Nottawasaga Valley Conservation Authority

Technical Design Guidelines, Standards, and Policies for Siltation and Erosion Control

JULY 2003

General Practice

The implementation of erosion and sediment controls during construction operations requires proper installation and maintenance of the devices to ensure optimum performance.

* It should be noted that these guidelines, standards, and policies are not in relation to works within watercourses for which full approvals and permits from regulatory authorities will be required.

Design Principles

- Limit the size of the disturbed areas;
- Retain existing vegetation where possible;
- Reduce and redirect flows to lower gradients and areas that are less susceptible to erosion;
- Limit slope length and gradient of disturbed areas;
- Maintain overland sheet flow and avoid concentrated flows;
- Limit the duration of soil exposure;
- Re-vegetate disturbed areas as soon as possible; and
- Incorporate good housekeeping and maintenance schedules for supervision and construction staff.

Construction Implementation

Pre-Construction

- Advise Conservation Authority of staff responsible for site sediment control supervision, inspection and maintenance, including after hour contacts;
- Provide written inspection and maintenance schedule of sediment control devices; and
- Install all sediment control devices as identified on the approved erosion control plan prior to implementation of topsoil stripping or earthwork operations.

During Construction (Site and Building Works)

- Ensure topsoil, stripping, grading and underground works conform to approved grading, servicing and erosion control plan;
- Conduct required weekly inspection, maintenance and reporting of sediment controls to the Conservation Authority; and
- Stabilize site as required throughout site construction schedule.

Post Construction (Including Building Construction)

- Complete final site stabilization and re-vegetation works; and
- Remove all sediment control devices after site is stabilized to a condition equal to, or better than, pre-construction.

Siltation Control Measures

All erosion and sediment controls are considered temporary applications and are to be constructed prior to any disturbance of land, and shall be maintained until the subject area has been stabilized to a condition that is equal to, or better than, the existing.

Devices

- Sediment Control Basins;
- Sediment Control Fences;
- Rock Check Dams;
- Vegetation Buffer Zones; and
- Stone Pad Construction Entrance.

Additional Measures for Sediment/Erosion Control

- Terracing to reduce slope length and steepness;
- Use of erosion control blankets and bio-engineered structures; and
- Engineered surfacing (Cable Mat, riprap, etc.)

Erosion and Sediment control structures and appurtenances shall be designed, constructed, and maintained in all developments in accordance with the following specifications and criteria:

Sediment Control Basins

Description: A temporary structure that is created by excavation and/or berming of soil including a perforated riser pipe, and is to be designed to detain runoff for a minimum period of 24 hours

Purpose: To intercept sediment laden runoff water and allow the settlement of suspended sediments

Application: They are to be used as an end of pipe solution as well as an intercept overland flow. They are to be used for drainage areas greater than 1.0 hectare. The basin location is to be based on topography to allow for the maximum control of runoff from the construction area.

Design: All sediment control basins will be constructed off-line and at no time shall the permanent stormwater management facility for the development be used for construction sediment control;

Each sediment control basin will be designed for a maximum drainage area of 10 hectares and a minimum catchment area of 1.0 hectare. Construction projects in excess of this area will require multiple facilities (i.e. 11 hectares would require two basins).; and

The volume of the permanent pool will be determined based on an annual sediment yield as calculated by the Universal Soil Loss Equation [A = (F) (R) (K) (LS) (VM)] and/or a minimum 125m^3/Ha whichever is greater. For the purposes of this equation 1 tonne = 1 m^3.

A = computed soil loss per unit area (tonnes/hectare)

F = 2.24 for Metric units

R = 90 for City of Barrie

K = use MTO Drainage Manual Part 3 Design Chart 6.01

LS =use MTO Drainage Manual Part 3 Design Chart 6.04

VM = use 1 for City of Barrie

- The permanent pool will have a minimum settling zone depth of 0.6 meters and a maximum of 1.0 meter;
- The volume of active storage is to be based upon the volume required to detain the 1-10 year return Chicago 4 hour duration storm event for a minimum duration of 24 hours (see attached Intensity- Duration frequency data);
- The sediment basin shall be designed on the basis of a minimum freeboard of 0.3 meters above the 1-10 year storm event active storage level;
- The sediment basin is to be designed on the basis of a minimum length to width ratio of 4 :1 and all pond slopes shall not exceed 3:1;
- The sediment basin shall be designed with the provision of an emergency spillway for all events that exceed the 1-10 year storm event up to, and including, the 1-100 year storm event. The spillway shall be protected from erosion with appropriate riprap materials;

Sediment Control Basins (Cont'd.)

- The sediment basin outlet control will consist of a structure, that shall conform to Standard BSD- 23A (see attached); and

- The basin shall be secured with a minimum 1.5 meter high security fence erected along the perimeter of the basin. A hazard advisory sign shall be attached to the security fencing stating that the area is used for sediment control purposes, and is subject to permanent ponding and flash flooding during and after rain events.

Maintenance All sediment is to be removed upon 80% of the permanent pool volume being lost to sediment loading and at least once annually; and

Any erosion or bank instability in and around the basin must be rectified immediately upon field observation to ensure the structural stability of the device.

Sediment Control Fences

Description — A temporary structure consisting of wire fence, steel posts and woven or non-woven U.V. stabilized fabric material that is attached vertically to the wire fencing and anchored 300 millimetres below a compacted surface

Purpose — A barrier to prevent the displacement of sediment laden overland runoff

Application — This is to be used for the control of overland flow on disturbed areas with a low to medium grade. To function properly the sediment control fence location must consider the combined effects of slope length and gradient. In that regard the fence is to be placed beyond the toe of slope and based upon the Topographic Factor (LS) equal to or less than 5, and overall slope lengths of no greater than 15 metres. Any slopes that exceed these requirements will require terracing and additional silt fencing. The terracing and additional silt fences shall only be removed in coordination with the final site grading and stabilization of the slope.

Design — All sediment control fences shall be located at the bottom and 3 metres beyond the toe of slope on the flat surface;

They are to be constructed of U.V. stabilized woven or non-woven fabric that is wrapped over the top of the support fencing and fastened. The base of the fabric is to be toed into the native soil to a minimum depth of 300 millimetres by either static slicing technique or trenching;

The native trench material to toe, in fabric base, shall be compacted to 95% Standard Proctor Maximum Dry Density;

The fence structure shall consist of a 1.1 meter, 150 millimetre page wire fence fastened to steel T-bar fence posts, located 2500 millimetres on center. The posts shall be placed a minimum of 600 millimetres into the ground; and

The fence design shall conform to Standard Drawing BSD- 23 (see attached).

Maintenance — Upon 60% of the fence height being blocked from sediment deposition, a new sediment control fence shall be constructed up stream of the existing one. The new fence shall be installed upstream and beyond the sediment loading area and shall conform to all design standards and policies.

Rock Check Dam

Description — A rock check dam is a temporary structure which consists of clear stone with a geotextile, and is placed in areas of concentrated flow such as ditches, swales, and rills.

Purpose — To reduce the velocity of the concentrated flows and minimize erosion, as well as intercept sediment laden runoff water, and allow the settlement of suspended sediments

Application — To be used in areas of concentrated flows, and are quite often used in sequence to reduce the erosive forces of the runoff in a ditch, channel, rill or swale

Design — The rock is to be piled with a maximum upstream slope of 1.5:1 and a maximum downstream slope of 4:1;

A temporary settling trench is to be excavated in front of the rock check dam to a minimum depth of 0.6 meters with a volume of 3 cubic meters;

The rock is to be placed in two layers, separated by a non-woven geotextile. The first layer is to consist of a 150 millimetre diameter stone wrapped in the fabric to a height of 450 millimetres. The second layer is to consist of a 50 millimetre diameter stone that extends from the base of the settling trench to the top of the first layer. The second layer is to be a minimum 100 millimetres thick;

The second layer of stone should be piled to anchor the geotextile and form a low center spillway that is a minimum 300 millimetres below the top of the channel bank;

The channel ditch side slopes are to be armor protected from erosion on each side of the rock check dam by extending the stone along the ditch side slopes to a height of 0.7 meters;

In swales and ditches where there is increased slope length and/or a significant gradient, a series of rock check dams must be used;

The height of subsequent rock check dams must be equal to the elevation of the base of the previous rock check dam; and

The rock check dam design shall conform to Standard Drawing BSD- 24 (see attached).

Maintenance — The rock check dam is to be replaced upon 50% of the height of the rock check dam being covered with sediment; and

Extreme care is to be undertaken to minimize downstream contamination from silt removal.

Vegetative Buffer Zone

Description	A permanent setback located along property lines, stream banks and along contours at various intervals, and top of bank areas that maintain existing ground cover conditions
Purpose	To perform as a sediment filter and reduce the velocity of sheet flow to intercept sediment laden overland runoff
Application	To be used adjacent to all construction projects on steep sloped areas and adjacent bodies of water and environmentally sensitive areas
Design	Construction projects shall provide a minimum 3-metre wide vegetative buffer strip along the limits of the development including frontages along existing road boulevards; Areas adjacent to watercourses shall provide a minimum 15-meter buffer zone setback from top of bank (30 metres for cold water fisheries) and/or average high water mark, whichever is greater.
Maintenance	Restrict access to areas identified as a buffer zone to ensure area remains undisturbed; and Areas that are disturbed shall be reinstated to existing or better condition with the appropriate vegetation as specified by the Development's Landscape Architect.

Stone Pad Construction Entrance

Description — A temporary pad of crushed stone to allow access of construction equipment to a construction site

Purpose — To reduce the tracking of mud onto adjacent streets and disturbance of native soil in high traffic areas.

Application — To be used at all entrance and exit locations for construction projects

Design — The stone pad shall be a minimum 20 metres in length and 5 meters in width; and

The pad shall be a minimum of 450 millimetres thick, constructed with 50 millimetre diameter clear stone in the first 10 meters of the pad extended from the street. The remainder of the pad shall be constructed with 150 millimetre diameter stone.

Maintenance — Upon observation of continuous mud tracking, occurring onto adjacent streets, the stone mat is to be fully replaced.

Construction Control Requirements

All construction activities shall have due recognition of the requirement for implementation and maintenance of appropriate sediment and erosion control measures as well as the following:

- The Site Project Engineer shall undertake weekly inspections of all sediment/erosion control facilities during the extent of the entire construction project including the building construction period as well as after all rain events 13 millimetres or greater. The weekly inspections are to be completed on an Erosion and Sediment Control Inspection report (see attached);

- The Site Engineer shall provide weekly status reports to the Municipality and Conservation Authority advising of the condition of structures and maintenance works that have been undertaken; and

- Construction areas that exceed 30 days of inactivity shall be stabilized by seeding. This is to include stockpiles of fill and topsoil. The specification for site stabilization are as follows:

1. Large Open Areas - Loosen soil to a depth of 100 millimetres and apply the following Hydroseed mixture (30% Annual Ryegrass, 40% Perennial Ryegrass, 15% Creeping Red Fescue, 10% Timothy, 5% White Clover) with Verdyol mulch at a rate of 200kg/ha and a Fertilizer 8-32-16 at a rate of 450kg/h.

2. Topsoil Stockpiles - Loosen soil to a depth of 50 millimetres and apply the Hydroseed mixture indicated in #1 above.

3. Buffer Zones - Spread 50 millimetres of topsoil and apply Hydroseed mixture, “Greenfields” by Pickseed, at an application rate of 200kg/ha.

   All areas that have not sustained any growth within 14 days of application shall receive supplemental applications until the surface vegetation is established.

- During the construction period, when internal street systems have had the asphalt installed, a street cleaning schedule will be undertaken on a minimum weekly basis, or as directed by the Municipality or Conservation Authority.

Implementation of the Principles

- The success of the erosion and sediment control plan, along with the protection of the environment and reduced construction costs, will be of a direct result of the understanding of how erosion and sedimentation problems produce negative effects upon the environment and the project.

- There is a responsibility for all to ensure erosion and sediment controls are designed, constructed, inspected and maintained at optimum functioning levels.

- Implementation, inspection and maintenance of sediment/erosion control measures lie with:

  A. Landowner / Devloper
  B. Site Field Inspector/ Engineering Firm (Primary);
  C. Builders;
  D. Contractors;
  E. Approval Agencies.

- On this basis, field inspections should be undertaken on a continuous basis pending site construction operations and rainfall events.