Erosion, Sediment and Drainage Control Plan

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The purpose of erosion, sediment and drainage control is to prevent to the maximum extent practicable, the transport of sediment to the fiord, streams, and fresh water lake, during and following construction and excavation activities. In many circumstances it is difficult to completely prevent the transport of sediment to these features, because of the difficulty in removing silt and clay-sized particles from runoff or because of the occurrence of mudslides. However, a variety of strategies will be used to minimize erosion and the transport of sediment to the maximum extent practicable.

1. Details of grading work to prevent surface drainage into or out of excavation areas

Surface water control systems will be used to prevent surface drainage into or out excavation areas. The purpose of surface water control is to collect and convey surface drainage water in such a way that erosion is minimized and runoff is controlled.

Interceptor dikes, swales and ditches will be used to intercept runoff from draining into excavations. Surface drainage originating from undisturbed areas will be rerouted downstream away from the excavations to a discharge point that will minimize surface erosion. Figure 1 and 2 illustrate the grading details of interceptor dikes and swales, respectively. Construction traffic over temporary dikes and swales shall be minimized.

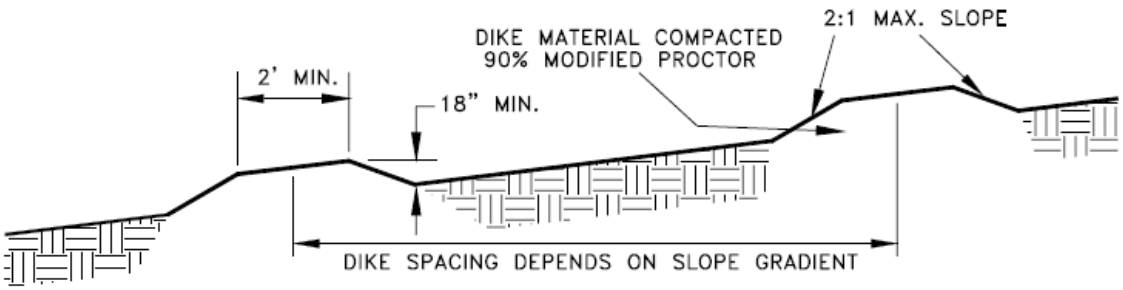

Figure 1 : Interceptor Dike

(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

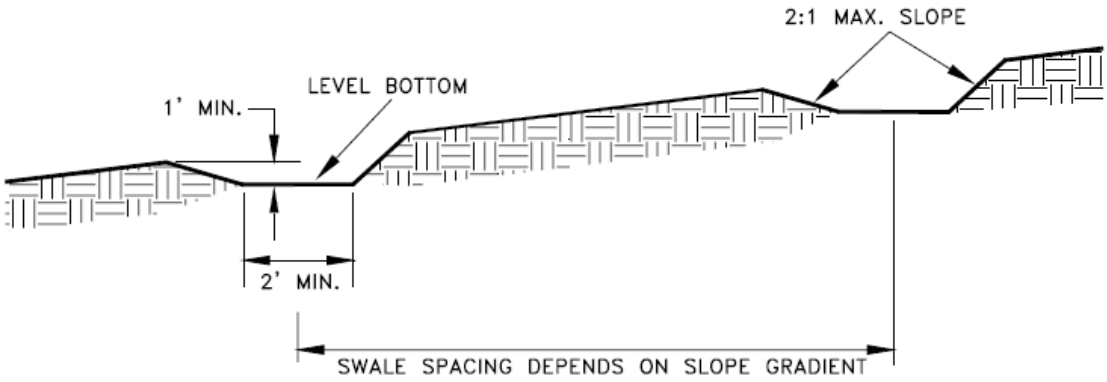

Figure 2 : Interceptor Swale
(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

Surface drainage originating from excavation or construction areas will be collected and analysed for the following discharge criteria:

Parameter	Maximum Allowable Concentration
pH	6 to 9
Oil and Grease	5 mg/L and none visible
Total Suspended Solids	15 mg/L
Arsenic (total)	100 µg/L
Cadmium (dissolved)	10 µg/L
Chromium (total)	100 µg/L
Cobalt (dissolved)	50 µg/L
Copper (dissolved)	200 µg/L
Lead (dissolved)	50 µg/L
Mercury (total)	0.6 µg/L
Nickel (dissolved)	200 µg/L
PCB: discharge to barren area	50 µg/L
PCB: discharge to vegetated area	5 µg/L
Phenols	20 µg/L
Zinc (total)	1,000 µg/L

If the water originating from the excavation and construction areas conforms to the discharge criteria it will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and in an non-erosive manner.

2. Details of erosion control works and materials to be used, including the deployment of silt fencing and containment booms during construction and excavation activities

A technique called *surface roughening* will be used to control erosion by reducing runoff velocity, increasing infiltration, and providing for sediment trapping through the provision of a rough soil surface. The rough soil surface may be created by operating equipment on the contour to form horizontal depressions or by leaving slopes in a roughened condition by not fine grading. Two practical methods of surface roughening are illustrated in Figure 3 and 4 below.

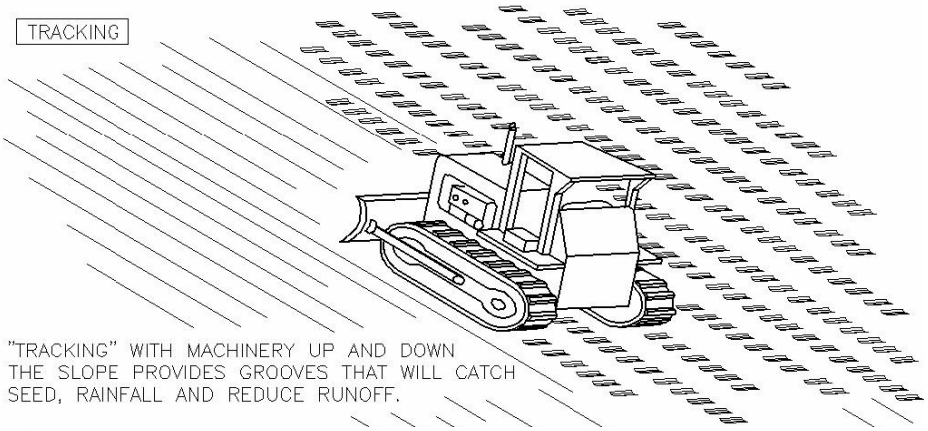

Figure 3 : Surface Roughening by Tracking
(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

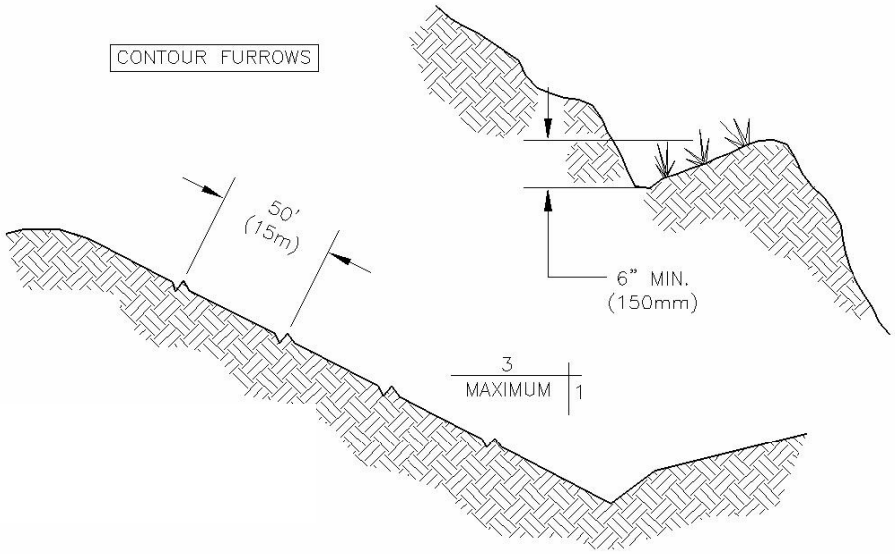

Figure 4 : Surface Roughening by Contour Furrows

(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow. Note however, that the silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Any concentrated flows must be sent to a check dam. The only circumstance, in which overland flow may be treated solely by a silt fence, rather than by a check dam, is when the area draining to the fence is small.

The geotextile silt fences that may be used meet the following standards:

Minimum Grab Tensile Strength (ASTM D4632):	520 N
Maximum Elongation (ASTM D4632):	15 %.
Minimum Puncture Strength (ASTM D4833):	250 N
Maximum Apparent Opening Size (ASTM D4751)	500 µm

Installation of the silt fence will be done according to Figure 5.

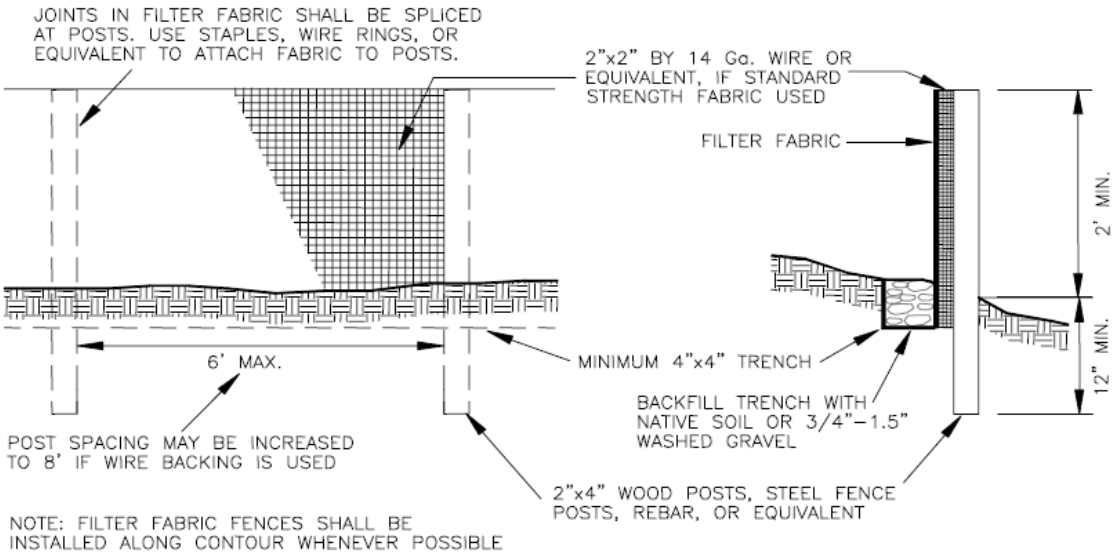

Figure 5 : Silt Fence Installation Details

(Erosion and Sediment Control Standards, King County Department of Natural Resources and Parks, 2005)

3. Work schedule including the sequence and duration of all related work activities

Due to the unpredictable nature of the weather conditions and quickly evolving work site constraints, an up-to-date work schedule would be impossible to include in this Erosion, Sediment

and Drainage Control Plan. Refer to the latest version of the Work Schedule and Work Plan Breakdown provided by Qikiqtaaluk Corporation for the most recent earthwork scheduling details.

4. The treatment of site runoff to prevent siltation of watercourses

As previously mentioned, silt fences may be used to treat site runoff if the silt concentration is not elevated and if the water volume can be adequately handled. However, if a silt fence or a series of silt fences can not be used adequately, a check dam will be constructed to reduce the siltation of the runoff. The use of a check dam was proven to be a simple yet effective way to treat silty runoffs, as seen in Figure 6.

Figure 6 : Check Dam and Runoff Flow Direction (FOX-C 2006)

5. Dewatering procedures for excavated materials including silt removal procedures prior to discharge

As previously mentioned, all contact water form excavated areas will be tested in accordance with the Discharge Criteria. If the water originating from the excavation and construction areas conforms to the discharge criteria it will be released onto the ground at a location that is a minimum of 30 metres from natural drainage courses and 100 metres from fish bearing waters and in an non-erosive manner. Drainage ditches may have to be conducted to convey the water

to an adequate discharge point. Whenever possible, sediment-laden water shall be discharged into relatively level, vegetated areas. This is the only way to effectively remove fine particles from runoff.

6. Stabilizing procedures during excavation

Care will be taken to stabilize the sides of excavations as to avoid even their partial collapse or cave-in. A practical method is to slope the sides of an excavation away from the excavation at the soils' natural repose angle. The angle of incline will vary depending on soil type, environmental conditions of exposure, and application of surcharge loads.

Once the excavation is complete, the sides of the excavation will be sloped gently to fit the local topography. Swales and ditches may also be required to prevent surface standing water. In specific cases, where severe erosion is envisioned, rip rap maybe added to protect the slopes.

7. Maintenance of filters and sedimentation traps

The following maintenance standards will be implemented with regards to filtering media such as silt fences:

- Any damage shall be repaired immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a check dam.
- It is important to check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Sediment must be removed when the sediment starts to accumulate more then 150 mm high.
- At the completion of the project, dispose of used silt fence as non-Hazardous Waste in accordance with Section 31 22 15 – Grading.

The following maintenance standards will be implemented with regards to sedimentation traps such as check dams:

- Sediment shall be removed from the trap when it reaches 300 mm in depth.
- Any damage to the trap embankments or slopes shall be repaired.
- Any accumulated sediment on or around inlet protection shall be removed immediately.
- Any sediment in the check dam shall be removed when the sediment has filled two-third of the available storage.