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EROSION AND SEDIMENT CONTROL PLAN

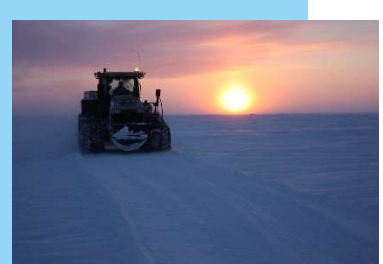
Arctic Bay Harbour Development

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Author :

François Bourassa

Project Manager, Pilitak Enterprises Ltd



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Review :

Jean-Marc Ballard

Environmental Monitor, JMB Consultant

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List of abbreviations

Abbreviation	Full Name
DFO	Fisheries and Oceans Canada
EM	Environmental Monitor
ESC	Erosion and sediment control
NWB	Nunavut Water Board
NTU	Nephelometric Turbidity Unit
PEL	Pilitak Enterprises Ltd
PSPC	Public Services and Procurement Canada
SCH	Small Craft Harbour
TSS	Total suspended solids

1. INTRODUCTION

The purpose of this document is to present the Erosion and sediment Control (ESC) Plan employed to control site runoff and to prevent and mitigate erosion and sedimentation during the construction of the new harbour in Arctic Bay, Nunavut. In-water construction activities have the potential to temporarily affect marine water quality and increase turbidity and total suspended sediment (TSS) in the harbour. Dredging and the placement of materials can also result in the resuspension of sediment.

The construction project was awarded to Pilitak Enterprises Ltd (PEL) in February 2026 by Public Services and Procurement Canada (PSPC) for the Department of Fisheries and Ocean (DFO). At the end of August 2026, heavy equipment, camp facilities and material will be delivered by sealift to Arctic Bay. The project consists mainly of the construction of a new breakwater with fixed wharf, a boat launch ramp, small craft floating docks laydown area and lighting. The new marine infrastructure will be constructed during the summers of 2027, 2028 and 2029 while preparation work will be carried out during the fall of 2026.

This ESC Plan includes the identification of the activities that are susceptible to generate erosion and/or sedimentation, the mitigation measures, the description of the protection equipment to be used and the monitoring and reporting. This ESC Plan is part of the environmental management and mitigation measures that are being implemented to protect the environment during construction. These measures will help maintain compliance with the Federal Fisheries Act, especially Sections 34 to 36 of the Act, which prohibits any activities, other than fishing, that results in the death of fish, including the deposition of deleterious substances into waterbodies frequented by fish.

1.1 ADDITIONAL DOCUMENTATION

The latest version of the following documents, which have been issued for the current project, must be used in conjunction with the present plan:

Document	Current Revision
Contract specifications and drawings	Issued for tender
Construction Environmental Management Plan (CEMP)	Rev. 2
Contractor Construction Environment Protection Management Plan CCEMP	Rev-01
Traffic Management Plan	Rev-01
Spill Prevention and Response Plan	Rev-01
Quarry Blasting and Management Plan	Rev-00
Health and safety and Emergency Response Plan	Rev-00
Archeological Resource Discovery Plan	Rev-00
Wildlife Protection and Monitoring Plan	Rev-00

The conditions of the following licences and permits issued for this project shall be complied with:

Permit/licence	
Nunavut Planning Commission (NPC)	No. 149437
Nunavut Impact Review Board (NIRB)	No. 21UN004
Nunavut Water Board (NWB)	8BCABH2125
Fisheries Act Authorization (FAA)	20-HCAA-00155
Environment and Climate Change Canada (ECCC)	PNR-00214-1
Transport Canada (TC)	2021-603772
Natural Resources Canada (NR Can)	To be issued

1.2 OBJECTIVE AND DEFINITIONS

Erosion and sedimentation are natural processes of loosening and transporting soil through the action of wind, water, and the subsequent movement and deposition of sediment particles. Construction activities can result in increased erosion and sedimentation. The dredging activities will generate important volume runoff water which will require appropriate mitigation measures.

The importance of erosion and sedimentation control is primarily to reduce the potential impact that erosion has on watercourses. Soil consists of many components, the majority of which are organic material, sand, silt and clay. It is the silt and clay that are the most damaging to watercourses as they are comprised of small particles that can be carried for long distances while suspended in water. Small silt and clay particles can cloud the water making it difficult for fish to find food, and also block sunlight reaching aquatic plants. When small silt and clay particles settle on the bottom, they can smother fish and amphibian eggs. There is an added risk that eroded soil may carry hard metals, traces of petroleum product or other pollutants from land into a watercourse. The effects of sedimentation in watercourses can be profound enough to be considered deleterious (harmful or damaging) to fish.

Erosion

Occurs when energy (water in this case) applied to a soil surface is sufficient to cause the detachment, suspension and transfer of soil particles from a stable mass. The objective is to reduce the water flow that could loosen the soil particles.

Sedimentation

The process whereby the energy of water carrying soil particles is reduced down to the point that those suspended particles are allowed to settle out and be deposited, creating a build-up of sediment at that location. The objective is to create a sedimentation low point to reduce energy and deposit all the size particles before they enters any water bodies, rivers and streams.

Deleterious

The federal Fisheries Act defines it as “Any substance that, if added to water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use of by man of fish that frequent that water” (Canadian Fisheries Act).

Wind can be a mechanism of erosion, particularly for dry, finely textured soils with low organic content that is exposed by construction activities. Wind erosion can influence air quality on the project site and be a source of sediment for water bodies. Areas of potential wind erosion are mainly roads and stockpiles.

1.3 EXISTING SURFACE AND VEGETATION CONDITIONS

Arctic Bay is in the northern part of the Borden Peninsula on Baffin Island. The community faces southeast into Arctic Bay that in turn faces southwest to Adams Sound, which feeds into Admiralty Inlet to the west, draining northwards to Lancaster Sound and the Northwest Passage. The region is characterized by mountains and valleys, which have either been carved out by

glaciers and/or intruded by diabase dykes. Valley walls and cliffs are dominated by individual and coalescing rock fall talus cones and boulder tongues, with very steep rock walls at the top, becoming gentler due to the accumulation of talus nearer the base.

Drainage is controlled by valleys that also include lakes that supply the community with drinking water. There are several small streams, which flow through and/or around the community into the bay during the summer.

Vegetation in the Arctic Bay area is characteristic of High Arctic tundra ecosystems on northern Baffin Island. Plant cover is generally sparse and low-growing, consisting primarily of mosses, lichens, sedges, grasses, and dwarf shrubs adapted to cold, dry, windswept conditions and continuous permafrost. Vegetation is discontinuous over exposed bedrock and rocky uplands, with greater density occurring in sheltered valleys, coastal lowlands, seepage areas, and seasonal drainage channels

According to the geotechnical report issued for this project, at the SCH, the encountered subsurface conditions onshore typically consisted of gravelly sand/sandy gravel above the high tide level, overlying till (gravelly clay/ clayey gravel). In the marine area the subsurface conditions typically consisted of loose to dense silty sand overlying at locations soft silty sandy clay, overlying stiff to very stiff sandy silty clay/compact to dense sand (of glacial origin), overlying shale bedrock.

At the future quarry, the encountered subsurface conditions included 1.6 to 2.8 m of colluvium / frost shattered bedrock, overlying diorite bedrock.

2. EROSION RISKS IDENTIFICATION AND MITIGATION MEASURES

This section describes the risks and outlines the mitigation measures. The following construction activities have been identified as operations that could potentially cause erosion and sedimentation.

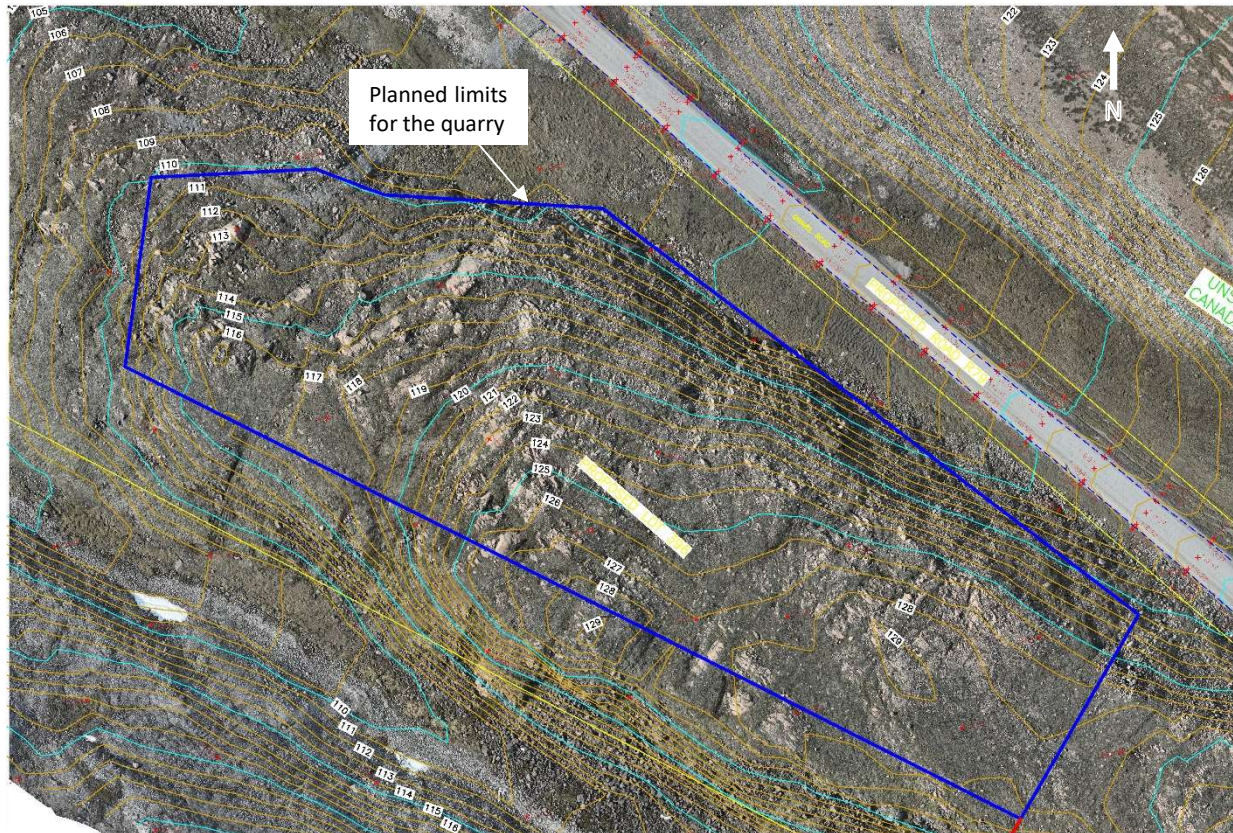
- Quarrying (drilling, blasting, excavation)
- Rock and material processing
- Material stockpiles
- Haul road
- Breakwater and laydown construction
- Dredging and disposal of dredged material
- Culvert installation

2.1 QUARRY AND PROCESSING ACTIVITIES

For the construction of the breakwater, a significant quantity of rock will need to be blasted and processed from the new quarry to be developed. The proposed quarry is located approximately 1.5 kilometres northwest of the SHC site, on the west side of the road leading to Victor Bay. Within the proposed quarry limits, the rock outcrop has a base elevation of approximately 109 m and reaches a maximum elevation of about 133 m at its highest point.

We intend to develop the quarry on the northeastern half of the outcrop, starting from the northern end, as shown in **Figure 2.1.1**. The rock extracted from the quarry will be processed on the flat area located approximately 200 m to the north.

The natural drainage paths in the surrounding of the quarry area are indicated in the **Figure 2.1.2**. The surface water in the vicinity of the quarry flow mainly to the north – northwest, to reach out the Alternate Water Supply Lake, located about 600 m downgradient. The water surface elevation of the lake is approximately 76 m, while the quarry floor will be at an elevation of ± 110 m, representing an average slope of approximately 6% from the quarry toward the lake. The terrain between the quarry and the lake is mainly covered with tundra and rocks.

Figure 2.1.1: Quarry development plan

As indicated in **Figure 2.1.2**, runoff from the quarry and the processing area will discharge into existing drainage paths leading to the Alternate Water Supply Lake. To mitigate the potential migration of fine materials into the drainage system, silt fences and catch basins will be installed. Their exact locations will be determined once on site. A culvert will also be installed across the quarry access road to be constructed, as shown in **Figure 2.1.3**.

It is expected that no runoff originating from the quarry or the processing area will reach the Dead Dog's Lake.

Figure 2.1.2: Drainage path in the quarry area

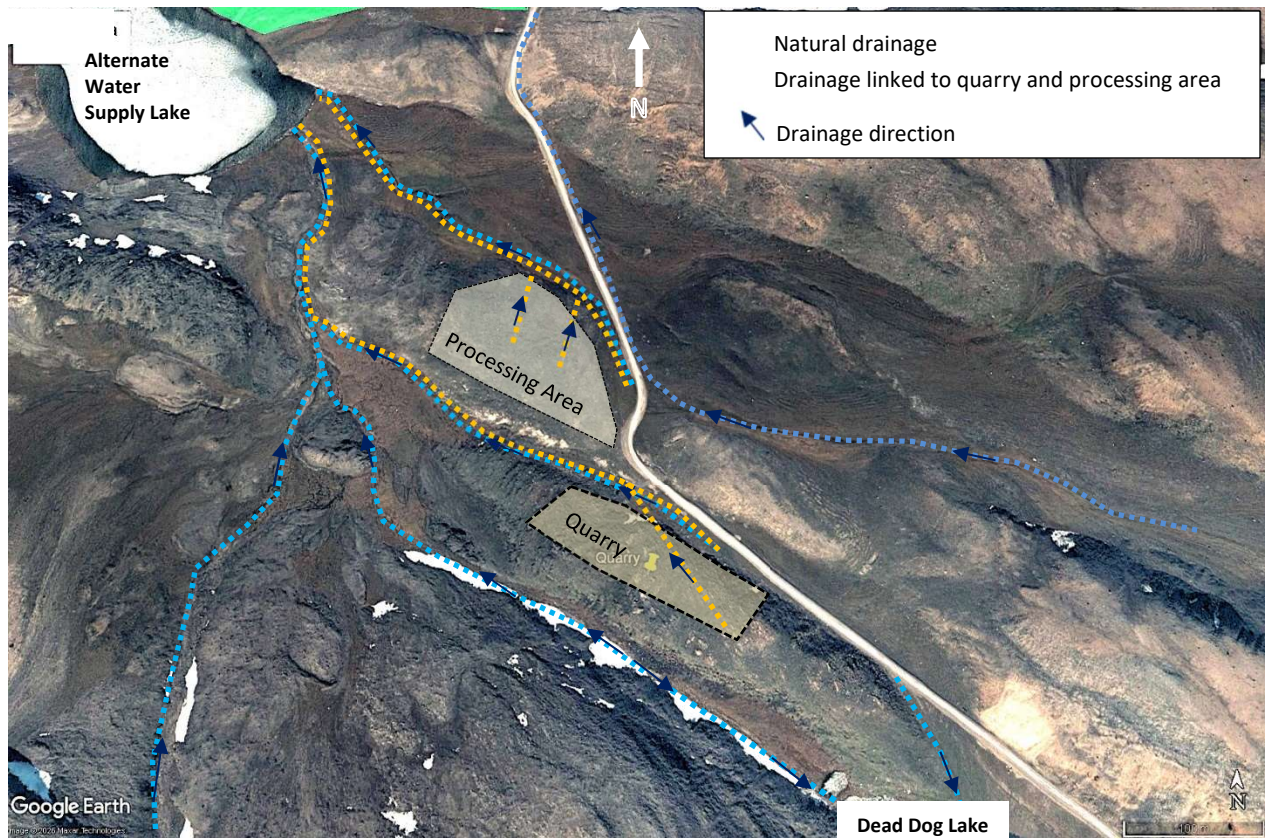


Figure 2.1.3 : Culvert to be added



2.2 STOCKPILES

Rock of the appropriate size for Armour Stone Type 1 will be separated in the quarry and stockpiled in rows along the haul road. This operation is not expected to generate erosion or sedimentation. However, if fines or runoff are observed, appropriate control measures will be implemented. The blasted rock extracted from the quarry will be transported to the processing area, where it will be sorted, blended, or crushed to produce the different types of material required for the project. The fine material from the blasted rock will be screened and/or crushed to meet the gradation requirements for the other types of material required for the project and will be stockpiled within the processing area. Silt fences will be installed on the downgradient side of the fine material stockpiles to prevent the migration of fine materials into the natural drainage pathways within the area.

The limits of the processing area, as well as the stockpile areas, will be identified and flagged. No work shall be carried out outside these areas unless approved by the Environmental Monitor (EM).

2.3 HAUL ROAD

The existing roads will be used for the transportation of the rocks and granular material required for the construction of the breakwaters and other features of the new harbour. The total drive distance between the quarry and the construction site is about 1.5 kilometers. With the exception of two pull-over areas, no major road upgrades are planned. The existing roadside drainage will not be modified. The haul roads will be frequently graded to maintain them in good condition. Additional crushed gravel may be added to sections of the road where needed. If signs of erosion related to hauling activities are observed, appropriate corrective measures will be implemented. Silt fences and erosion control measures will be installed in areas where corrective work is carried out.

Figure 2.3.1: Haul road from the quarry to the construction site

2.4 BREAKWATER AND LAYDOWN CONSTRUCTION

The breakwater and laydown construction involves the placement of large quantities of rock and granular material at various depths in the water. Even though the materials to be used for the construction of the breakwater and the laydown contain little to no fine material, their placement could generate suspended solids originating from the seabed and from residual fines present on the rocks.

For the construction of the breakwater, the core material will be dumped and pushed into place, while the armour stone will be placed using an excavator or a crane equipped with a clamshell bucket. Even when placed carefully, these operations will disturb the seafloor and may temporarily increase water turbidity.

A perimeter berm will be constructed up of the existing breakwater material to prevent the migration of the fines during the placement of dredged material for the construction of the laydown.

These activities will be monitored by the EM. Ocean water quality will be monitored as described in Section 4. The material placement methods may be adjusted, if required, to mitigate environmental impacts.

2.5 DREDGING AND DISPOSAL OF DREDGED MATERIAL

The dredging of the zones B, C and D will be carried out during the 2027-2028 construction seasons. These 3 areas will be dredged using a dredging crane mounted on a barge and equipped with a clamshell bucket. The excavated material will be loaded onto scows with a capacity of 100 m³, transported to the area designated for disposal at sea, and dumped into the water via the opening of the bottom doors. Obviously, this operation cannot be carried out without releasing sediments into the water, as it involves excavating the existing seabed and disposing of the excavated material at sea. However, the following precautions, where feasible, can help reduce the dispersion of sediment:

- Maintain appropriate fill levels to ensure proper bucket closure.
- Raise the bucket slowly and steadily to minimize turbulence and the resuspension of fine sediments.
- Avoid dragging the bucket along the seabed. Vertical extraction reduces disturbance of surrounding sediments.
- Avoid carrying dredging operations during rough sea conditions.
- Ensure the scows are properly sealed and maintained to prevent leakage of sediment-laden water during transport.
- Avoid Overfilling the scow. Maintain sufficient freeboard to prevent overflow caused by wave action, vessel movement, or loading operations.
- Visually inspected for foreign debris, which will be removed and hauled to an appropriate waste facility.
- Optimize transport routes and scheduling to reduce the duration of sediment disturbance and the potential for leakage.
- Avoid transport and disposal operations during rough seas, high winds, or strong currents that could increase turbidity and accidental release.

Dredging of Zone A will take place during the 2028 construction season. A floating silt curtain could be installed to minimize the migration of fines beyond the work area. Its use will depend on the prevailing ocean conditions during construction and on whether access to the area must be maintained for local boat users. Whether a silt curtain is installed or not, turbidity monitoring will be conducted to ensure that the established thresholds are not exceeded.

Dredging of the Zone A will be done using a long-reach excavator via temporary access roads built perpendicular to the shoreline. The temporary roads will be built with material containing no fines. With the help of a long-reach excavator, the seabed will be excavated down to the specified grades and loaded into dump trucks. The excavated material will be transported by dump trucks to the dumping site, where it will be spread out. This dumping site consists of the southern end of the existing harbour, which will be enclosed by a rock and geotextile berm. According to the design, the entire area will be filled with material excavated from Zone A.

This operation cannot be carried out without releasing sediments into the water, as it involves excavating the existing seabed. However, the following precautions, where feasible, can help reduce the dispersion of sediment:

- Carry out this operation after the breakwater has been constructed. The breakwater will protect the work area from wave action.
- Prepared adequately the dumping site.
- Do not overload the truck boxes to avoid spillage.
- Avoid working during high wind and strong currents conditions.
- Install a floating silt curtain, if possible, to isolate the dredging area.

2.6 CULVERTS INSTALLATION AND NEW DRAINAGE DITCH

Along the SCH shoreline there are seven existing culverts that drain into the bay. The project design redirects these culverts around the harbour with a series of ditches and new culverts to manage discharge. This is required to reduce sediment accumulation within the harbour and prevent future maintenance dredging.

The project scope includes the replacement of one culvert through the existing road and the installation of 2 additional culverts. The culverts will be installed according to design specifications and approved typical shop drawings. The following precautions will be taken during the installation and replacement of the culverts:

- Schedule the work during low-flow periods and favorable weather conditions.
- Where possible, retain or divert the water while installing the culvert.
- Install silt curtains and or sediment traps downstream of the work area.
- Stabilize exposed soils and banks as soon as possible using rip rap.
- Restrict machinery movement within the watercourse and use designated access points to minimize bed and bank disturbance.
- Keep excavated materials at a safe distance from the waterbody to prevent accidental releases.

The new ditches and swales will be lined with filter rock as they are constructed to prevent erosion and scour of the excavated surfaces.

Figure 2.6.1: New culvert to be installed under the breakwater access road



Figure 2.6.2: Culvert replacement under the existing road and new culvert to be added

According to Water Licence No. 8BC-ABH2125 issued for this project by the Nunavut Water Board, "in-stream activities are prohibited during fish migration." This condition applies to fish-bearing watercourses. The drainage channels where the culverts will be installed are not expected to be fish-bearing. The Environmental Monitor (EM) will verify the presence or absence of fish prior to the commencement of the works.

3. EROSION PROTECTION DEVICES AND METHODS

Sediment control measures, as silt fences, are employed only as a second line of defense. These controls are designed to slow the flow of water and allow sediment particles to settle out when primary erosion control measures are unable to fully prevent their transport. Sediment fences do not “filter” the water; rather, they are intended to reduce water velocity and allow fine soil particles or other potentially deleterious materials to settle behind them. Additional sediment control measures will be implemented where necessary and feasible, including the installation of floating silt curtains in marine environments, as well as the use of culverts, ditches, berm construction, embankment works, and grading of the working surface.

The erosion and protection devices will be stored nearby the site office. Their installation will be done under the supervision of the EM.

3.1 SILT FENCES

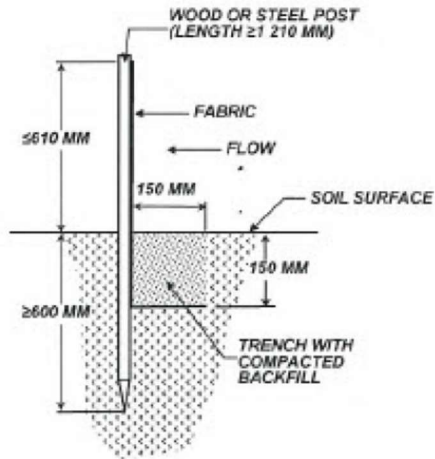
Silt fences are made with permeable geotextile fabric installed vertically and supported by posts with the bottom of the fabric buried in a trench. They are designed to prevent transport of sediment off site. It acts as an above ground settling pond to provide an area of catchment where water can remain still and allow sediment to settle out. Sediment fencing requires frequent monitoring and maintenance to remain effective.

Application

- Flat Ground
- Anywhere low flow runoff and retention of sediment are a concern
- Sloping Ground
- Stockpiles
- Ditches

Implementation

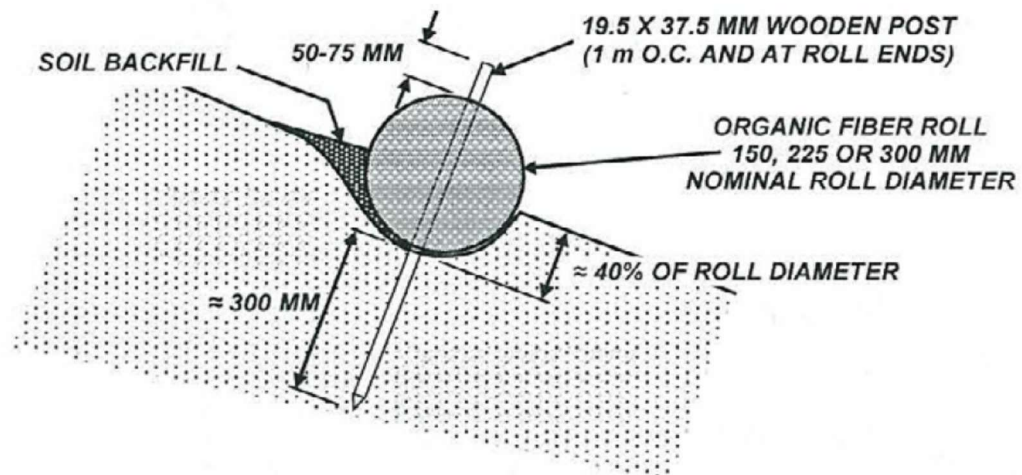
It is important to note that the correct installation of this sediment control measure is crucial to its effectiveness and the level of maintenance it will require. It should be installed downslope from construction activities, and used with other control measures (such as straw wattles/roles, or sediment catch basin). Silt fences should follow the contour of the slope with sides going upslope making the shape of a “U” to trap water. The amount of joints in the fabric should be minimized. Regular inspections of the fence should occur, especially after rain events.



3.2 ORGANIC FIBRES ROLLS

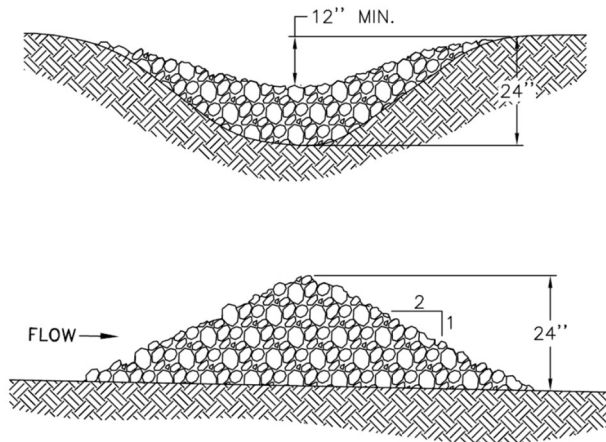
Organic fibres (straw) are encased in a photodegradable plastic net casing that form a roll used primarily for erosion control but also for sediment control as a secondary use. Installed perpendicularly across a slope it reduces erosion by shortening the slope length and by providing grade breaks. They are also effective at slowing flow velocity of overland flow and retaining sediment that accumulates behind the roll instead of migrating down slope.

Organic fibre rolls will be used where slopes are steeper, where the surface has been disturbed and at a risk of erosion. The rolls cannot be installed across ditches, swales or natural water flow paths.



3.3 CHECK DAMS

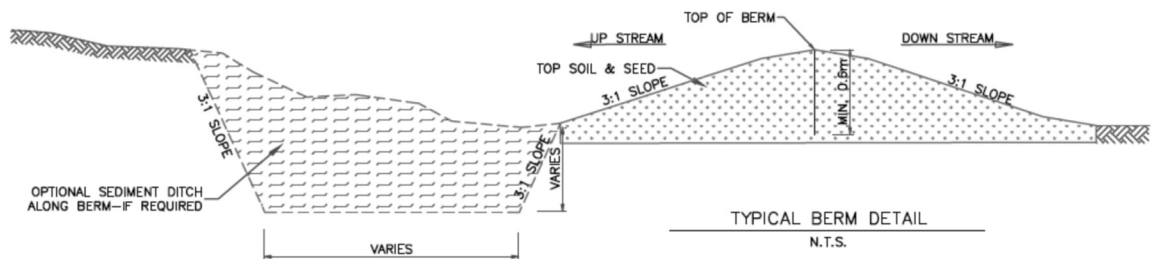
A check dam is a small barrier or dam constructed across a swale, drainage ditch or other area of concentrated flow for the purpose of reducing channel erosion. Channel erosion is reduced because check dams flatten the gradient of the flow channel and slow the velocity of channel flow. Most check dams are constructed of rock, but hay bales, logs and other materials may be acceptable.



Typical rock check dam

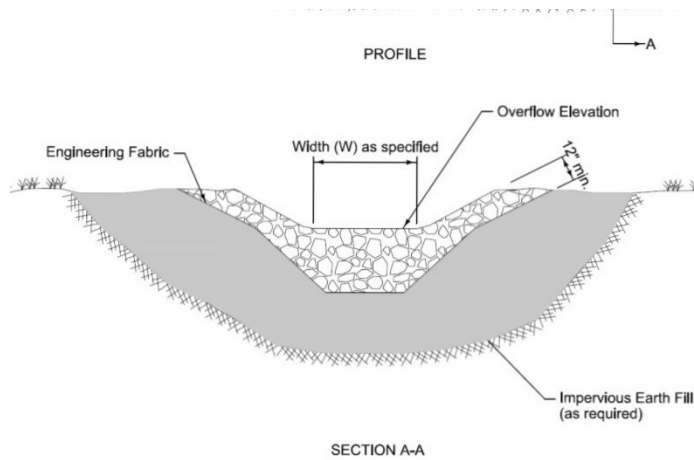
3.4 DITCHING AND BERMS

Ditching and berms will be mainly used at the dredged spoil disposal area in order to manage the water runoff from the saturated soils. Berms will be constructed with available material and compacted. Ditches will be dug and collected to catchment basins where fine sediment will settle downwards.



3.5 CATCHMENT BASINS

Catchment basins will be installed to collect the sediments from the drainage ditches before they reach out to the existing water courses. The basin sizes will be adjusted to the area drained by the ditches. Each basin will be excavated, lined with geotextile and protected with clear stones.



3.6 FLOATING SILT CURTAINS

The floating silt curtains are designed to help prevent particulate materials from leaving the immediate area of construction in the water. Type 2 silt curtains for moderate current conditions will be available for works to be carried out at the harbour site.

4. MONITORING AND REPORTING

Monitoring, inspection and adaptive management are necessary to ensure the effectiveness of this plan. It provides confirmation of proper implementation and effectiveness of erosion and sediment control measures. The effects of wet weather during construction activities can have a significant impact on ground conditions and can change otherwise stable soils into soils that are affected by erosion and sedimentation. Freeze thaw cycles at the beginning and at the end of construction seasons can also expose stable soils to an unstable condition overnight and throughout the day.

4.1 EROSION AND SEDIMENT CONTROL MONITORING AND MAINTENANCE

Monitoring will take place until the concern of erosion and sedimentation no longer exists. It is the duty of the EM to ensure that the erosion and sediment control measures are properly installed, well maintained and functioning as intended. However, it is the responsibility of everyone to report any ineffective erosion and sedimentation control measures or those in need of repair. The inspection of the erosion and sediment control measures will be part of the EM daily routine. These inspections and repairs will be reported.

4.2 WATER QUALITY MONITORING

Marine and land construction activities will be monitored for their potential impact on water quality and marine habitat.

4.2.1 Surface water

The EM will be monitoring all surface runoff or discharges impacted by construction activities associated with the Project, where flow may directly or indirectly enter Water. The EM will perform daily visual inspections to make sure that land-based activities do not result in sediment or other deleterious substances entering aquatic environments (freshwater, marine). The EM will implement adequate silt and erosion protection measures and will be in charge of verifying their effectiveness and their maintenance.

According to the project's Water Licence, *"all surface runoff or discharges impacted by construction activities associated with the Project, where flow may directly or indirectly enter Water, shall not exceed the following effluent quality limits"*:

Parameter	Maximum Average Concentration (mg/L)	Maximum Concentration of Any Grab Sample (mg/L)
Total Suspended Solids	50.0	100

Oil and Grease	No visible sheen	No visible sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

Measures to control sedimentation and erosion will be installed at the start of the project in areas where construction activities could impact water quality. The exact locations of these measures will be determined in summer 2026. Depending on the progress of the project, additional measures may be added.

The EM will monitor the surface runoff from the quarry area, the processing area and the construction site. Particular attention will be given to the inflow to the Alternate Water Supply Lake located downgradient from the quarry and the processing area.

Surface water is transiting on the SCH construction site by the existing culvert and drainage pattern. The quality of the surface water flowing from upstream of the construction site could be affected by activities unrelated to the construction project. Monitoring points will be set up upstream and downstream of the site to establish whether project activities are impacting the quality of the surface water.

The TSS measurements will be conducted on site with a Hatch portable meter HATSSMETER that measures turbidity and the total suspended solids. The respective range of the probe for TSS and turbidity are between 0.001 to 400 g/L and 0.001 to 9999 FNU. The pH values will be measured with a Hanna HI98127 pH meter. All measurements will be included within the daily environmental reporting.

The exact control points will be established during the Summer / Fall 2026. Updated/ revised plans will be shared with regulators, as necessary.

4.2.2 Marine environment

Some project activities include in-water work, such as filling and dredging. These activities could generate fine particles that affect water turbidity. As per the Fisheries Act Authorization issued for the current project, *“Turbidity sampling shall be taken outside the work area and is not to exceed turbidity levels as per the Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life for the duration of the in-water works including but not limited to dredging, disposal at sea, and rock placement”*.

These quality guidelines stipulate that:

- 1- *“Turbidity (NTU) Allowance Over Background (“Induced” Turbidity): Maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period).*

- 2- *Maximum average increase of 2 NTUs from background levels for a longer-term exposure (e.g., 30-d period) in all waters during clear flow.*
- 3- *Maximum increase of 8 NTUs from background levels at any one-time when background the floating levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is >80 NTUs for high flow or turbid waters.*

Two Aqua-Troll 500 real-time turbidity measurement devices mounted on a rugged buoy will be installed in the ocean outside the work areas to monitor variations in turbidity. The devices will be installed before the start of the construction activities in order to determine the background turbidity level. The system will send real-time turbidity measurements via the Vulink cellular network. One buoy will be installed outside the area designated for sea disposal, while the other will be installed outside the new harbour construction site. The proposed locations are presented in **Figure 4.2.2**. The exact locations will be determined on site. Manual turbidity measurements will also be performed when a sediment plume is observed. All data will be recorded on the *Hydrovu* platform and summarized in the daily environmental report.

Figure 4.2.2: Turbidity Monitoring Point T1 and T2

The variation of the turbidity will be monitored at the two control points T1 and T2 to determine if the short- and long-term criteria are exceeded. If a turbidity variation of over 8 NTU is observed within 24 hours and this increase can be directly attributed to construction activities, the construction methodology will be reviewed with the site superintendent to reduce the impact on water turbidity. The long-term exposure criterion will be evaluated over a period of 30 days. Exceeding this criterion may also require some work procedures to be modified.

In any case where measured quality remains above the guideline criteria established by the CCME guidelines, the EM has the authority to suspend any related construction activities and require corrective measures to be implemented until the guideline criteria are met. In this specific case, immediate communication will be forwarded to the Worley site representative for further discussion and resolution of the issue.

4.3 REPORTING

All monitoring activities of the ESC Plan will be documented in a daily environmental report that will include the following elements:

- Site conditions (i.e. snow levels, melt rate and weather events).
- Identification and location of the work activities causing erosion that could affect water quality.
- Sediment control measures or correction actions to minimize or eliminate the source of sediment transport will be documented in the daily report. These measures could include but are not limited to silt fencing, culvert installation, water channel and berm construction, embankment work and grading of the working surface, etc. On-site modification to the plan and actions could be adapted accordingly as needed and in order to efficiently resolve any impact of water quality issue (s) related to erosion.
- Photographs of “before and after” work/events will be documented and provided as needed.
- At the end of each season, a synthesis of the daily reports will be prepared, with a focus on presenting the significant events that occurred during the work period. This synthesis will be included in the annual reports.

A prompt notification will be sent to the Departmental Representative/Worley for any exceedance or ineffective ESC control.