PILITAK ENTERPRISES LTD
ᐱᓕᑕᒃ ᐃᖃᓇᐃᔭᕐᕕᐊᓪᓚᑦᑐᐊᑦ ᓕᒥᑎᑦ

Submittals

No. : 28
Rev. : 00
Date : July 30, 2022

Project :	**CLYDE RIVER HARBOUR CONSTRUCTION** **DFO ETO-025-222050**	**Project No. :**	2022-034
Subject :	**Erosion and Sediment Control Plan**		
Submitted to :	CBCL Limited 1505 Barrington St Halifax, NS, B3J 3K5	David Parsons davidp@cbcl.ca 506-633-6650 ext 3233	
Copy to :	Kenton Thiesson PSPC	kenton.thiessen@pwgsc-tpsgc.gc.ca 204-229-6375	

Speciality :	Environment	**Submitted for :**	Révision
Specification section :		**Revision required by :**	**August 9, 2022**
Drawing reference :		**Color choice required :**	
Submited as :	As specified	**Total Page incl. cover :**	**20**

Subcontractor or supplier :

-

Manufacturer :

Description : Erosion and Sediment Control Plan

Supplier No :

Comments :

Revised and submitted by :

REVIEWED BY CONTRACTOR
PILITAK ENTERPRISES LTD
NAME: François Bourassa
DATE: Jul 30, 2022

François Bourassa, P.Eng.
Pilitak Enterprises Ltd.
1519 Federal Road
Iqaluit
418-781-6114 ext 213
fbourassa@pilitak.biz

Review by the consultant or the client :

PILITAK ENTERPRISES LTD
ᐱᓕᑕᒃ ᐃᖃᓇᐃᔭᕿᐅᓪᔪᐊᑦ ᓕᒥᑎᑦ

EROSION & SEDIMENT CONTROL PLAN

Clyde River Harbour Development

DFO ET025-222050/A

Submitted to:

Public Services and Procurement Canada

Revision: July 2022

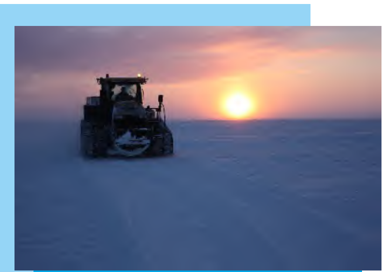


TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

The purpose of this document is to present the Erosion and Sediment Control Plan (ESCP) employed to control site runoff and to prevent and mitigate erosion and sedimentation during the construction of the new harbour in Clyde River, Nunavut. Clyde River. 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 May 2022 by Public Services and Procurement Canada (PSPC) for the Department of Fisheries and Ocean (DFO). At the end of August 2022, heavy equipment, camp facilities and material will be delivered by sealift to Clyde River. The project consists mainly of the construction of two large breakwaters, a fixed wharf structure, two lines of float wharf modules, a retrofit of the existing sealift ramp and improvements to the uplands. The new marine infrastructure will be constructed during the summers of 2023, 2024 and 2025 while preparation work will be carried out during the fall of 2022.

This ESCP 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 ESCP 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. This plan is in effect from August 2022 and will be updated accordingly, as needed.

1.1 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) is applied to a soil surface causing 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 in order to reduce the energy and have all the size particles deposited before it 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 local 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.

1.2 EXISTING SURFACE AND VEGETATION CONDITIONS

Most of Clyde River's town and airport are built atop thick, terraced, raised marine and glaciomarine sandy sediments that contain saline permafrost. According to the geotechnical investigation done for this project, the native soils at the harbour water lot and at the harbour uplands primarily consist of silty sand to sand with silt and gravel. It is acknowledged that the sediments present on site are susceptible to be easily transported and will need special attention in order to minimise the erosion and sediment processes during the different construction phases.

2. EROSION RISKS IDENTIFICATION AND MITIGATION MEASURES

This section describes the risks and presents the mitigation measures. The following construction activities have been identified as operations that could potentially generate erosion and siltation.

- Quarrying (drilling, blasting, excavation)
- Rock crushing
- Haul road and river crossing upgrades
- Breakwater construction
- Dredging and disposal of dredged material

It is important to understand that sedimentation controls themselves are only employed as a second line of defense. Sedimentation controls are designed to provide a place for water to slow down and allow the particles to be deposited that the primary erosion controls were unable to prevent. Sediment fencing does not “filter” the water but rather are meant to slow down the water and allow fine soil particles or other potentially deleterious materials to settle behind it. Other measures related to sediment control will be implemented when necessary and when possible, as the installation of floating silt curtain in the ocean, culverts, ditches, berm construction, embankment work and grading of the working surface.

2.1 QUARRY ACTIVITIES

For construction of the breakwaters, a large amount of rock will have to be blasted and processed from the existing quarry. As presented in the figure 2.1, the existing quarry is located 600 meters southwest of the Clyde River. The topography of the quarry area slops toward the Clyde River. The elevation of the bottom of the quarry is about at 20 meters while the river bottom in this area is at around 2 meters.

The quarry needs to be kept free of standing water. The drainage of the quarry will be done through a ditch that eventually leads to the Clyde River. Even though the quarry operations will not generate a lot of fine material, the drainage of this area could transport fine material to the river. In order to prevent silt to reach out the river, a catch basin will be built at the exit of the quarry. The exact locations of the catch basins will be determined on site. Silt fences could be added according to site conditions.

Some dust could be produced during dry days mainly from heavy equipment movements. This will be addressed into a further section. The rock sorting process will not generate a lot of dust since we will mainly be working with mainly blasted rocks. The blasts do create some dust but only for a brief moment. The drilling operation does generate dust but it is mitigated by a dust collector.

Figure 2.1 Quarry Location

2.2 CRUSHING ACTIVITIES

The rock crushing activities will be carried out on a flat area located nearby the west side of the airport. This area was used for the same purpose during the runway upgrade, a few years ago. The material extracted from the quarry will be transported to this area, processed and stockpiled. Silt fences will be installed around the stockpiles, if needed. This entire area is flat and not well drained. Additional drainage ditches could be added where needed. The existing ground could be soft in some areas and in order to control the potential erosion from the heavy equipment circulation, coarse material will be used to improve the surface stability where needed. Considering that this area is mainly flat, existing drainage paths will generate only low velocity currents and the erosion potential should be considered low. The main receptor is a draining ditch located on the north side of the road that leads to the airport. Silt fences and catch basins will be added according to site conditions in order to avoid fine sediments from getting through this receptor which is connected to a brook that leads to the bay of Clyde River.

According to the weather conditions, dust could be generated during the rock crushing operation. Water spray could be used to keep the dust down during the dry and windy days.

2.3 RIVER CROSSING

The river crossing to reach out the existing quarry will be done either on a temporary culvert crossing to be installed or on the existing bridge that will require improvements in order to handle the weight of loaded trucks and heavy equipment. At the time of writing this document, the option for the bridge improvement is preferred but pending for permitting. The required permits are in place for the temporary culverts crossing and if this method is used, the erosion protection and sediment control measures will be added within this section.

The bridge improvement would include the drilling and the installation of 14 steel piles of 203 mm diameter. The work is planned for mid September but could be done later in the season, pending of the permit issuance. According to the period when the work would be performed, the drilling activities would be carried out either from the bridge or form the bottom of the river. Both options would generate low impacts on the river compared to the yearly installation and removal of the culvert crossing.

This part of the plan will be updated when the river crossing method will have been determined.

2.4 ROAD AND ACCESS 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 5 kilometers. Existing culverts are crossing the road at different places. Some of the culverts will have to be replaced. During the process of replacing a culvert, adequate sediment control measures will be installed. Both culvert entry and exit will be protected with clear stones and geotextile. The access road to the quarry will need to be upgraded. Drainage ditches may have to be improved and road structure to be reinforced in order to avoid rutting, gouging and/or erosion of the ground surface. The existing hamlet roads will be frequently graded and compacted in order in order to maintain them in good conditions. Additional crushed gravel will be added in some sections of the road where needed.

Regarding the dust control, water and calcium chloride will be added in order to keep the dust down. Water will be poured out by our water truck which is equipped with a rear spreader bar. Calcium chloride will be added with a 2 tons spreader installed at the back of a pickup truck. The normal rate of application recommended by the manufacturer is one tonne per kilometer, for a 10 meters wide road. Several applications could be done during one summer, depending upon the weather conditions and the volume of the traffic. Based on daily observations, the environmental monitor will be responsible to determine when the dust suppression application is required.

2.5 BREAKWATER CONSTRUCTION

The breakwaters construction will involve the placement of large quantities of rocks and granular material at different depths in the water. Even tough the type of material to be used for the construction of the breakwaters contains almost no fine, the placement of the materials could generate suspended solids coming from the seabed. The core material will be dumped and pushed while the rocks will be placed using an excavator. Even placed with care, this operation will create seafloor disturbance and increased water turbidity conditions. This operation will be followed by the environmental monitor. The water quality will be monitored as per described in section 4. The method used for material placement could be adjusted to mitigate the impacts. According to sea conditions and the absence of floating ice, a floating silt curtain could be installed around the work area. The floating silt curtain will be available at the site and installed if needed.

2.6 DREDGING AND DISPOSAL OF DREDGED MATERIAL

The dredging operations involve the construction and removal of temporary roads in order to access the areas to be dredged, the excavation of the seabed, the transportation and the management of the dredged spoils. According to our current schedule, dredging operations will be carried only once both breakwaters will have been completed. This will allow the reduction of potential impacts generated during this type of activity. This will also render possible the installation of a floating silt curtain that will enclose the work area in order to reduce the impact of suspended solids in water. The temporary access roads will be built with clear stones and gravel to reduce the impact on water quality. During the dredging operations, the water quality will be monitored as per described in section 4.

The dredged material will be loaded into dump trucks and transported to the dredge spoil disposal area, located on the west side of the tankfarm, as indicated on the figure 2.6.1. This area will be prepared in order to control the water runout from the dredged spoils as well as to avoid erosion and siltation. The entire area will be reshaped and ditches will be dug in order to control the water runoff. Silt fences and catch basins will be installed at the proper locations. The dredged spoil will be placed in order to facilitate their drainage. Rocks will be placed in a separate pile and drained material will be either processed for reuse, as per specifications, or spread out and compacted.

figure 2.6.1: Dredge spoil disposal area

3. EROSION PROTECTION DEVICES AND METHODS

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

3.1 SILT FENCES

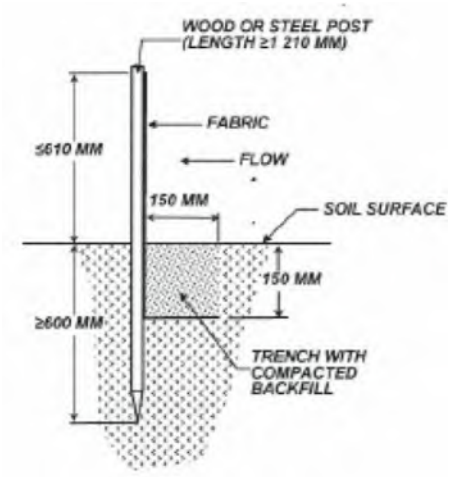
Silt fences are made with permeable geotextile fabric installed vertically and supported by posts with the bottom of the fabric buried in a trench. They are designed to prevent transport of sediment off site. It acts as an above ground settling pond to provide an area of catchment where water can remain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

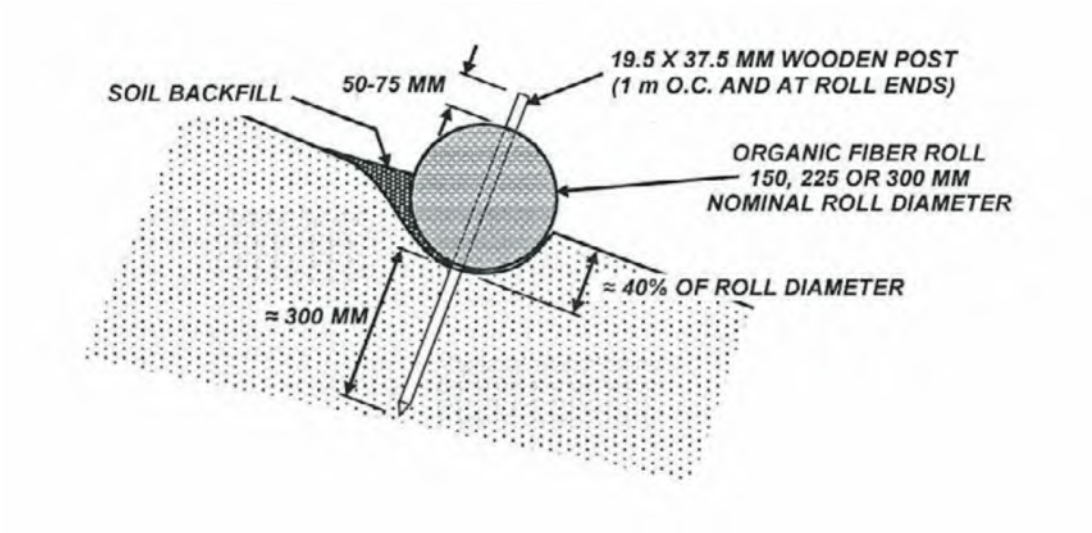
It is important to note that the correct installation of this sediment control measure is crucial to its effectiveness and the level of maintenance it will require. It should be Installed downslope from construction activities, and used with other control measures (such as straw wattles/roles, or sediment 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

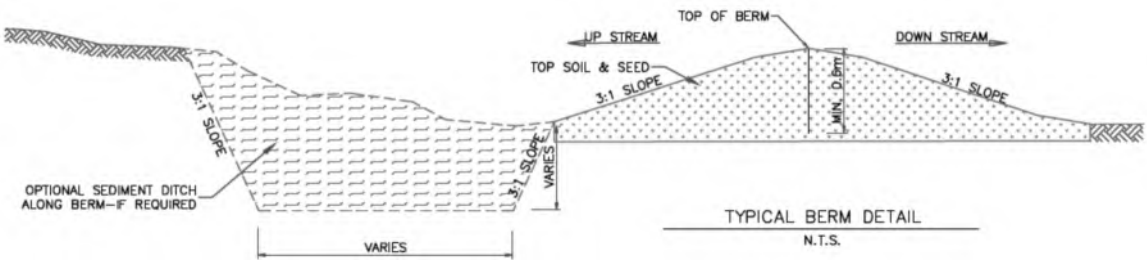
Organic fibres (straw) are encased in a photodegradable plastic net casing that form a roll used primarily for erosion control but also for sediment control as a secondary use. Installed perpendicularly across a slope it reduces erosion by shortening the slope length and by providing grade breaks. They 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.



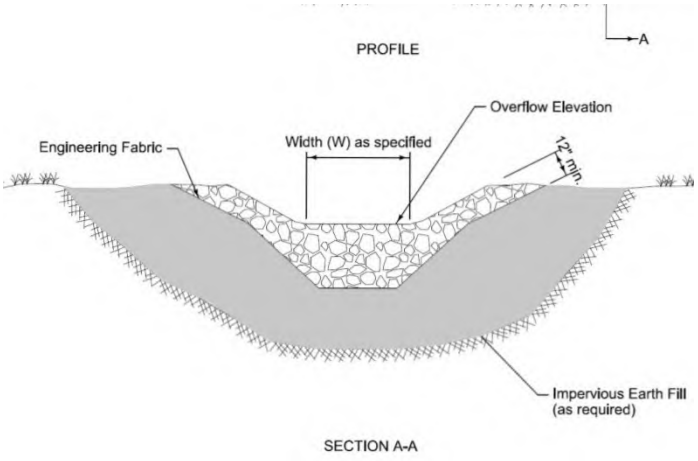
3.3 DITCHING AND BERMS

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.



3.4 CATCHEMENT BASSINS

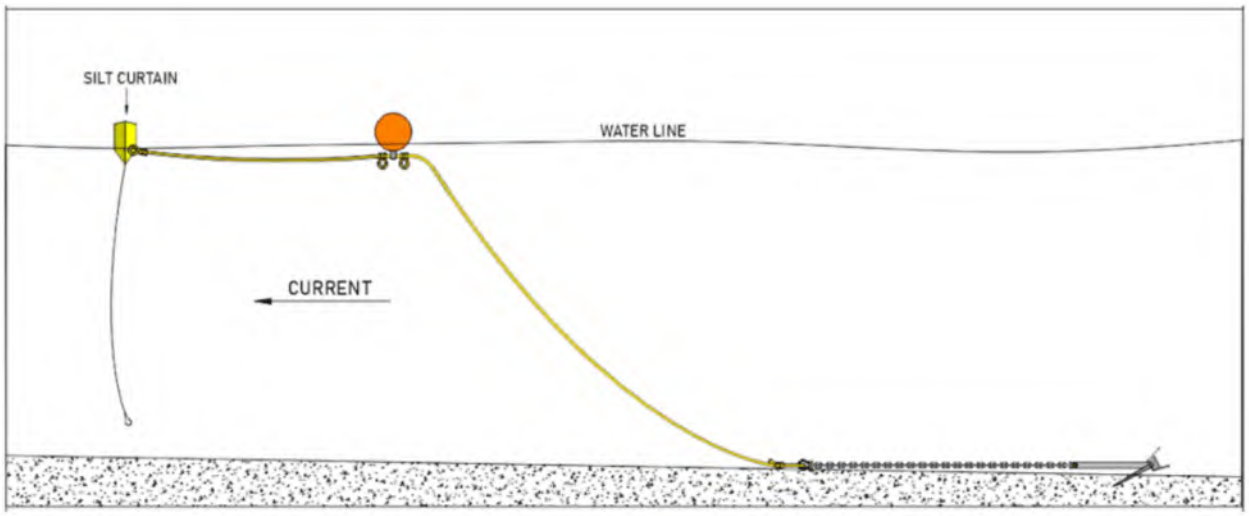
Catchment basins will be installed to collect the sediments from the drainage ditches before they reach out to the existing water courses. The basin sizes will be adjusted to the area drained by the ditches. Each basin will be excavated, lined with geotextile and protected with clear stones.



3.5 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. Type 3 silt curtains for high current conditions will be available for the river crossing site.

Typical installation of a type 2 floating silt curtain



Typical installation of type 3 floating silt curtain

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 environmental monitor 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 environmental monitor daily routine. These inspections and repairs will be reported.

Sediment control measures may require accumulated sediment to be removed in order to function properly or to not overload the structure. The removed sediment will be transported to the dredge spoil disposal area.

4.2 WATER QUALITY MONITORING

Marine and land construction activities will be monitored for their potential impact on water quality and marine habitat. The specific purpose of ESCP is to first identify any activities that could increases the potential of sediment erosion by implementing mitigation measures in order to reduce or eliminate soil particulate transport into the existing water bodies (river, steam or ocean). Second, in the case of any event of potentially impacted water reaching the water bodies, direct measurement of the water quality will be carried-out for the total suspended solids (TSS) and the turbidity. If needed, on-site correctives measure will be immediately implemented in order to reduce the load of sediment in the runoff water. In any case of measured quality remaining above the guideline criteria of the CCME guidelines, the EM has the authority to shut down any related construction activities and have corrective measures implemented until guideline criteria are meet. For that specific case, immediate communication will be forwarded to the CBCL and DFO representative for further discussion and correction of the issue. The following section of the plan is detailing the monitoring and reporting actions related to erosion related issues of on-site activities.

All monitoring activities of the ESCP will be documented in a daily report that will include the following elements (see appendix X for a preliminary version of the report sheet).

- Contact information of the sites supervisors and the environmental monitor.
- 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.
- When visual monitoring identifies sediment run-off in the natural water bodies, the direct monitoring of the turbidity and the total suspended solids (TSS) of the water quality will be conducted and documented. The measured parameters (TDS and turbidity) are directly related to the presence of small solid particulates that are suspended in the water and that could affect its quality. These particulates will originate from the washout and leachate of inorganic manipulated soil material, and should not affect the chemical balance of the water, so the pH will not be monitored. The measurement will be conducted on site with a Hatch portable meter HATSSMETER that measure 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 monitoring program will measure the background values before work begins and at different periods of activities based on visual monitoring and potential effect of the work on the water quality. The location of measurement with the probe will be made at around 1 to 2 meters from the point of entry of potentially impacted water into the water bodies. The monitoring distance can be adjusted based on context, results and visual observations. The measured total suspended solids (TSS) and turbidity are compared to the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of aquatic life which can be found; (https://ccme.ca/en/res/total-particulate-matter-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf). A resume of these guideline is provided below:
- *For TSS:*
    - For clear flow, maximum increase of 25 $mg \cdot L^{-1}$ from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5 $mg \cdot L^{-1}$ from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d) .
    - For high flow, maximum increase of 25 $mg \cdot L^{-1}$ from background levels at any time when background levels are between 25 and 250 $mg \cdot L^{-1}$. It should not increase more than 10% of background levels when background is >250 $mg \cdot L^{-1}$.

- *For turbidity:*
  - For clear flow, maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period).
  - For high flow or turbid waters, maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. It should not increase more than 10% of background levels when background is >80 NTUs.

- Photographs of ''before and after'' work/events will be documented and provided as needed, and also included in the reports.

- At the end of each season, a synthesis of the daily reports (see appendix 1) will be compiled with a focus on presenting the important events that have occurred during the working period. This compilation will be included in the yearly report.

APPENDIX 1
CLYDE RIVER HARBOUR CONSTRUCTION

APPENDIX 1

ESCP DAILY MONITORING SHEET

Pilitak

Daily reporting sheet
Environmental monitoring of erosion and water quality

Date :

Contact information

Sites supervisors :
Environmental monitor :

Identification and location of the work activities causing erosion and that could affect water quality.

Visual inspection of erosion events and detailed description

Direct monitoring of the turbidity and the total suspended solids (TSS) of the water quality

Location 1:

	Background (date/hour)	1st reading (hour)	2nd reading (hour)	3rd reading (hour)
TSS (NTU)				
Turbidity (mg/L):				

Location 2:

	Background (date/hour)	1st reading (hour)	2nd reading (hour)	3rd reading (hour)
TSS (NTU)				
Turbidity (mg/L):				

Location 3:

	Background (date/hour)	1st reading (hour)	2nd reading (hour)	3rd reading (hour)
TSS (NTU)				
Turbidity (mg/L):				