely. 54. Lighting will be directed to the work area to reduce light pollution during dark hours to the extent feasible.
Wildlife Encounters and Sightings	55. Feeding or harassing wildlife is prohibited. 56. Travel within posted speed limits and yield to wildlife. 57. Report incidents of collisions or close calls with wildlife to the Owner or their representative. 58. The Contractor will notify the Owner and/or their representative of the following wildlife sightings: • Any suspected SAR or suspected species of special status, which are listed in **Table 3-1**; • Any dead or sick/diseased wildlife; and • Any food caches, dens, or nests found within or close to the site. 59. The Government of Nunavut will be notified of wildlife encounters by the Owner when required. 60. If previously unidentified listed or sensitive wildlife species or their site-specific habitat (e.g., dens, nests) are identified during construction, the Contractor will report the sighting to the Owner or their representative and implement the Wildlife Species of Concern Discovery Contingency Plan (**Section 6.2**).
Water Management	61. Water taking/withdrawal can only be carried out while personnel are on-site or nearby, allowing for regular inspection and maintenance of the pumping and discharge system. 62. Prior to discharging any water to the environment, the water must be inspected for any signs of contaminants. If signs of contaminants are present, the water must be collected and hauled to a disposal facility or sampled and analyzed to determine if the water meets Canadian Council of Ministers of the Environment water quality guidelines for the protection of aquatic life. 63. Water is to be discharged using pumps that will be directed to sediment removal materials (i.e., filter bag) or water settlement areas, in low-lying, vegetated areas at least 30 m away from a watercourse or wetland. At no time shall water be discharged directly into a watercourse or wetland. Dewatering volumes are to be monitored and recorded daily. 64. Where possible, discharge locations should be chosen that are near the dewatered area to maintain the local water table elevation. 65. Suitable discharge locations will be reviewed and confirmed by the Construction Manager and the EI.
Discovery of Heritage	66. Avoid impacts on lands outside of the work areas, including vegetation clearing. 67. If any artifacts or signs of archaeological artifacts are encountered, all work in the area

Issue/Activity	Mitigation Measures
Resources, Sites, or Artifacts	will be stopped immediately and the Owner and their representative will be immediately notified. Work will not resume until the Regulator has approved mitigation measures are implemented. Do not operate vehicles or equipment within 30 m of a known or suspected archaeological site, or burial ground. 68. The Owner will notify the following, as soon as possible, upon the discovery of an archaeological or historical site: • Government of Nunavut Territorial Archaeologist 867 934 2040 and include the following information: ○ Name and contact information of the person who made the discovery; ○ The date of discovery; ○ The nature of the object or fossil; ○ A description of the site and any artifacts/fossils noted; ○ A few photographs of the artifact/fossil and/or site; ○ A GPS reading of the location, if possible; ○ Any other relevant information; and ○ Regulations: subsection 51 (1) of the *Nunavut Act* and the Nunavut Archaeological and Palaeontological Sites Regulations. 69. No one shall knowingly remove, disturb, or displace any archaeological specimen or site.
Watercourse Protection	70. Install effective erosion control and sediment control measures before starting work to prevent sediment from entering any water body or spreading outside of the work site. 71. Wash, refuel, and service machinery, and store fuel and other materials for the machinery in such a way that prevent any deleterious substances from entering the water. 72. Schedule work to avoid wet, windy, and rainy periods that may cause erosion and sedimentation. 73. Apply the following mitigation measures to ensure fish habitat is maintained when crossing waterbodies: • Install a temporary bridge structure over the waterbody. The temporary bridge will be placed above the ordinary high water mark so that instream works are not required. Use matting to cross non-fish bearing watercourses and wetlands. • Use temporary crossing structures or other practices to cross watercourses with steep and/or highly erodible (e.g., dominated by organic materials and silts) banks and beds. • Design and construct approaches to the watercourse or waterbody, such that they are perpendicular to the watercourse or waterbody to minimize loss or disturbance to riparian vegetation. • The banks of the watercourses are not to be cut unless otherwise authorized by the Regulators. • Do not remove naturally occurring material from the bed and banks of any watercourse below the ordinary high water mark. • Do not store material on the ice surface of a watercourse, unless required for immediate use. • Minimize the disturbance of riparian vegetation within the immediate boundary of watercourse crossings to the extent practical. • Install suitable erosion and sediment controls measures around work areas near watercourses and wetlands to prevent resuspension of sediment into water bodies. • If works around watercourse or wetland crossings cause exposed soils and/or bank stability issues, remediate the exposed banks upon completion of the work. • Do not ford wet streams.

Issue/Activity	Mitigation Measures
	• Remove all construction materials from site upon crossing completion. 74. Notify the Owner's representative if any suspected contamination is discovered in or near a waterbody, who will initiate the applicable investigation and sampling to be completed to confirm suspect soil or water: • Soil or slurry material should be considered contaminated if any of the following are found: ○ Oil residue; ○ Gaseous odour; ○ Discoloured soil; and/or ○ Sheen on water. • Upon discovery of potential impacted soil or water, the site observer and their Project Manager will consult with the Owner to determine proper sampling requirements. • If required, the Owner will notify the applicable regulators of the newly discovered impacts. • Contaminated materials will be disposed of in accordance with the Waste Management Plan. • Consult with the Owner prior to disposing of any contaminated waste. requirements are met and an approved facility has been arranged to receive the waste.

Table 4-3: Waste Management Procedures

Issue/Activity	Mitigation Measures
Waste Handling and Disposal	1. Appropriate waste disposal facilities for each waste type to be produced by the project must be identified by the Contractor, prior to starting work. 2. All waste leaving the site must be accompanied with an appropriate waybill, bill of lading or waste manifest. Consult with the Owner or their representative to determine what type of paperwork is required. 3. Notify waste disposal facilities of waste shipments prior to leaving the site and determine if any there are facility sampling requirements. 4. No wastes may be disposed of on-site. 5. If wastes, including wastewater, are to be disposed of at a local municipal waste facility, agreements should be in place between the receiving local municipal waste facility and the Contractor, prior to any wastes being hauled. 6. All sewage and solid waste will be contained and sealed in watertight containers. 7. Tanks used for transporting greywater will be watertight and will be regularly and properly inspected and maintained by the operator.

5.0 Monitoring and Inspection

As a defined Contractor responsibility, and consistent with regulatory requirements, monitoring and inspection activities are to be conducted during the construction phase of the project, to assess any impacts to the surrounding environment and habitat. Environmental monitoring and inspections are important during this phase because the potential for negative impacts to the environment and habitats occurring within and outside the site area is high. It is imperative that spills and other incidents, which impact the environment and wildlife in the area, such as the discovery of a nesting bird in the construction zone, are reported immediately. If a site characteristic is deemed problematic, appropriate mitigations measures are to be implemented. There may be a need to revise specific monitoring and inspection activities outlined below to address unforeseen site-specific conditions.

6.0 Contingency and Emergency Response Plans

6.1 Spill Response Plan

The following sections contain spill response plans for small and large spills. Mitigation measures pertaining to Fuel and Hazardous Material Storage, Equipment Refueling and Servicing and Spill Response, Reporting, and Notification is found in **Section 4.0** - **Environmental Protection Measures**.

6.1.1 Small Spills/Leaks

Spills or leaks less than 20 L are considered small spills and the following procedure must be followed:

1. The first observer will check the immediate area for any affected or injured personnel and will inform the Contractor, as soon as possible.
2. The Contractor will:
    a. Ensure activity in the area is restricted to guarantee the safety of the personnel cleaning up the spill.
    b. Direct staff to take appropriate emergency environmental protection measures such as placing booms, barrier, or absorbent pads around the spill to prevent liquid escape into the environment or into surface water bodies.
    c. Shovel the spilled material and clean-up debris into a drum, bin, or bag;
    d. Label the container(s) as “Spill Material” along with the spilled substance and date. Place it in a safe storage area.
    e. Notify the Department of Environment for the Government of Nunavut and take their direction as appropriate.
    f. Complete a *Spill Report Form* detailing the following:
        i. Amount of product spilled;
        ii. Name of material spilled if known. If the material is unknown, indicate as such in the log;
        iii. Person who discovered the spill;
        iv. Date and time of the spill;
        v. Estimated volume of spill clean-up material used; and
        vi. Any other relevant details.
    g. Forward the incident report/memo to the supervisor for review; and
    h. Attempt to determine the cause of the release, if risk to further release exists, and if feasible, mitigate the cause to prevent further releases.

6.1.2 Large Spills/Leaks

Spills or leaks greater than 20 L are considered large spills. For a large spill, the following procedure must be followed:

1. The first observer will check the immediate area for any affected or injured personnel and will inform the Emergency Coordinator, as soon as possible.

2. The Contractor will take control of the emergency and complete the remaining steps:
    a. Clear all personnel out of the area.
    b. Notify the Department of Environment for the Government of Nunavut and take direction from the Department or their designated authority.
    c. If over 100 L of fuel is spilled, or the spill volume is unknown, by law it must be reported to the Government of Nunavut. Report a spill in one of the following two ways:
        i. Call the 24-Hour Spill Report Line at 867-920-8130; or
        ii. Complete the *Spill Report Form* from the Nunavut Government (found in **Appendix E** of this report) and fax it to 867-873-6924, or email it to spills@gov.nt.ca.
3. For other Schedule B Contaminants (NWT Reg., 2006), if greater than the reference amount of contaminant was spilled or you are unaware of how much was spilled, by law it must be reported to the Government of Nunavut. To report a spill of Schedule B Contaminants, phone the 24-Hour spill Report Line at 867-920-8130. A list of Schedule B Contaminants and the reference spill volumes (NWT Reg., 2006) are presented in **Table 6-1**.

Table 6-1: Schedule B Contaminant Reference Spill Amounts

TDGA Class	Description of Contaminant	Amount Spilled
1	Explosives	Any amount
2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 L
2.2	Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
2.3	Compressed gas (toxic)	Any amount
2.4	Compressed gas (corrosive)	Any amount
3.1, 3.2, 3.3	Flammable liquid	100 L
4.1	Flammable solid	25 kg
4.2	Spontaneously combustible solids	25 kg
4.3	Water reactant solids	25 kg
5.1	Oxidizing substances	50 L or 50 kg
5.2	Organic peroxides	1 L or 1 kg
6.1	Poisonous substances	5 L or 5 kg

4. Use appropriate personal protective equipment (PPE) for proper handling of material;
5. If there is danger due to exposure, fire, explosion, or if public safety, the Contractor will suspend operation. All personnel should evacuate to the Emergency Muster Area. If the Emergency Muster Area is an unsafe area due to the conditions, personnel must proceed to an Alternative Muster Area.
    a. Contractors should take attendance from preprinted list.
    b. Phone and seek guidance from the 24-Hour Spill Report Line at (867-920-8130).

6. If the chemical spill is too dangerous or toxic to handle with equipment on-site or if it appears to be dangerous, reactive, or unknown, contact the 24-Hour Spill Report Line (867-920-8130) for guidance and assistance.
7. If safe to do so, direct staff to take appropriate emergency environmental protection measures such as placing booms, barrier, or absorbent pads around the spill to prevent liquid escape into the environment or into surface water bodies. If necessary, create a ditch around the area of the spill or leak, or build a berm to minimize the movement of the spilled product.
8. Shut off all valves to utilities in the area, if they pose a potential risk to the spill clean-up personnel.
9. Block any sewers or drains in the area if they pose a potential risk to the spill clean-up personnel.
10. Place the spill clean-up material into an open top drum or lugger bin, including disposable PPE used in the spill clean-up.
11. Complete a *Spill Report Form* detailing the following:
    a. Amount of product spilled;
    b. Name of material spilled if it is known; if the material is unknown, indicate that it is unknown in the log;
    c. Person who noted the spill;
    d. Date and time of the spill;
    e. Estimated volume of spill clean-up material use; and
    f. Any other relevant details.
12. Forward the incident report/memo to the supervisor for review.
13. Supervisor will make arrangements for proper disposal of spill and spill clean-up material.
14. Attempt to determine the cause of the release and if there is a risk of a future release.
15. Assess and potentially upgrade the level of emergency, if necessary.

6.2 Incidental Discovery of Sensitive or Protected Species Contingency Plan

In the event that wildlife species of concern or their specific habitat are discovered on-site during construction, the following mitigation steps will occur:

1. Suspend work immediately in the vicinity of the newly discovered wildlife species of concern. Work may not resume until the measures below are complete.
2. Notify the Contractor, who will notify the Owner and/or their representative.
3. The Owner, engaging specialist advice as necessary, will assess the potential discovery and either allow construction to resume or proceed by notifying:
    a. Applicable government agencies, as required; and
    b. Wildlife Consultants (i.e., Dillon Consulting Limited).
4. The wildlife consultant may deem it necessary to visit the site to develop an appropriate mitigation plan. The mitigation measures available may include:
    - Abiding by seasonal timing constraints within the recommended set back distances;
    - Abiding by daily timing restrictions on construction activities;
    - Narrowing the proposed area of disturbance, and protect the site using fencing and signage;

- Altering or delaying construction activities to avoid sensory disturbance (e.g., avoid burning, loud noises, bright lights, etc.);
- Extending road or watercourse bores to avoid or minimize site-specific effect;
- Informing all users of access restrictions in the fenced sites;
- Altering the route to avoid the site;
- Installing nest boxes/platforms and/or replace/enhance habitat during reclamation or restoration; and
- Relocating nests, habitat features, or individuals if practical and monitor post-construction response.

The wildlife or wildlife habitat will be assessed based on the following criteria:

1. The location of the wildlife or wildlife habitat with respect to the proposed construction site;
2. The presence of topographic features or vegetation to effectively screen the wildlife or habitat from the construction activities;
3. The species critical timing restraints in relation to the timing of construction; and
4. The potential to alter construction activities to minimize or avoid sensory disturbance.

7.0 References

Delvin, M. 2018a. Phase I Environmental Site Assessment, New Waste Transfer Station, Iqaluit, NU. Prepared for City of Iqaluit, Project: New Waste Transfer Station, OTT-00248813-A0 by EXP Services Inc.

Delvin, M. 2018b. Phase II Environmental Site Assessment, New Waste Transfer Station, Iqaluit, NU. Prepared for City of Iqaluit, Project: New Waste Transfer Station, OTT-00248813-A0 by EXP Services Inc.

Ecological Framework of Canada. 2019. Ecoregions of Canada – Meta Incognita Peninsula. Retrieved from http://ecozones.ca/english/region/28.html (accessed 08.05.2019).

EXP Services Inc. (EXP). 2018. Physical and Biological Assessment, Proposed New Landfill Site, Iqaluit, NU. Prepared for City of Iqaluit, Project: New Landfill Site, OTT-00248813-A0 by EXP Services Inc.

Northwest Territories Regulations (Nunavut) (NWT Reg). 2006. Spill Contingency Planning and Reporting Regulations, NWT Reg (Nu) 068-93, Retrieved from https://www.canlii.org/en/nu/laws/regu/nwt-reg-nu-068-93/latest/nwt-reg-nu-068-93.html (accessed 08.05.2019).

Nunavut Parks. 2019. Sylvia Grinnell Territorial Park. Retrieved from https://nunavutparks.com/parks-special-places/sylvia-grinnell-territorial-park/ (accessed 08.05.2019).

Appendix A

Project Contact List

CITY OF IQALUIT – LANDFILL AND WASTE TRANSFER STATION — JANUARY 2020
Project Contacts List

CITY OF IQALUIT			
CONTACT	**PAGER #**	**WORK #**	**CELL #**
Dispatch	N/A	979-5650	-
Chief Administrative Officer	N/A	979-5666	222-2953
Director of Public Works and Engineering	N/A	975-8509	222-2965
Operations Superintendent, Public Works	N/A	979-5631	222-2956
Manager of Engineering (Vacant)	-	-	-
Utilidor Manager	N/A	979-5632	222-2966
Utilidor On-Call	32	N/A	222-3243
Garage/Roads Foreman	N/A	979-5668	N/A
Trucked Services Foreman	N/A	979-5612	222-2947
Owner's Third Party Representative- Dillon Consulting Limited, Calgary, AB (Keith Barnes)	-	(403) 215-8885 ext. 4310	(403) 827-6299

EMERGENCY SERVICES		
CONTACT	**WORK #**	**CELL #**
Dispatch	979-5650	-
Duty Officer (Fire/Ambulance)	979-4422	-
Fire Chief	979-5657	222-5073
Deputy Fire Chief	979-5650	222-2955
Deputy Fire Chief	979-5650	222-3981
Chief Municipal Enforcement Officer	979-5670	222-5521
RCMP	979-1111 979-0123	
GOVERNMENT RESOURCES- SPILL LINE		
24-Hour Spill Line	Telephone #	**(867) 920-8130**

EXTERNAL ASSISTANCE- GOVERNMENT RESOURCES	
DEPARTMENT	**CONTACT #**
Environmental Protection, Government of Nunavut	975-5900
Indian and Northern Affairs Canada, Nunavut District Manager	975-4295
Indian and Northern Affairs, Baffin Sub-District	975-4295
Environment and Climate Change Canada, Iqaluit	975-4636
Department of Fisheries and Oceans, Iqaluit	979-8000
Regional Public Health Officer, Government of Nunavut	979-7652

CONTRACTORS	CONTACT #
Baffin Building Systems	979-5903
Kudlik Construction Ltd	979-1166
Nunavut Excavating Ltd	975-3320

CONTRACTORS	CONTACT #
RL Hanson	979-6004
Tower Arctic Ltd.	979-6465
Qikiqtaaluk Environmental, Brossard, QC	(514) 940-3332
Nunatta Environmental	979-1488

Appendix B

Orders, Permits and Licenses
(to be added when available)

Appendix C

Erosion and Sediment Control Plan

DILLON CONSULTING

CITY OF IQALUIT

Erosion and Sediment Control Plan

Landfill and Waste Transfer Station

January 2020 | 19-9543 – Version 3.0

Table of Contents

Figures

1.0 Introduction

The City of Iqaluit (City) retained Dillon Consulting Limited (Dillon) to develop an Erosion and Sediment Control (ESC) Plan as a component of the Landfill and Waste Transfer Station Project (the Project). The Project involves the construction and subsequent operation of two new waste management facilities to serve municipal solid waste generators within the City; a Waste Transfer Station (WTS) and a Landfill. The construction component of the Project is scheduled to commence in 2020 with completion and facility commissioning in 2022. The two facilities are being developed with an anticipated 75 year operational life.

Consistent with the Nunavut geological context, it is acknowledged that site surficial soils and selected construction materials for the Project are primarily sands and gravels; thus, the potential for significant issues associated with sediment-laden runoff is limited. As a result, measures relevant to the soil conditions in Nunavut (versus locations with fine grained surficial soils) are highlighted in this document.

1.1 Purpose and Goal

Within the context of overlying EMP and EPP documents for the Project, the purpose of this ESC Plan is to provide recommendations for erosion and sediment control measures to be implemented by the City of Iqaluit during both the construction and operations/closure/post-closure phases of the Project.

The goal of the ESC Plan (a supporting component of both the construction and operations/ closure/post-closure EPPs) is to reduce the risk of sediment (from wind and water erosion) being transported off-site or into nearby water bodies, including the Sylvia Grinnell River.

1.2 Limitations

In recognition of the uncertainties related to soil types, water movement or weather that may be encountered during construction and operations/closure/post-closure activities, the Erosion and Sediment Control (ESC) Plan may change based on the observations of:

Construction Phase

- Construction Manager or Environmental Inspector (EI) and in consultation with the Project Environmental Lead.

Operations, Closure and Post-Closure Phase

- The City's Facility Manager in consultation with the Manager of Solid Waste and the Director of Public Works.

2.0 Project Components

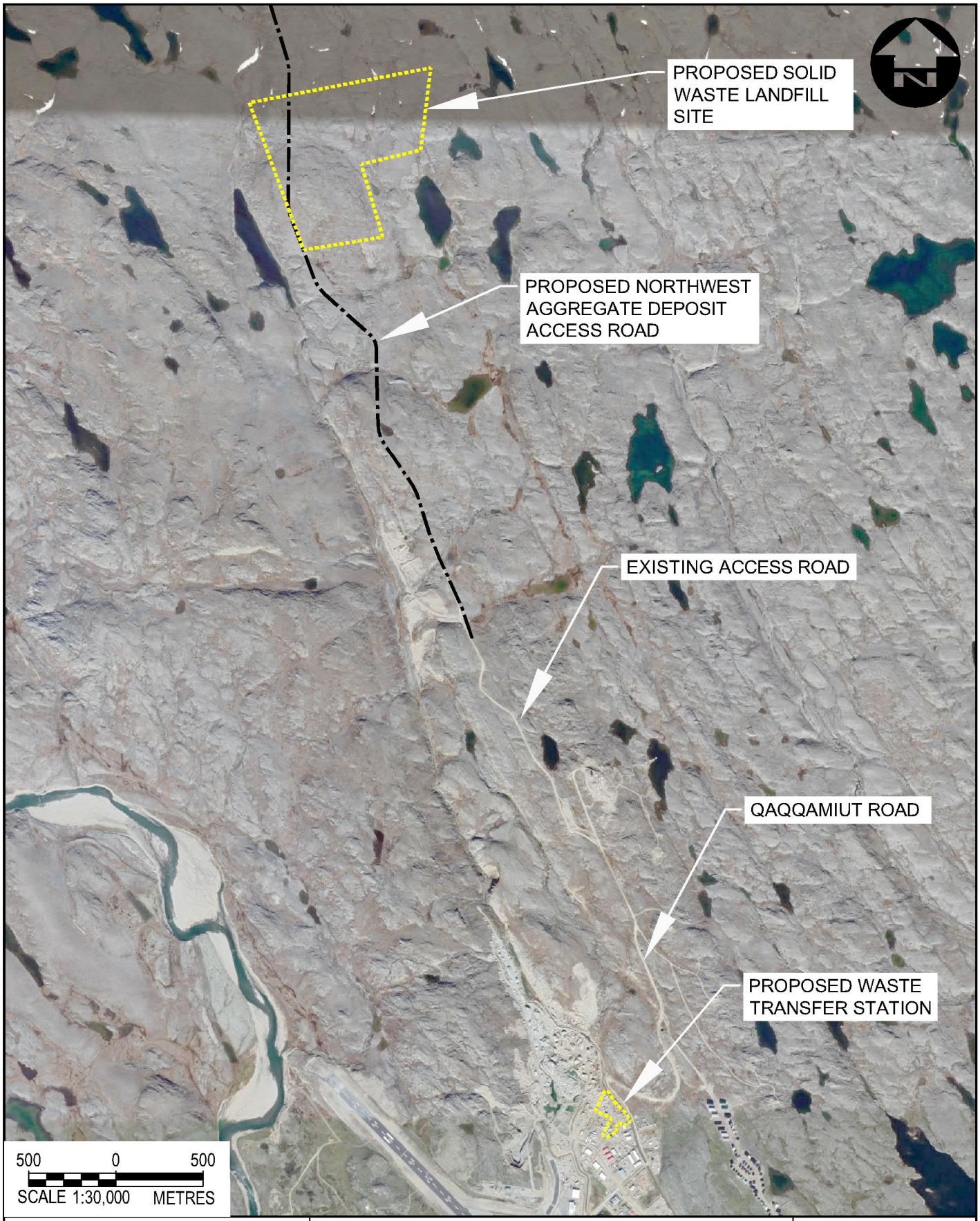
Figure 2-1 identifies the location of the two Project areas. The WTS and Landfill sites are shown in greater detail in **Figures 2-2** and **2-3** and are described in the following subsections.

2.1 Transfer Station

The WTS is located at the end of Kakivak Court in Iqaluit. The site occupies an area of approximately 2.4 ha and includes a fenced yard, transfer station, scale house, site office and exterior storage areas.

2.2 Landfill

The Landfill site is located approximately six kilometres northwest of the Iqaluit and occupies an approximate area of 22 ha. The landfill is comprised of site access roads, 12 lined waste disposal cells (developed in sequence), leachate collection and treatment infrastructure as well as an Attendant's Trailer.



DILLON CONSULTING

DATE: JANUARY 2020	PROJECT: IQALUIT LANDFILL & WASTE TRANSFER STATION EROSION & SEDIMENT CONTROL PLAN	PROJECT NO.: 19-9543
	TITLE: SITE LOCATIONS	FIGURE NO.: 2-1

FileName:c:\projectwise\working directory\projects 2019\50dbc\dms12727\1199543-02site-con-cover.dwg

N 7070938.495
E 522468.109
LAT. N63° 45' 54.98"
LONG. W68° 32' 40.05"

N 7070933.020
E 522493.659
LAT. N63° 45' 54.80"
LONG. W68° 32' 38.19"

N7070901.04
E522548.91

N7070857.94
E522613.96

30.44 BM

CONSTRUCTION AND DEMOLITION DEBRIS PAD

APPROX. TOE OF SLOPE

BALES TO LANDFILL

SLIDING GATE

SNOW STORAGE

CULVERT (2100x1500 CSPA)

CONSTRUCTION AND DEMOLITION DEBRIS SIGN

BALE STORAGE AREA

QAQQAMIUT ROAD

EXIST. DITCH

LIMIT OF SURVEY

N7070880.70
E522520.49

N 7070882.500
E 522518.704
LAT. N63° 45' 53.16"
LONG. W68° 32' 38.39"

GENERATOR PAD

OIL TANK PAD

TOE/TOP OF SLOPE

THERMOSYPHON MANIFOLD 2

N7070881.58
E522456.38

THERMOSYPHON MANIFOLD 1

N7070848.74
E522531.34

WASTE TRANSFER STATION
FIN. FLOOR ELEV. 28.40

ALL TRAFFIC LEFT SIGN

N7070821.38
E522519.03

PUBLIC DROP-OFF

PUSH WALL

N7070854.22
E522448.08

N7070829.72
E522500.50

STOP SIGN

N 7070808.996
E 522591.935
LAT. N63° 45' 50.77"
LONG. W68° 32' 31.08"

METALS/WHITE GOODS SIGN (1000x1000)

MISCELLANEOUS METALS/WHITE GOODS STORAGE PAD

TIRE STORAGE

TIRE SIGN (1000x1000)

N 7070784.282
E 522620.968
LAT. N63° 45' 49.32"
LONG. W68° 32' 28.98"

END OF LIFE VEHICLE AND MISCELLANEOUS METALS STORAGE

APPROX. PROPERTY LINE

HHW DEPOT

HH DEPOT SIGN (1000x1000)

USED OIL TANK

HHW STORAGE CONTAINERS (12.2m SHIPPING CONTAINERS-3 REQUIRED)

SITE OFFICE

SCALE HOUSE

SCALE ELEV. 28.30

ASPHALT RAMP (TYP.)

SLIDING GATE (2 REQUIRED)

BALER/LOADER

N 7070740.806
E 522579.802
LAT. N63° 45' 48.57"
LONG. W68° 32' 32.00"

REUSE CONTAINER

PERIMETER FENCE

PARKING AREA (6 SPACES)

1.0 c.m. BOULDER SPACED AT 5.0m (TYP.)

N 7070823.708
E 522416.445
LAT. N63° 45' 51.29"
LONG. W68° 32' 43.88"

N 7070782.672
E 522507.583
LAT. N63° 45' 49.94"
LONG. W68° 32' 37.25"

GREENHOUSE (FUTURE)

COMPOST PAD (FUTURE)

STOP SIGN

KAKIVAK COURT

N7070732.51
E522570.86

SNOW STORAGE

ROCK WALL

N 7070709.361
E 522543.694
LAT. N63° 45' 47.56"
LONG. W68° 32' 34.65"

AREA FOR POTENTIAL COMPOST AND BIO-MASS EQUIPMENT (FUTURE)

N 7070870.500
E 522480.004
LAT. N63° 45' 46.32"
LONG. W68° 32' 39.32"

N 7070884.449
E 522457.560
LAT. N63° 45' 46.78"
LONG. W68° 32' 40.95"

N7070900
N7070800
N7070700
E522400

SCALE 1:1,000 METRES

FileName:c:\projectwise\working directory\projects 2019\50dbc\dms12728\199543-02-site-con-wts-proposed.dwg

Iqaluit

DILLON CONSULTING

DATE JANUARY 2020

PROJECT IQALUIT LANDFILL & WASTE TRANSFER STATION
EROSION & SEDIMENT CONTROL PLAN

PROJECT NO. 19-9543

TITLE WTS SITE LAYOUT PLAN

FIGURE NO. 2-2

N 7076611.105
E 520430.739
LAT. N63° 48' 58.70"
LONG. W68° 35' 06.06"

N 7076811.317
E 521471.650
LAT. N63° 49' 04.94"
LONG. W68° 33' 49.85"

N 7076339.855
E 521413.790
LAT. N63° 48' 49.72"
LONG. W68° 33' 54.32"

N 7076258.454
E 521073.388
LAT. N63° 48' 47.17"
LONG. W68° 34' 19.25"

N 7075841.343
E 521196.851
LAT. N63° 48' 33.66"
LONG. W68° 34' 10.42"

N 7075766.976
E 520742.903
LAT. N63° 48' 31.36"
LONG. W68° 34' 43.64"

FUTURE CELL 1
FUTURE CELL 2
FUTURE CELL 3
FUTURE CELL 4
FUTURE CELL 5
FUTURE CELL 6
FUTURE CELL 7
FUTURE CELL 8
FUTURE CELL 9
FUTURE CELL 10
FUTURE CELL 11
FUTURE CELL 12

FUTURE PERIMETER ROAD
WEST PERIMETER ROAD
SOUTH PERIMETER ROAD
CELL 1 ROAD
ATTENDANT'S TRAILER
LEACHATE LAGOONS ROAD
LAGOON #1
LAGOON #2
LEVEL SPREADER
NEW ROAD TO NORTHWEST AGGREGATE DEPOSIT

BH-101
BH-102
BH-103
W-107 T-107
W-108 T-108
W-109 T-109
W-110 T-110
W-111 T-111

N7076500
N7076000
E520000
E520500
E521000
E521500
E522000

LEGEND:
- SITE PROPERTY BOUNDARY
- FUTURE ROAD
- 50m BUFFER
- BOULDER FIELD
- GLACIOFLUVIAL TERRACE
- GROUND WATER PONDING
- GROUND WATER FLOW
- BEDROCK OUTCROP
- BH-101 BOREHOLES
- T-108 THERMISTOR
- W-108 ACTIVE WATER MONITOR STATION
- DITCH FLOW DIRECTION
- DRAINAGE DITCH

100 0 100
SCALE 1:5,000 METRES

Iqaluit

DILLON CONSULTING

DATE JANUARY 2020

PROJECT IQALUIT LANDFILL & WASTE TRANSFER STATION
EROSION & SEDIMENT CONTROL PLAN

PROJECT NO. 19-9543

TITLE LANDFILL LAYOUT PLAN

FIGURE NO. 2-3

FileName:c:\projectwise\working directory\projects 2019\50ddbc\dms1272712-199543-02-site-con-proposed.dwg

3.0 Areas Susceptible to Erosion and Sedimentation

Areas susceptible to erosion expected throughout the Project area consist of slopes within and along site boundaries, areas stripped of vegetation, banks of water bodies, drainage swales and areas which require ground disturbance beyond basic grading (e.g., excavations) and constructed berms. Specific areas in which extra caution and care are required to minimize the potential for erosion are outlined below.

Waste Transfer Station

- Areas adjacent to the drainage ditch between the eastern property boundary and Qaqqamiut Road.

Landfill

- Existing streams, drainage swales and shallow ponds (flowing north to south), with discharge to Carney Creek.
- Constructed berms for the landfill and leachate treatment infrastructure.
- Capped surfaces of completed portions of the landfill.

Mitigation measures and guidelines described in the sections below are intended to address these areas with a greater risk of erosion and sedimentation.

4.0 Site Specific Mitigation Measures

4.1 Erosion and Sediment Control Best Management Practices

As detailed in their respective EPPs, a range of best management practices (BMPs) can be implemented to minimize erosion and the mobilization of sediments during both Construction and Operations, Closure and Post-Closure Phases. The use of adequate erosion and sediment control measures will prevent or reduce the potential of sediment transport both on- and off-site. The key to controlling potential erosion and sedimentation caused by site activities is to stabilize surfaces and control site runoff of surface waters. A wide variety of sediment control devices can be used on site with a selection of options being described in this section.

An additional reference for potential use to mitigate erosion impacts associated with the Iqaluit solid waste management project is *Government of the Northwest Territories Department of Transportation – Erosion and Sediment Control Manual* (January 2013). This manual provides guidelines for analysis, design, construction, and maintenance of erosion and sediment control systems for transportation construction projects in the Northwest Territories (NWT), but can be selectively applied (acknowledging the "Arctic Lowland" soils context of the project site) to construction and related activities in Nunavut. Notably, the manual includes a number of Best Management Practice (BMP) summary sheets, incorporating concise descriptions of construction and maintenance requirements as well as installation details.

4.2 Erosion and Sediment Control Feature Installation Locations – Construction Phase

Recommended locations for specific erosion and sediment control features to be established during the initial Construction Phase to establish the Landfill and WTS are presented on two sheets included on the original project tendering package; LF-C03 and WTS-C03. Potentially, at the discretion of the City and depending on observed site conditions, a selection of these management feature locations could be maintained going forward into the Operations Phase. Further, depending on future site conditions and the details of requited decommissioning activities, erosion and sediment control practices presented in this document could be incorporated into Closure and Post-Closure activities.

4.3 Surface Water Mitigation Measures and Best Management Practices

To prevent impacts to surface water resources at both the Landfill and WTS sites during the Project activities, the following BMPs should be implemented:

- Should there be overlap between site waterbodies and proposed work or access areas, retain existing riparian habitat along the waterbody where possible;
- Implement proven surface water management procedures at areas deemed susceptible to erosion, including:
  - Controlled collection/direction of surface runoff.
  - Minimization of exposed areas.

  - Project activity timing (e.g., avoidance of storm events).
  - Application of surficial stabilization measures.
  - Surface roughening.
  - Granular material stockpile control (e.g., limiting extend/number and maintain setback distance from sensitive receptors).
- Implement dust control measures to reduce the potential for dust accumulation in and around surface waters. The Project Authority (consistent with the applicable EPP as well as the Facility Operations and Maintenance Manual) should recommend the implementation of dust control measures, should it be observed that dry conditions are resulting in the airborne mobilization of fine soil particles.

The recommended BMPs that are to be employed as part of this ESC Plan include those that will be used to control surface flows from rain events and/or snowmelt which have the potential to result in erosion and ultimately sediment transport. A combination of BMPs, structural or procedural, will be implemented at each of the sites to provide the necessary level of erosion and sediment control.

Design considerations, guidelines, and procedures for the installation or implementation of BMPs are summarized below. For ease of reference, the recommended BMPs are separated into erosion control and sediment control measures.

4.4 Erosion Control Practices

Erosion prevention (source control) is essential and is the most effective method in protecting downstream/receiving aquatic habitat during the construction and operational activities. Erosion control typically includes two categories of action:

- Source Control practices.
  - Protection of exposed surfaces using cover materials
- Runoff Control practices.
  - Modification of slope surfaces
  - Reduction of slope gradients
  - Control of flow velocity
  - Flow diversion
  - Upstream runoff storage

4.4.1 Source Control Practices

Riprap Armouring

- Typical for channel lining with a geotextile underlay.
- Effective for high velocities and flows.

Rolled Erosion Control Products (RECP)
- Provides a protective covering over bare surfaces.
- Not suitable for rocky surfaces.

4.4.2 Runoff Control

Slope Texturing*
- Contouring/roughening of slope using tracked equipment.
- Reduces runoff velocity and increases infiltration.

**: generally not suitable for permafrost areas.*

Offtake Ditch
- Collects and diverts sheet flow at the top of a slope to mitigated downslope erosion.

Energy Dissipater
- Reduces runoff velocity and dissipates flow energy allowing the collection of sediment.

Slope Drains
- Direction of runoff into a pipe or lined channel.

Gabions
- Durable, suitable for resisting high flow velocities.

Rock Check Dams
- Permanent flow drop structure providing a degree sediment filtering.

Synthetic Permeable Barriers
- Reusable barriers that reduce flow velocities and provide a degree sediment filtering.

Fibre Rolls
- Effective in sheet flow conditions to reduce flow velocities.

4.5 Sediment Control Measures

Sediment control measures reduce off-site sedimentation by promoting the release of suspended soil particles from runoff prior to discharge from the construction or operational area. Sediment control typically includes two categories of action:
- Filter and Entrapment Practices.*
  - Filtering through a porous media
  - Entrapment using silt fences or course-material check dams
- Impoundment Practices.*
  - Sediment basins or traps
  - Temporary impoundment barriers

**: Permanent basins and traps should be avoided in areas of permafrost as ponding of water will contribute to increased rates of permafrost melt or degradation.*

4.5.1 Filter and Entrapment

Fibre Rolls
- Good performance in freeze/thaw conditions.

Silt Bags
- Typically applicable in emergency situations only.

Silt Fence
- Effective in settling out coarse grained sediments.

Berm Interceptor
- Basic construction requirements.

Gabions
- Durable, suitable for resisting high flow velocities.

Rock Check Dam
- Permanent flow drop structure providing a degree sediment filtering.

Synthetic Permeable Barriers
- Reusable barriers that reduce flow velocities and provide a degree sediment filtering.

4.5.2 Impoundment

Sediment Traps/Basins
- Can be constructed from a range of materials, typically requires a large construction area and significant maintenance requirements.

5.0 Monitoring

Monitoring of erosion and sediment controls at work sites will be conducted once every two days during construction and clean-up to ensure controls are effective and are maintained in working order. It is anticipated that monitoring efforts will be increased to daily during periods of precipitation and that ESC measures will be repaired in a timely manner as needed to ensure the proper function of controls. Failed erosion and sediment control measures will be repaired as soon as possible. Erosion and sediment control measures are not static and may need to be upgraded and/or amended as site conditions change, as directed by the Construction Manager upon the recommendation of the EI.

Erosion and sediment controls left in place following the completion of construction and clean-up activities will be monitored via landfill staff conducted every two weeks. Failed erosion and sediment control measures will be repaired as soon as possible.