

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Overview of erosion and sedimentation control requirements and procedures. See Site Plan Civil Drawing for existing chain link fence, silt fence location and existing asphalt area at construction gate entrance for use by Contractor for required stabilized construction entrance as an erosion and sedimentation control procedure.
- B. The required erosion and sedimentation control measures, i.e.: silt fence details, etc., described in this section were provided in Phase 1 Construction Contract for the demolition of existing school. Contractor shall continue to provide erosion and sedimentation control as described in this Division. Existing silt fence and other measures may be used by the General Contractor during this phase of construction. Any additional erosion and sedimentation control measures, or modifications to the current provision shall be provided by the Contractor in the work.
- C. Introductory Information, Bidding Requirements, Division 1, General Requirements as written, shall be a part of this section and apply as if repeated here.

### **1.02 RELATED SECTIONS**

- A. 01352 General LEED® Requirements
- B. 02220 Demolition

### **1.03 REFERENCES**

- A. U.S. Environmental Protection Agency, Office of Water. "Chapter 3: Sediment and Erosion Control" and Chapter 4: Other Controls". Document No. EPA 832-R-92-005 Storm Water Management for Construction Activities. 1992.
- B. Canada Green Building Council. "Sustainable Sites Prerequisite 1: Erosion & Sedimentation Control". LEED Green Building Rating System Reference Package: For New Construction & Major Renovations LEED Canada-NC Version 1.0, December 2004.
- C. Canada Green Building Council. "Sustainable Sites Prerequisite 1: Erosion & Sedimentation Control". LEED Green Building Rating System Reference Guide Addendum: LEED Canada for New Construction & Major Renovations Version 1.0, September 2007.

### **1.04 OBJECTIVES**

- A. Prevent the loss of soil from the construction site resulting from storm water runoff, wind erosion, and construction activities.
- B. Prevent the sedimentation of storm sewers and receiving waters.
- C. Prevent air pollution caused by dust and particulate matter.

- D. Meet or exceed the requirements of LEED Canada-NC Version 1.0 Sustainable Sites Prerequisite 1 "Erosion & Sedimentation Control" which specifies compliance with EPA832/R-92-005 (September 1992), Storm Water Management for Construction Activities, Chapter 3, or local erosion and sedimentation control standards and codes, whichever is more stringent.

#### 1.05 DESCRIPTION OF WORK

- A. The site superintendent (or other person designated by the Contractor) shall be responsible for all aspects of LEED coordination (during construction) related to erosion and sedimentation control.
- B. Erosion and sedimentation control activities shall include:
  - 1. Implementing erosion and sedimentation control measures shown on the drawings and described in this Section
  - 2. Installing erosion and sedimentation control products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document
  - 3. Supervising on site erosion and sedimentation control activities on a daily basis
  - 4. Coordinating erosion and sedimentation control tasks with subcontractors to ensure timely and orderly progress of the work
  - 5. Conducting erosion and sedimentation control inspections and making necessary repairs
  - 6. Maintaining an erosion and sedimentation control inspection log to document observations, deficiencies and corrective actions
  - 7. Preparing erosion and sedimentation control documentation and submittals as detailed herein
  - 8. Reporting erosion and sedimentation control progress to the Consultant

#### 1.06 SUBMITTALS

- A. Schedule E1 – ESC Inspection and Photograph Checklist
  - 1. Using the checklist for reference, conduct an inspection of all erosion and sedimentation control measures implemented onsite each week and following any significant storm event (0.5 inches of precipitation or greater).
  - 2. Inspections shall commence when the site is "disturbed" (i.e. when site work begins) and carry through until final landscaping is complete.
  - 3. Provide a minimum of 3 digital photographs of each ESC measure implemented on-site. Record the date each photograph was taken in the checklist. Photographs are required at the following occasions:
    - a. Immediately following installation,
    - b. In-situ and,
    - c. At the end of construction or prior to removal, whichever comes first

4. Coordinate with photo requirements of General LEED Requirements 01352 paragraph 1.09B.2
  5. Submit the completed checklist and accompanying photos to the Consultant after construction and prior to Contractor demobilization.
- B. Schedule E2 – ESC Inspection Log
1. Complete the log on a weekly basis. The log shall commence when the site is “disturbed” (i.e. when site work begins) and carry through until final landscaping is complete.
  2. The inspection log shall be completed for each inspection and must document:
    - a. Deficiencies related to the measures listed in Schedule E1 – ESC Inspection and Photograph Checklist and,
    - b. Corrective actions taken to remedy the deficiencies
  3. Each deficiency must be initialed and each log signed after all corrective measures have been completed and documented.
  4. Submit an up-to-date copy of the ESC Inspection Log to the Consultant on a monthly basis.
  5. Submit a compilation of the completed logs to the Consultant after construction and prior to Contractor demobilization.

## **PART 2 PRODUCTS**

NOT USED

## **PART 3 EXECUTION**

### **3.01 PROCEDURES**

- A. Installation
1. Install and /or maintain existing erosion and sedimentation control as per this Section and drawing No ES-6, Inlet Protection For Drainage Areas < 1 Acre and Drawing No. ESC-4 Standard Silt Fence Details and ESC-1 Stabilized Construction Entrance.
  2. Install erosion and sedimentation control products in accordance with manufacturer instructions and the prescribed installation procedures in the referenced EPA document.
- B. General Practices
1. Site Arrangement
    - a. All construction trailers and equipment shall be positioned to reduce the disturbance of the site. They shall be located close to the current phase of construction to minimize traffic damage to the site.

2. Stabilized Construction Entrance (SCE)
    - a. Provide as required a stabilized construction entrance as indicated in drawing ESC-1. **Note:** Existing asphalt at site entrance may be used. Provide new stabilized construction entrance if decided and / or required by Contractor at no additional cost to the Owner.
    - b. Construct a SCE before construction begins at every point where traffic leaves the site and enters onto a public road and/or any unpaved entrance/exit location where there is a risk of transporting mud or sediment onto paved roads.
    - c. The SCE must be at least 3.65m wide, with room for two vehicles to pass at high traffic areas, and constructed of 50mm dia. clear stone, 150mm dia. rip rap, and filter fabric with the following characteristics:
      - 1) Grab Tensile Strength: 220lbs;
      - 2) Elongation Failure: 60%;
      - 3) Mullen Burst Strength: 430lbs;
      - 4) Puncture Strength: 125lbs;
      - 5) Equivalent Opening: Size 40-80 (US std Sieve).
  3. Material Stockpiling
    - a. If material that has been stockpiled and will not be used within 14 days, it must be stabilized using one of the following measures:
      - 1) Temporary Seeding
      - 2) Tarps
      - 3) Compaction
      - 4) Surface Roughening
- C. Stabilization Practices
1. Temporary Seeding
    - a. Use temporary seeding to reduce soil erosion by stabilizing areas disturbed by construction that will not be brought to final grade within 30 days.
    - b. Areas that may require temporary seeding include, but may not be limited to soil stock piles, dikes, dams and sides of sediment basins and traps.
    - c. Species used for temporary seeding must be fast growing, native or adapted, not require permanent irrigation and not be invasive.
    - d. Till/loosen compacted soil prior to planting seed.
  2. Permanent Seeding
    - a. Apply permanent seeding to any graded or cleared area as specified on the landscaping plan.

- b. Plant native grass, tree and shrub species in favourable growth conditions. For areas outside of construction activity, plant species within 3 weeks of construction start.
    - c. Species shall not require permanent irrigation after the first two years or fertilizers containing phosphorus. Species must not be invasive.
    - d. Use topsoil on areas where topsoil has been removed, where the soil is dense or impermeable, or where mulching and fertilizers alone cannot improve soil quality. Make topsoil layers at least 2 inches deep, or similar to the existing topsoil depth.
3. Mulching
  - a. Hay, grass, woodchips, straw, and/or gravel shall be used in areas prone to erosion during construction and to facilitate the growth of permanent seeding.
4. Preservation of Natural Vegetation
  - a. Establish construction boundaries to limit site disturbance to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walkways and main utility branches, and 25 feet beyond parking areas.
  - b. Stakes shall be used to indicate limits of construction, grading and disturbance. Trees shall be clearly marked to be preserved and protected from ground disturbances around the base.
5. Buffer Zones
  - a. Incorporate vegetated strips of land on floodplains, next to wetlands, along stream banks, and on steep, unstable slopes to decrease the velocity of storm water runoff, preventing soil erosion.
  - b. May be areas of vegetation left undisturbed during construction, or can be newly planted. New strips require establishment of permanent seeding and planting.
6. Stream Bank Stabilization
  - a. Use riprap, gabion, reinforced concrete, log cribbing, grid pavers, or asphalt where vegetative stabilization practices are not practical and where the stream banks are subject to heavy erosion.
  - b. Structures shall be planned and designed by a licensed professional engineer.
7. Soil Retaining Measures
  - a. Use skeleton sheeting, continuous sheeting, or permanent retaining walls to hold in place loose or unstable soil where other soil retaining methods of soil retention are not practical.
8. Sod Stabilization
  - a. Sod shall be applied in alternating strips or other patterns on graded or cleared areas that might erode.

- b. Roll or compact immediately after installation to ensure firm contact with topsoil. Add lime and phosphorus-free fertilizers to the soil to promote growth. If the soil is acidic, then add lime as directed by the Landscape Architect.
      - c. Do not plant sod during very hot or wet weather or on slopes greater than 3:1 if they are to be mowed.
- 9. Rolled Erosion Control Products (RECP)
  - a. Use RECPs on recently planted slopes to protect seedlings until they become established, on tidal or stream banks where moving water is likely to wash out new plantings, and/or alone on slopes to mitigate soil erosion.
  - b. Installation shall follow manufacturer/consultant requirements.
- 10. Dust Control
  - a. Apply vegetative cover, mulch, spray-on adhesives, calcium chloride, sprinkling, stone, or barriers on open dry areas of soil as specified on drawings.
- D. Structural Practices
  - 1. Silt Fence (Provide as required)
    - a. Construct posts with a filter fabric media to remove sediment from storm water volumes flowing through the fence.
    - b. The lower edge of the fence is to be vertically trenched and covered by backfill.
    - c. Filter fabric should be a pervious sheet of polypropylene, nylon, polyester, polyethylene, or equivalent and have the following characteristics:
      - 1) Filtering Efficiency: 75%-85% (minimum)
      - 2) Tensile Strength at 20% (maximum) Elongation: Standard Strength = 30 lb/linear in. (min.), Extra Strength = 50 lb/linear in. (min.)
      - 3) Slurry Flow Rate: 0.3 gal/ft<sup>2</sup>/min (min.)
  - 2. Outlet Protection
    - a. Install stone, riprap, concrete aprons, paved sections, or settling basins at all pipe, interceptor dike, swale, or channel section outlets where the velocity of flow may cause erosion or pools at the outlet of an erosion and sedimentation control measure.
  - 3. Inlet Protection
    - a. Install straw bales, stone, concrete masonry units and stone, filter fabric, or silt fences around catch basins and manhole covers to prevent silting of inlets, storm drainage systems, or receiving channels.

4. Surface Roughening
  - a. Create horizontal grooves, depressions, or steps that run parallel to the contour of the land.
  - b. Use surface roughening on all slopes, as soon as possible after the vegetation has been removed.
  - c. Methods of surface roughening are stair-step grading, grooving (using disks, spring harrows, or teeth on a front-end loader), and tracking (driving a crawler tractor up and down a slope, leaving the cleat imprints parallel to the slope contour).
5. Check Dams
  - a. Install check dams in steeply sloped swales, or in swales where adequate vegetation cannot be established, and only in small open channels which will not overflow once dams are constructed.
  - b. Construct a small, temporary or permanent dam of stone, straw bales, logs or pea gravel-filled sandbags across a drainage ditch, swale, or channel to slow water flow and allow suspended sediment to settle.
6. Drainage Swale
  - a. Construct a channel with a lining of vegetation, riprap, asphalt, concrete, or other material to convey runoff from the bottom or top of a slope.
  - b. Intercepted runoff shall be diverted to an appropriate outlet with sediment trap if required; swale shall have a positive grade with no dips to collect water.
  - c. Swale shall be lined using geotextiles, grass, sod, riprap, asphalt, or concrete - based on the volume and velocity of the runoff.
7. Interceptor Dikes and Swales
  - a. Construct ridges of compacted soil (dikes) and excavated depressions (swales) where upslope runoff has high risk of erosion.
  - b. Construction shall occur before any major soil disturbing activity takes place. Outfall shall be stabilized or a structural sediment trapping practice.
  - c. Temporary dikes and swales to remain in place longer than 15 days, must be stabilized and remain until area is permanently stabilized.
  - d. Permanent controls shall be permanently stabilized and designed to handle runoff after construction is complete.
8. Gradient Terraces
  - a. Use gradient terraces on long, steep slopes with high potential for water erosion.
  - b. Construct earth embankments or ridge-and-channels along the face of a slope at regular intervals that drain to an outlet where erosion will not occur.

- c. Design and installation must be completed according to a plan determined by an engineering survey and layout. Design elevation of the water surface of the terrace shall not be lower than the design elevation of the water surface in the outlet at their junction at design flow.
  - d. Provide vegetative cover at outlet where possible.
9. Earth Dike
- a. Construct a mound of stabilized soil to divert surface runoff volumes from disturbed areas or into sediment basins or sediment traps.
  - b. Check for local design requirements. Ensure dike is properly compacted, has properly designed height and thicknesses, constructed along a positive grade, and has no low points for water to collect.
  - c. Stabilize using vegetation or stone/riprap.
10. Gravel or Stone Filter Berm
- a. Construct a temporary ridge of loose gravel, stone, or crushed rock to slow filter flow and divert it from exposed traffic in areas with gentle slopes and traffic.
11. Sediment Trap
- a. Excavate a pond area or construct earthen embankments to allow for settling of sediment from storm water volumes.
  - b. Incorporate temporary seeding, mulching, and/or earth dike per installation procedures to reduce erosion of banks.
  - c. Use a sediment trap for small drainage areas, no more than 2 hectares (5 acres).
12. Temporary Sediment Basin
- a. Use sediment basins for areas larger than 2 hectares (5 acres).
  - b. Construct a pond with a controlled water release structure to allow for settling of sediment from storm water volumes.
  - c. Construction shall occur before any clearing and grading occurs, and must not be built on an embankment in an active stream.
  - d. Incorporate temporary seeding, mulching, and/or earth dike per installation procedures to reduce erosion of banks.
  - e. Design of outlet pipe and spill way shall be designed by an engineer based on an analysis of the expected runoff flow rates from the site.
13. Pipe Slope Drains
- a. Install pipes, sectional down drains, paved chutes, or clay tiles to carry concentrated runoff from the top to the bottom of a slope without causing erosion.
  - b. Inlets and outlets of drain shall be stabilized, and inlet properly installed to ensure runoff does not bypass the inlet.



14. Subsurface Drains

- a. Place a perforated pipe or conduit beneath the surface of the ground at a designed depth and grade to drain an area with a high water table.
- b. Use relief drains in a gridiron, herringbone, or random pattern to dewater an area where the water table is high.
- c. Place interceptor drains, as single pipes, to remove water where sloping soils are excessively wet or subject to slippage.
- d. Backfill with open granular, highly permeable soil immediately after pipe is placed.
- e. Stabilize outlet and ensure sediment-laden storm water runoff is directed to a sediment trapping measure.

15. Temporary Stream Crossing

- a. Construct a bridge or culvert across a stream or watercourse for short-term use by construction vehicles or heavy equipment.

16. Temporary Storm Drain Diversion

- a. Install a pipe to redirect an existing storm drain system or outfall channel to discharge into a sediment trap or basin.
- b. Measure shall remain in place while the area draining to the storm drain is disturbed.

3.02 INSPECTIONS & MAINTENANCE

- A. Using Schedule E1 – ESC Inspection and Photograph Checklist for reference, inspect all erosion and sedimentation control measures at least once each week and following any significant storm event (0.5 inches of precipitation or greater).
- B. All erosion and sedimentation control measures must be maintained in good working order. If maintenance or repairs are identified they must be completed within 24 hours.
- C. Schedule E2 – ESC Inspection Log (1.06B) must be completed for each inspection.
- D. Inspection procedures specified below summarize the EPA document and shall be followed in conjunction with details, drawings, and manufacturer requirements.
  1. Stabilized Construction Entrance: Apply additional gravel as required, remove sediments and other materials from all areas to minimize clogging. Keep adjacent public roadway(s) free of sediment.
  2. Material Stockpile: Inspect for effective prevention of runoff and erosion.
  3. Temporary Seeding: If plants do not grow quickly or thick enough to prevent erosion, reseed the area as soon as possible. Keep seeded areas adequately moist. If irrigation is required, over-watering shall be avoided. Phosphorus-containing fertilizers are not to be used.

4. Permanent Seeding: Inspect for sufficient growth and water conditions. Replant areas as per installation instructions (refer to 3.01C.2) if cover does not provide erosion control.
5. Mulching: Inspect to ensure mulching is not loose or removed. Apply additional mulch or reseed if necessary. If mulch binder is required, apply at rates specified by the manufacturer. Employ alternative controls if current measures are not effective.
6. Preservation of Natural Vegetation: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning, and weed and pest control, depending on the specific species and environmental conditions. Remove any debris, and ensure area is protected from traffic.
7. Buffer Zones: Routine maintenance shall include mowing, fertilizing, liming, irrigating, pruning, and weed and pest control, depending on the specific species and environmental conditions. Remove any debris, and ensure area is protected from traffic.
8. Stream Bank Stabilization: Inspect for structural damage and repair as required.
9. Soil Retaining Measures: Inspect for structural damage and repair as required.
10. Sod Stabilization: Remove and replace dead sod. Ensure area receives sufficient water. If irrigation is required do not over-water.
11. Rolled Erosion Control Products (RECPs): Inspect for separation, cracks, tears, and breaches. Ensure matting is in continuous contact with the soil.
12. Silt Fence: Silt fence to be inspected for depth of sediment, tears, loose fabric attachment at the fence posts, channel erosion beneath fence, sagging or collapse and to ensure the fence posts are firmly in the ground. Built up sediment is to be removed from silt fence when it has reached one-third the height of the fence. Repair such that fence is in original installation condition.
13. Outlet Protection: Inspect outlet for erosion and pooling of water. Necessary repairs to be made as required to reduce exit velocity of runoff. If a riprap apron is used, inspect for riprap displacement and damage to filter fabric.
14. Inlet Protection: Inspect that measures are in original installed condition. Ensure measures are effectively trapping sediment. Remove accumulated sediment and debris when it reaches  $\frac{1}{2}$  the design depth of the trap. Repair protection measures as required.
15. Surface Roughening: Inspect for small eroded watercourses, as little as a few inches deep, or washout of roughened grading. Fill, regrade, and reseed immediately.
16. Check Dams: Inspect for sediment and debris accumulation and erosion of sides. Sediment should be removed when it reaches one half the original dam height. Repair dams as required.

17. Drainage Swale: Inspect for dips or low points along the swale where water is pooling and ensure that runoff is being directed to sediment-trapping measure used onsite.
18. Interceptor Dikes and Swales: For swales inspect for dips or low points along the swale where water is pooling and ensure that runoff is being directed to sediment-trapping measure used onsite. For dikes ensure runoff is being directed to sediment-trapping measure used onsite and that it is compacted and free of low points for water collection.
19. Earth Dike: Ensure runoff is being directed to sediment-trapping measure used onsite and that it is compacted and free of low points for water collection.
20. Gravel or Stone Filter Berm: Inspect for breach in structure caused by vehicles and accumulated sediment. Replace filter material if needed, and remove and properly dispose of accumulated sediment.
21. Sediment Trap: Remove sediment when it reaches 300mm in depth. If outlet becomes clogged with sediment it must be cleaned to restore flow capacity. Maintain until site area is permanently stabilized and/or permanent structures are in place. Ensure bank is sufficiently compacted and stabilized such that erosion into the basin does not occur.
22. Temporary Sediment Basin: Remove sediment when it reaches 300mm in depth. If outlet becomes clogged with sediment it must be cleaned to restore flow capacity. Maintain until site area is permanently stabilized and/or permanent structures are in place. Ensure bank is sufficiently compacted and stabilized such that erosion into the basin does not occur.
23. Pipe Slope Drains: Ensure runoff does not bypass the inlet, undercutting the structure. Repair undercutting at inlet if needed. If required, install a headwall, riprap, or sandbags around the inlet. Inspect pipes for leakage. Repair leaks and restore damaged slopes. If evidence exists of pipe movement, install additional anchor stakes to secure slope.
24. Subsurface Drains: Inspect for pipe breaks or clogging by sediment, debris, or tree roots. Remove blockage immediately, replace any broken sections, and re-stabilize the surface. Check inlets and outlets for sediment or debris, and remove and dispose of these materials properly.
25. Temporary Stream Crossing: Inspect for structural deficiencies. Ensure runoff is flowing through culvert, not between soil and outside edge of the pipe.
26. Temporary Storm Drain Diversion: Ensure flow is being properly directed towards sediment-trapping device. When construction is complete, move diversion, flush storm drain prior to removal of sediment trap/basin, stabilize outfall, and restore grade areas.

### 3.03 REMOVAL OF PRODUCTS

- A. Erosion and sedimentation control measures shall be maintained and inspected until final landscaping is complete.

**END OF SECTION**

**SCHEDULE E1 – ESC INSPECTION AND PHOTOGRAPH CHECKLIST**

(Submit checklist with photos to Consultant after construction and prior to demobilization)

<b>Project Name:</b>		<b>Completed By:</b>	
<b>Project Location:</b>		<b>Company:</b>	

Conduct an inspection of all erosion and sedimentation control measures implemented onsite each week and following any significant storm event (0.5 inches of precipitation or greater). Record any maintenance or repair performed in Schedule E2 – ESC Inspection Log.

Photographs of each measure must be taken immediately following installation, in-situ and at the end of construction.

Customize this checklist for your Project by listing measures on drawings and in specs

ESC Measure	Location Onsite	Date of Photo		
		#1	#2	#3

I hereby certify that the information provided is complete and correct:

\_\_\_\_\_  
**Signature of Authorized Official**                      **Position**                      **Date**

**SCHEDULE E2 – ESC INSPECTION LOG**

(Complete weekly. Submit most recent copy to the Consultant on a monthly basis)

<b>Project Name:</b>		<b>Completed By:</b>	
<b>Project Location:</b>		<b>Company:</b>	

Date		Erosion and Sedimentation Control Measures			Initials
		Observations	Deficiencies	Corrective Action Taken	
Ex.	Sept 17/06	Heavy rain night before. Measures in good condition.	Straw bale check dam in northeast swale deteriorated	New straw bale installed in northeast swale.	G.L.

I hereby certify that the information provided is complete and correct:

\_\_\_\_\_  
**Signature of Authorized Official**                      **Position**                      **Date**