

**Management Plan – Erosion and Sedimentation Control  
(During Construction)**

**LEED® for BD+C:NC v4**

## Responsible Parties

Estimated Project Dates:

Establishment of perimeter:

Grading and demolition:

Utilities:

Foundations:

Facade completion:

Exterior paving:

Landscaping:

Interior completion:

Earth Work Contractor's Emergency 24-Hour Contact:

Construction Manager's Emergency 24-Hour Contact:

Owner's Emergency 24-Hour Contact:

**Table of Contents**

**Responsible Parties** ..... 2  
**Section 1: Overview**..... 4  
 1.0 Intent ..... 4  
 1.1 Description of Sections..... 4  
**Section 2: Site Evaluation, Assessment, and Planning 5**  
 2.0 Project/Site Information ..... 5  
 2.0.1 Local Water Path ..... 5  
 2.0.2 Regional Water Path ..... 6  
 2.1 Nature of the Construction Activity ..... 6  
 2.1.1 General Description of Project..... 6  
 2.1.2 Size of Construction Project ..... 6  
 2.1.3 Construction Support Activities..... 6  
 2.2 Sequence of Construction Activities and Controls ..... 7  
 2.2.1 Establishment of Perimeter ..... 7  
 2.2.2 Grading and Demolition..... 7  
 2.2.3 Utilities ..... 7  
 2.2.4 Foundations ..... 7  
 2.2.5 Facade Completion ..... 7  
 2.2.6 Exterior Paving..... 7  
 2.2.7 Interior Completion..... 8  
 2.2.8 Landscaping ..... 8  
 2.3 Site Maps ..... 8  
**Section 3: Potential Concerns** ..... 9  
 3.0 Erosion Source - Stormwater ..... 9  
 3.1 Erosion Source - Non-Stormwater ..... 9  
 3.2 Potential Sources of Pollution ..... 10  
**Section 4: Erosion and Sediment Control**..... 11  
 4.0 Erosion and Sedimentation Control..... 11  
 4.1 Natural Buffers ..... 11  
 4.2 Perimeter Protection ..... 11  
 4.3 Storm Drain Inlet Protection ..... 11  
 4.4 Soil Compaction Controls..... 11  
 Examples of Soil Compaction Controls ..... 12  
 4.4.1 Installation..... 12  
 4.4.2 Maintenance Requirements ..... 12  
 4.5 Sediment Basins ..... 12  
 Examples of Sediment Basins..... 12  
 4.5.1 Installation..... 13  
 4.5.2 Maintenance Requirements ..... 13  
 4.6 Sediment Track-Out Controls ..... 13  
 Examples of Track-Out Controls ..... 13  
 4.6.1 Installation..... 13  
 4.6.2 Maintenance Requirements (Wash Area)..... 14  
 4.6.3 Maintenance Requirements (Sedimentation Track-out Controls) ..... 14  
 4.7 Conveyance Channel Protection ..... 14  
 4.8 Slope Protection..... 14  
 Examples of Slope Protections ..... 14  
 4.8.1 Installation..... 15  
 4.8.2 Maintenance Requirements ..... 15  
 4.9 Stormwater Controls to Avoid ..... 15  
 4.10 Site Stabilization..... 16

4.11 Dust Control ..... 16  
 Examples of Dust Controls ..... 16  
 4.11.1 Installation ..... 16  
 4.11.2 Maintenance Requirements ..... 16  
 4.12 Stockpiling and Topsoil Protection ..... 16  
 4.13 Additional Guidance On-line ..... 17  
**Section 5: Pollution Prevention**..... 18  
 5.0 Spill Prevention and Response..... 18  
 5.1 Spill Containment Controls ..... 18  
 Examples of Spill Containment Controls ..... 18  
 5.1.1 Installation ..... 19  
 5.1.2 Maintenance Requirements ..... 19  
 5.2 Equipment and Vehicle Fueling and Maintenance ..... 19  
 Examples of Maintenance Controls ..... 20  
 5.2.1 Installation ..... 20  
 5.2.2 Maintenance Requirements ..... 20  
 5.3 Equipment and Vehicle Wash ..... 20  
 Examples of Wash Area Controls ..... 20  
 5.3.1 Installation ..... 20  
 5.3.2 Maintenance Requirements ..... 20  
 5.4 Applicator and Container Wash ..... 20  
 Examples of Material and Tool Wash Controls ..... 21  
 5.4.1 Installation ..... 21  
 5.4.2 Maintenance Requirements ..... 21  
 5.5 Landscaping and Construction Products ..... 21  
 Examples of Product Controls ..... 22  
 5.5.1 Installation ..... 22  
 5.5.2 Maintenance Requirements ..... 22  
 5.6 Demolition and Construction Waste..... 22  
 Examples of Waste Controls ..... 22  
 5.6.1 Installation ..... 23  
 5.6.2 Maintenance Requirements ..... 23  
 5.7 Sanitary Waste ..... 23  
 Examples of Sanitary Controls ..... 23  
 5.7.1 Maintenance Requirements ..... 24  
**Section 6: Training and Inspection** ..... 25  
 6.0 ESC Training ..... 25  
 Construction Manager(s) ESC Trainer..... 25  
 Training Requirements ..... 25  
 Training Report ..... 25  
 6.1 ESC Inspections and Corrective Action ..... 25  
 Construction Manager(s) ESC Inspector ..... 25  
 Inspection Procedure ..... 25  
 Inspection Report ..... 25  
 Corrective Action Procedure..... 26  
 Corrective Action Report ..... 26  
**ESC Appendices** ..... 27  
 Appendix A – Site Maps ..... 28  
 Appendix B – Sample ESC Training Log..... 29  
 Appendix C – Sample Inspection and Corrective Action Report..... 30  
 Appendix D – Sample Corrective Action Report..... 31

## Section 1: Overview

### **1.0 Intent**

The Erosion and Sedimentation Control Plan (ESC) is intended to serve as an educational, advisory, and reference document for the earthwork contractors and construction managers of this LEED project.

This written document describes areas of concern and the critical controls needed to limit sources of sediment, pollution and debris that can clog or contaminate the water and air leaving the site. Additionally, controls are described to limit on-site erosion and long term contamination of the project site. When a situation described in this plan is applicable to the project site, the responsible contractor is required to implement effective measures to limit erosion, sedimentation and/or pollution.

The drawings attached to this plan show the locations of the controls anticipated for this project, during the site grading process and the building construction process.

### **1.1 Description of Sections**

Section 2 is a project specific evaluation of the project site and phases of the construction process, highlighting the recommended controls for each phase and the suggested locations for those controls.

Section 3 is a project specific evaluation of the anticipated sources of erosion and pollution on site, including an analysis of the average and maximum weather patterns expected.

Section 4.0 is a project specific list of the individuals with overall responsibility for conformity with this Erosion and Sedimentation Control Plan. Section 4.1 is a project specific evaluation of natural buffers. The remainder of section 4 is reference information describing the most common erosion and sedimentation concerns and means to control those concerns.

Section 5.0 is a project specific list of the individuals responsible for spill control. The remainder of section 5 is reference information describing the most common pollution concerns and means to control those concerns.

Section 6 is a project specific list of the individuals responsible for personnel training and site inspection and correction and their required duties.

### **Please Note**

The methods recommended and locations suggested for controls are not meant to be exclusive of all other options. The responsible party on site must use their best judgment, knowledge of the particular situation, the materials and tools available to select, implement and maintain control methods that best suit the projects current erosion and pollution problems.

## Section 2: Site Evaluation, Assessment, and Planning

### 2.0 Project/Site Information

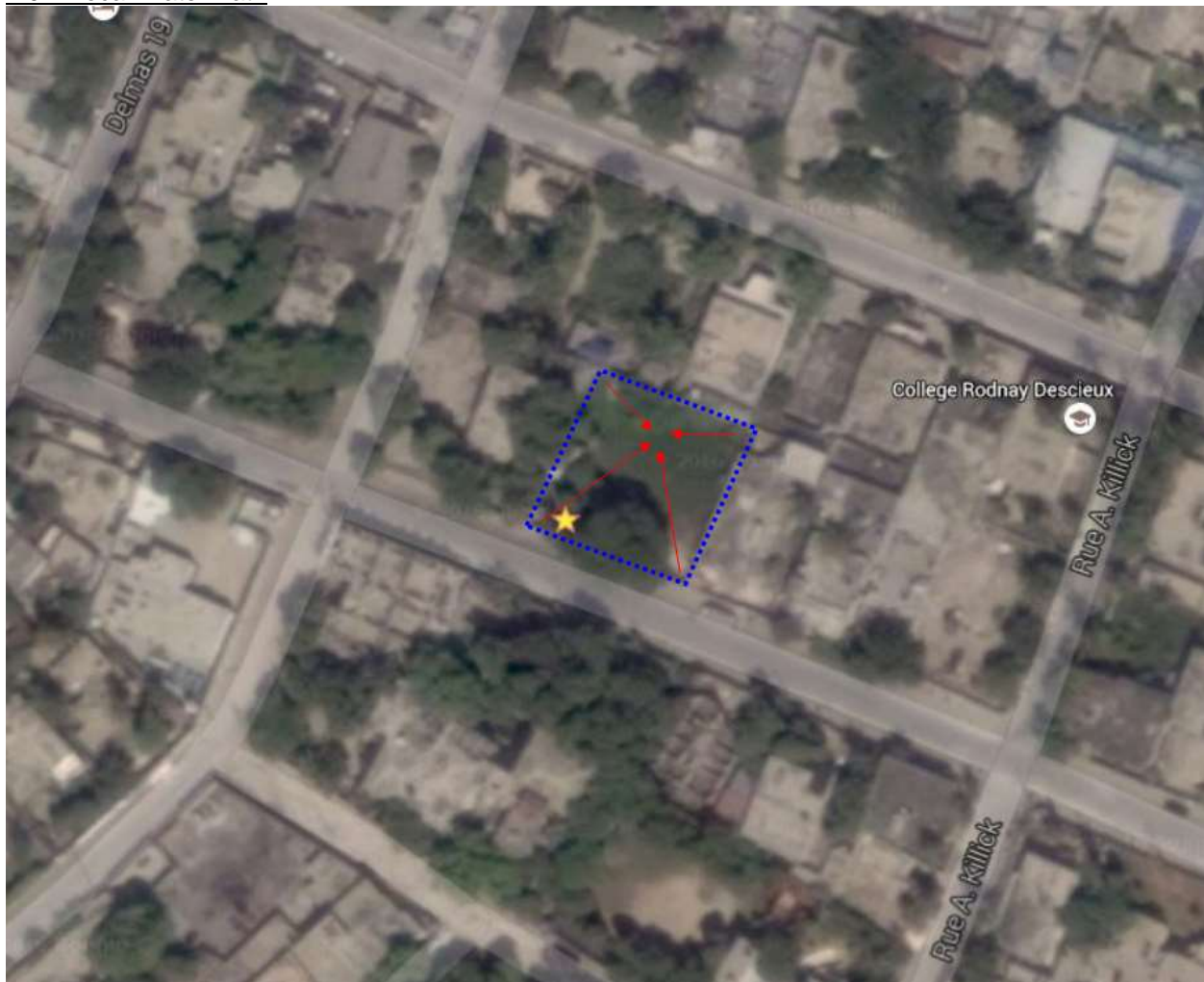
Project Name and Address

Project Latitude/Longitude

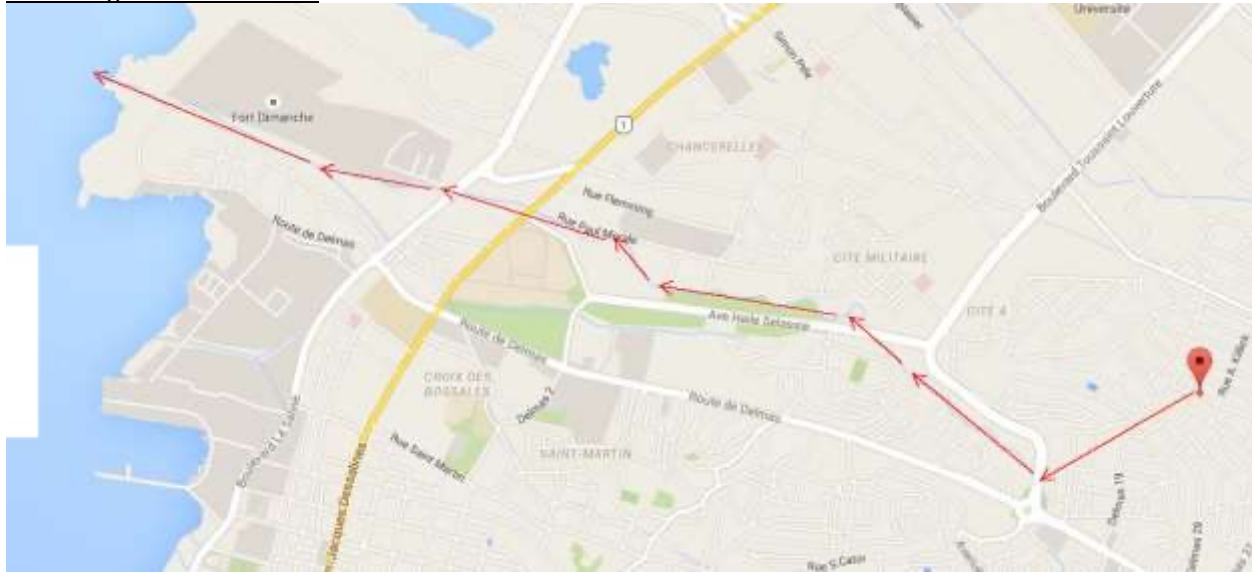
#### Additional Project Information

Is the project/site located on Native country lands, or located on a property of religious or cultural significance to a Native tribe?  Yes  No

#### 2.0.1 Local Water Path



## 2.0.2 Regional Water Path



## 2.1 Nature of the Construction Activity

### 2.1.1 General Description of Project

With pro-bono assistance from [redacted] and various organizations and firms specializing in multiple fields such as architecture, green design and innovative design solutions, a children's center is being constructed in [redacted]. [redacted] will act as an orphanage or temporary home for infants that will undergo adoption process. The site is located in the center of a heavily, urban residential area and is approximately 11,306.41sq ft.

Construction is expected is estimated to last for two years, assuming there are no delays of any type. It can be inferred that storm runoff flows through the municipal sewer system and makes its way west to the [redacted] Bay. Because the nature of this project is located in an urban environment and the site is small, the civil engineer or GC will need to strategically plan construction activities and limit disruption to neighboring properties.

### 2.1.2 Size of Construction Project

Site area: 1,050.40 square meters (.105 hectares), 11,306.41 square feet (.26 acres).

Over the course of the construction and site restoration activities, it is expected that the entire area will be disturbed in one way or another.

The maximum area to be disturbed at any one time will be during the earthworks involved in developing a new foundation for the building, upgrading the landscape area and accommodating for innovative technologies. This will be an estimated 1,050.40square meters (11,306.41 square feet).

### 2.1.3 Construction Support Activities

It is expected that a material staging area will be needed, including a concrete or grout mixing area. A waste collection and separation area will also be required. Both of these activities will be small scale operations, however, the GC will need to plan accordingly due to the small size of the project.

## **2.2 Sequence of Construction Activities and Controls**

### **2.2.1 Establishment of Perimeter**

During this phase the earthwork team designates their parking, moves vehicles and supplies to the site, and prepares for work.

#### ***Controls Added or Removed***

The project is surrounded by an existing wall, which will not be removed. There are no storm water inlets on site. The entire site will be disturbed, so no compaction controls are expected, however it is strongly recommended that only minimal traffic is allowed on the future septic area.

### **2.2.2 Grading and Demolition**

During this phase soil and fill will be excavated and leveled to create a base upon which the building will be built.

#### ***Controls Added or Removed***

Prior to excavation, sediment basins (section 4.5) and soil track-out controls (section 4.6) will be installed.

During construction, stockpile controls (section 4.12) will be used.

Temporary sediment basins will remain in place until the interiors are complete. Soil track-out controls will remain until landscaping is complete. Stockpile controls will be implemented as needed through the landscaping phase.

### **2.2.3 Utilities**

During this phase the new well and septic/disposal system will be installed and the old well removed.

#### ***Controls Added or Removed***

Temporary dewatering of the utility trenches may be required. If so, utilize a sediment trap to slow discharge water from the pumps (section 3.1).

### **2.2.4 Foundations**

During this phase the foundation will be poured.

#### ***Controls Added or Removed***

During this phase, materials staging and waste handling area controls will be installed.

Temporary dewatering of the foundation pit may be required. If so, utilize a sediment trap to slow discharge water from the pumps (section 3.1).

A concrete mixing station may be set up. If so, cementitious material wash-out controls should be installed (section 5.5). Material wash-out areas will remain until the completion of interiors.

### **2.2.5 Facade Completion**

During this phase, the majority of the building will be constructed, the roof and the majority of the exterior wall work completed.

#### ***Controls Added or Removed***

No new controls are anticipated.

### **2.2.6 Exterior Paving**

During this phase the sidewalk and parking areas will be excavated, prepared and the hardscape installed.

#### ***Controls Added or Removed***

No new controls are anticipated.

After this phase is complete, the cementitious material wash-out controls can be removed.

### 2.2.7 Interior Completion

During this phase any exterior finishes will be completed, the interior partitions and finishes completed, mechanical systems started up and commissioned and occupancy can begin.

#### *Controls Added or Removed*

No new controls are anticipated.

After this phase is complete, temporary sedimentation basins and soil compaction controls can be removed.

### 2.2.8 Landscaping

During this phase the landscaping will be installed and any remaining barren areas stabilized.

#### *Controls Added or Removed*

After this phase is complete, soil track-out controls, material and waste staging and stormwater inlet protections can be removed.

## **2.3 Site Maps**

Two site maps have been attached to this plan in Appendix A. The first shows the Erosion and Sedimentation controls and Pollution Prevention controls installed during site clearance and grading activities, the second during material staging and construction activities.

These maps include the following features:

- Boundaries of the site, grading activities, landscaping works, natural buffers, soil compaction controls, habitat for endangered or threatened species.
- Locations of surface waters, wetlands, crossing points, excavation stockpiles, material staging, waste handling, and construction exits.
- Site drainage pattern(s) before and after major grading activities.
- Locations of storm drain inlets and discharge locations.
- Locations of anticipated erosion and sedimentation controls and pollution prevention controls.



### Section3: Potential Concerns

#### 3.0 Erosion Source - Stormwater

##### Monthly Average Precipitation

Information Source

January:	33 mm
February:	58 mm
March:	86 mm
April:	49 mm
May:	54 mm
June:	102 mm
July:	74 mm
August:	145 mm
September:	175 mm
October:	170 mm
November:	89 mm
December:	33 mm

#### 3.1 Erosion Source - Non-Stormwater

Liquids discharged from the processes listed below may be released directly into municipal storm water systems only if they are not turbid and do not contain contaminants listed in Section 5. If the discharge water must travel across land before released into a sewer or surface water, the discharge should be directed into an energy dissipation control first, and then released into the projects system of on-site erosion and sedimentation controls.

	<i>Likely to be present?</i>	
Fire hydrant flushing	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Landscape irrigation	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Waters used to wash vehicles and equipment	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Water used to control dust	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Potable water including uncontaminated water line flushing	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Routine external building wash down	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Pavement wash down	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Air conditioning or compressor condensate	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Redirection of ground water or spring water	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Dewatering operations	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
Foundation drains or footing drain water	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

##### Contaminated or Turbid Discharges

Contaminated discharges must be handled according to local requirements. In rare cases these can be infiltrated on site or discharged to the municipal storm system, but most of the time they require removal to off-site treatment facilities.

Turbid discharges can often be filtered on site using appropriate on-site erosion and sedimentation controls.

##### Dewatering Operations

In addition to normal erosion and sedimentation controls, operations to remove water from excavations, trenches, foundations, vaults, or other points of accumulation must meet the following requirements:

- Backwash water from contaminated sources must be hauled away for proper disposal or returned to the beginning of the treatment process.
- Discharge must not contain visible floating solids or foam. If this is the case, use an oil-water separator or suitable filtration device if discharge contains oil, grease, or other products that cause visible solids or foam.
- Provide energy dissipation and speed reduction controls at all discharge points.
- Utilize vegetated areas of the site to infiltrate discharge unless infeasible.
- Replace and clean the pump filter media when pressure differential equals or exceeds the manufacturer's specifications.
- If using chemical treatment, must comply with local chemical treatment requirements.

**3.2 Potential Sources of Pollution**

Potential sources of pollution listed below should be considered when locating pollution prevention control measures, in order to prevent contamination of storm sewers, groundwater or receiving streams.

	<b><i>Likely to be Present?</i></b>	
Fueling and Maintenance of Equipment or Vehicles	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Washing of Equipment or Vehicles	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Washing of Applicators and Containers	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Hazardous Landscaping Products	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Hazardous Construction Products	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Demolition Waste	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Construction Waste	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Sanitary Waste	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

## Section 4: Erosion and Sediment Control

### 4.0 Erosion and Sedimentation Control

The following are the individuals with overall responsibility on the project site for installing, modifying and maintaining the required erosion and sedimentation controls. These individuals may also serve as the spill authority, trainer and inspector, but their primary duty is to implement the ESC:

Construction Manager(s) ESC Authority:

### 4.1 Natural Buffers

#### 4.1.1 Discharge Information

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)?

Yes  No

Does your project/site discharge stormwater into any surface waters?

Yes  No

Will an impermeable natural buffer or 15.25m (50') of permeable natural buffer be maintained between site disturbances and any surface waters?

Yes  No (If no, alternative buffers are required).

#### 4.1.2 Alternative Buffer Compliance

Not applicable.

### 4.2 Perimeter Protection

Not applicable.

### 4.3 Storm Drain Inlet Protection

Not applicable.

### 4.4 Soil Compaction Controls

Compacted limits infiltration rates long after construction is complete. Construction vehicles and material staging activities should remain clear of areas intended for infiltration in the future.

Effective measures to prevent unwanted soil compaction include: erecting hazard warning fencing or flags around the perimeter of the area to be avoided.

#### Examples of Soil Compaction Controls

##### *Fencing*

- Hazard warning fence, usually made of a fabric or mesh and always highly visible.
- Stakes should be placed every 2-4m (6-12ft) depending on soil conditions. Fencing should be of a height that is visible to all equipment operators. Height must be at least 1m (3ft) high but should be tall enough to be visible to all equipment operators. The fence material should be highly visible in inclement weather.

##### *Flags*

- Hazard warning flags staked into the ground at regular intervals.
- Flags should be placed every 3-6m (12-20ft). Height must be at least 1m (3ft) high but should be tall enough to be visible to all equipment operators. Flag material should be highly visible in inclement weather.

#### 4.4.1 Installation

- Areas of concern must be designated for the entire duration of the project.
- The warning systems must be installed prior to earth work and before construction.
- Protections must remain in place until construction is complete.

#### 4.4.2 Maintenance Requirements

- Soil compaction controls shall be inspected bi-weekly.
- An action plan must be executed within 1 week for controls approaching failure or 1 day for failed controls.

### **4.5 Sediment Basins**

Effective measures to slow and filter large volumes of moving water include: sediment traps and sediment basins. These must be designed to store the expected runoff from the 2 year, 24 hour storm and slow the release of that quantity or infiltrate the water within a reasonable time.

#### Examples of Sediment Basins

##### *Sediment Traps*

- Traps are excavated or bermed areas used as an energy dispersion method to slow stormwater or other runoff, allowing sediment to settle. Overflow often continues on to other filtration or conveyance methods or discharges into the municipal stormwater system.
- If trap receives a direct discharge from a point source such as a pump or drain outlet, the bottom of the trap should be lined with gravel or stones to dissipate impact energy. The minimum storage capacity is 1m<sup>3</sup>per 200m<sup>2</sup>(35cf per 7000sf) of total drainage area. Trap sides should be no greater than a 2:1 slope and the berm height should be no more than 1.5m (5ft) from the original ground level. Spillways should be 1.25m (4ft) long for a 0.4ha (1 acre) drainage area plus an additional 60cm (2') for each additional 0.4ha (1 acre) area (max. 2ha or 5 acres).

##### *Sediment Basins*

- Basins are natural depressions, excavated, or bermed areas that slow stormwater or other runoff, allowing sediment to settle and water to infiltrate. Overflow may continue on to other filtration or conveyance methods or discharge into the municipal stormwater system.
- Minimum basin volume should be able to safely contain twice the estimated 2 year, 24 hour storm runoff from the entire area feeding the basin.

#### 4.5.1 Installation

- Initial sediment basin controls should be designated for each major stage of site work and construction and these arrangements must be installed prior to the construction of conveyance channels for their stage of work.
- Sediment basins may be relocated at the construction manager's discretion to meet the evolving needs of grading, material staging and construction efforts, but no reductions are allowed in protection. This protection must remain in place until construction is complete or they are rendered obsolete by other stormwater management methods.

#### 4.5.2 Maintenance Requirements

- All sedimentation basins shall be inspected after each major rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- An action plan must be executed within 1 week for controls approaching failure or 1 day for failed controls.
- Sediment must be removed before it has reached one-half of the volume of any sediment basin.

### **4.6 Sediment Track-Out Controls**

Effective methods to minimize the amount of soil removed from the site by vehicles and pedestrians include: specified exit points, gravel pads, and wheel or vehicle wash stations with dedicated sediment traps.

#### Examples of Track-Out Controls

##### *Gravel Pads*

- Gravel areas over filter cloth placed at construction exits. Gravel pad stabilizes entrance and removes mud and sediment from construction equipment to keep it on-site.
- Pads should be placed at any point where vehicles or large volumes of pedestrians leave the site. Pads should be wide enough to comfortably accommodate the largest vehicle(s) or number of people that will exit the site simultaneously. Flare pads at connections to paved roadways and avoid using sharp-edged stone.
- Maintain pads until the rest of the site has been fully stabilized. Replace lost gravel from pad as needed and immediately sweep up soil that is tracked out for proper disposal.

##### *Wash Stations*

- Wheel washing should occur at designated exits from the site, to be used by all vehicles with mud, dirt and gravel attached to the tires or body of the vehicle.
- Boot washing should occur at designated exits from sites with large numbers of workers, to be used by all workers with mud, dirt and gravel attached to their shoes.
- If biodegradable or non-toxic soaps or detergents are used, wash areas can be constructed of a filter fabric overlaid by sufficient gravel to withstand the expected traffic, and should contain a water supply and tools as needed. Wash water must be directed into a dedicated sediment trap, basin or vegetated ditch (see section 4.5) that is **not** connected to the rest of the site's stormwater conveyance measures.
- Where non-biodegradable or toxic soaps or detergents **are** used, the wash must be conducted on an impermeable surface or deck utilizing spill containment controls (section 5.2), with a controlled drain to an impermeable container for proper off-site disposal of contaminated liquids. Where possible, these areas should be covered by a roof in order to reduce the amount of water that must be properly disposed.

#### 4.6.1 Installation

- Construction site exits should be designated by the construction manager for each major stage of site work and construction.

- Exit controls must be installed before earth work and construction if material delivery and site work vehicles or personnel will be traversing large areas of dirt or landscape.
- Protections must remain in place until construction is complete, they are rendered obsolete by a new phase of construction, or the site is fully stabilized.

#### 4.6.2 Maintenance Requirements (Wash Area)

- All wash area controls shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Any lax in requirements should be determined and an action plan executed to improve compliance.

#### 4.6.3 Maintenance Requirements (Sedimentation Track-out Controls)

- All sedimentation track-out controls shall be inspected after each major rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Sediment tracked off-site must be removed within 1 day.
- The sediment must be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Hosing or sweeping tracked-out sediment into a storm drain inlet or surface water is prohibited (unless it first runs through and on-site sediment basin, sediment trap, or similarly effective control).
- An action plan must be executed within 1 week for controls approaching failure or 1 day for failed controls.

#### **4.7 Conveyance Channel Protection**

Not applicable.

#### **4.8 Slope Protection**

Effective measures to prevent the disturbance of steep slopes include compost blankets, geotextiles, terracing, and sodding.

Shallow slopes can employ the measures listed above, but also may benefit from less intense erosion control methods, such as mulching, seeding, and soil roughening.

#### Examples of Slope Protections

##### *Compost Blankets*

- Loosely applied composted material laid over soil in disturbed areas to reduce runoff, prevent channelized flow and promote re-vegetation. Compost should meet all local and national requirements.
- Effective on areas with slopes up to 1:1. Netting should be used on steeper slopes for stability. Berms should be used in conjunction blankets in areas of high runoff. Blankets should not be used in areas of existing channelized flow or known point source runoff.

##### *Geotextiles*

- Permanent or semi-permanent, permeable fabrics made to contain soil and rock and encourage vegetation growth. Considerations include selecting a textile that will degrade slower than vegetation will grow and ensuring that installation is secure and does not in fact increase runoff.
- Effective on areas with slopes up to 1:2.

### *Terracing*

- Permanent earthen embankments or ridge and channel systems which slow and collect runoff. Terraces are most effective in barren areas with existing or expected runoff problems.
- Do not build terraces on rocky or sandy soil that may not adequately redirect runoff. Terraces should be designed with outlets to areas that are not highly susceptible to erosion.

### *Sodding*

- Sheets of mature grasses laid down over a slope to provide instant vegetated cover, stabilizing soils and slowing runoff.
- Seed mixes containing native and adapted, non-invasive plants should be used when sodding an area. Because the plants are established, it can be laid in areas that cannot be readily vegetated by seed and during times of the year where seeding is more likely to fail, but must be watered to maintain adequate moisture, especially within the first few weeks.

### *Mulching*

- A layer of mulched wood chips, grass, hay, wood fibers, straw or gravel used to stabilize exposed or recently planted soils surfaces and filter runoff. Most effective when combined with vegetation.
- Use natural mulches when possible that are free of seeds. Mulches may require a binder, netting or tacking to anchor them in place on steeper slopes.

### *Seeding*

- Planting inexpensive vegetative cover to control runoff and erosion as a long term solution.
- Seed mixes containing native and adapted, non-invasive plants should be used on roughly graded areas that will not be altered for at least a year. Combine with mulching on slopes 2:1 or steeper.

### *Soil Roughening*

- Increases the relief of bare soil with grooves running parallel to the slope's contours.
- Roughening is appropriate for flat areas but is especially effective on slopes up to 2:1. Roughening can be done with only the wheels or tracks of mid-sized vehicles, but tracked vehicles are not recommended. Roughened soil should be combined with seeding as soon as possible if a long-term strategy is desired.

#### 4.8.1 Installation

- Slope protections are designated for each major stage of site work and construction but may move at the construction manager's discretion do to the evolving needs of grading, material staging and construction efforts.
- The initial arrangement must be installed after earth work and before construction or immediately after a temporary stop in activity.
- Protections must remain in place until construction is complete or they are rendered obsolete or relocated for a new phase of construction.

#### 4.8.2 Maintenance Requirements

- All slope protections shall be inspected after each major rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- An action plan must be executed within 1 week for controls approaching failure or 1 day for failed controls.

### **4.9 Stormwater Controls to Avoid**

The stormwater controls recommended here are not intended to be an exhaustive list of options available to the earthwork team or construction manager to slow and filter stormwater leaving the project site. Local or regional variations or solutions exist in many forms, with varying degrees of success. However, there are some common examples of erosion and sedimentation controls which often fail to meet expectations. The following control methods are not recommended:

***Straw or Hay Bales***

- Straw or hay bales have traditionally been used as check dams, inlet protection and perimeter controls, however, they are often maintenance intensive, inappropriately installed and less effective than they appear. Due to inadequate installation or maintenance, they have a high failure rate.
- They are nearly impermeable, often diverting water around them through narrow gaps, increasing channel erosion. They float or roll when not properly staked, their bindings will degrade and break if made of string, and they are often too heavy to move once waterlogged. Once they fall apart, they contribute to debris in the stormwater stream.
- Fiber rolls are preferred over straw or hay bales because they are smaller, more portable and more easily installed, used only for low-flow applications, and wrapped in a fabric or wire mesh to prevent them from falling apart.

**4.10 Site Stabilization**

If work on site should be put on hold or canceled, all exposed soils shall be seeded with a native or adapted plant mix. All steep slopes shall be stabilized with an appropriate, permanent measure according to section 4.8. These erosion and sedimentation controls must be in place within two weeks of work stoppage.

**4.11 Dust Control**

Effective methods to minimize dust generated by exposed soil, sand or gravel, stockpiled building materials or demolition activities include watering, polymer flocculation,

**Examples of Dust Controls*****Watering***

- Spraying or misting bare soil, roads or stockpiles of stone or masonry with water until it is moist enough to retain dust. Misting can remove dust particles from the air around masonry cutting or demolition operations as well.

***Polymer Flocculation***

- Spraying or misting bare soil, roads or stockpiles of stone or masonry with chemical compounds to bind loose particles together.
- Chemical sprays are closely regulated and may create larger pollution problems.

**4.11.1 Installation**

- Immediately following earth work and before construction, dust control efforts must begin.
- Action should be taken as needed after prolonged periods without rain and before a period of predicted high winds or whenever the construction manager notices construction vehicles kicking up dust on site.
- Dust control efforts must continue until construction is complete.

**4.11.2 Maintenance Requirements**

- Reapply as needed.

**4.12 Stockpiling and Topsoil Protection**

- Any stockpiled soil, sand, gravel or masonry that will remain unused for more than 1 day should be protected through the measures noted under 4.8 and 4.11.



- Any topsoil removed as part of excavation, site work or hardscape construction must be deposited elsewhere on site and should be protected through the measures noted under 4.8 and 4.11. Coordinate with the landscape designer to determine the best locations for excess topsoil.

#### **4.13 Additional Guidance On-line**

For more information on specific control methods, their applicability and common difficulties refer to the EPA Best Management Practice website for construction, located here:

<http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm>

A wiki briefly describing the erosion and sedimentation controls listed here, along with representative photos, is located here:

[http://epg.modot.org/index.php?title=Category:806\\_pollution%2C\\_erosion\\_and\\_sediment\\_control#Temporary\\_Seeding\\_and\\_Mulching](http://epg.modot.org/index.php?title=Category:806_pollution%2C_erosion_and_sediment_control#Temporary_Seeding_and_Mulching)

## Section 5: Pollution Prevention

### **5.0 Spill Prevention and Response**

Notify the property owner and the proper local or national government agency immediately after containing a spill of significant proportions. Within 7 days of the incident, deliver a report of the details of the spill, the individuals notified, and the actions taken to remediate the area.

The follow lists the individuals responsible for detection and response to spills or leaks:

Construction Manager(s) Spill Authority:

Construction Manager's Emergency 24-Hour Contact:

Owner's Emergency 24-Hour Contact:

Local or National Government Emergency Spill Response Contact:

None.

### **5.1 Spill Containment Controls**

Sections 5.1 through 5.6 describe potential sources of hazardous liquids. In areas where hazardous liquids can be produced or spilled, contaminant controls must be used. Effective methods of containing spills include absorbent materials, drip pans, spill containment pallets and impermeable berms.

- Ensure adequate supplies are available at all times handle spills, leaks, and disposal of hazardous liquids in areas where spills are likely to occur.
- Upon identification of a spill or leak of fuels, oils, hydraulic fluids, petroleum products or other chemicals, immediately stop the source of the leak and contain the spill.
- Clean up spills using a dry clean procedure whenever possible. Never clean an area by hosing it down, the pollutants become suspended and cannot be controlled.
- Hazardous liquids must be stored in closed, water-tight containers, and covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by a spill containment control.

Examples of Spill Containment Controls

#### **Absorbent Materials**

- Absorbent fabrics or dusts can be used as a pre-emptive measure in an area where spills may occur. This is a quick and easy method to employ when permanent measures are not available.

- When hazardous spills do occur, absorbent materials must be used to soak up the spill until little or no liquid remains. The fabrics or dusts should then be deposited directly into water-tight receptacles within or adjacent to the contained spill for proper disposal.
- Water should not be added to a contaminant spill unless absolutely required to remove the final remnants.

#### *Drip Pans*

- Portable drip pans are commercially available, very low capacity methods of containing slow leaks from a broad area. They should be used only when maintenance or fueling is sporadic or conducted in various areas around the site, or under containers where slow leaks can be quickly detected.
- Large, immobile, leak-proof drip pans can also be constructed using cement or metal plates.

#### *Spill Containment Pallets*

- Spill containment pallets are commercially available products that serve as forklift-portable trays capable of containing large spills or leaks from the containers stacked on top of them. These can serve as long term storage devices or as self-contained spill controls for small volumes of liquid.

#### *Impermeable Walls or Berms*

- Impermeable can be constructed of permeable materials or impermeable materials such as grouted masonry block, concrete curbs, metal sheet or other board materials. If a semi-permeable material is used to create the berm, it must be covered with a durable, impermeable sheet such as a thick plastic tarp to make it impermeable. The sheet should be buried under the soil on the inside of the berm, to a depth sufficient to prevent undercutting of the berm.
- Vertical barriers typically used for security purposes, made of impermeable materials and held in place by substantial wood or metal posts, may also function as erosion and pollution controls as well when properly designed.
- The wall or berm must be designed to completely contain the largest anticipated rainfall, plus an allowance for simultaneous additions of liquid spills. Consideration should be given to the controlled draining of areas completely surrounded by impermeable walls or berms.
- Sheet metal, masonry, or boards that comprise a wall must extend a minimum of 15-30cm (6-12") into the ground. Where rock or concrete does not allow a wall to extend into the earth, other perimeter controls may be needed upstream of the hardscape to prevent sediment from penetrating the barrier.

#### 5.1.1 Installation

- Spill containment measures should be constructed prior to conducting activities that may generate contaminant spills. If this is unfeasible, they should be erected immediately after the need has been identified (if it occurs once, it is likely to occur again).

#### 5.1.2 Maintenance Requirements

- All spill containment controls shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Any lax in requirements should be determined and an action plan executed to improve compliance.

### **5.2 Equipment and Vehicle Fueling and Maintenance**

All fueling and vehicle maintenance areas located on site must comply with the following requirements.

- Confine known leaky vehicles and equipment to staging areas equipped with a spill containment control when they are stationary.
- Fuels, oils, hydraulic fluids, petroleum products, and other chemicals used by equipment and vehicles must be stored in closed, water-tight containers, and covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by a spill containment control.

## Examples of Maintenance Controls

### *Maintenance Deck*

- Maintenance decks should be constructed on sites where regular maintenance and fueling operations are expected. They must have an impermeable surface surrounded by spill containment measures (section 5.2) and have a controlled method to drain into an impermeable container, allowing for proper off-site disposal of contaminated liquids.
- Where possible, these areas should be covered by a roof in order to reduce stormwater additions to the liquid that must be properly disposed.

### 5.2.1 Installation

- Decks and containment measures of an appropriate scale should be installed prior to fueling and maintenance operations. If this is unfeasible, they should be erected immediately after the need has been identified (if it occurs once, it is likely to occur again).

### 5.2.2 Maintenance Requirements

- All maintenance controls shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Any lax in requirements should be determined and an action plan executed to improve compliance.

## **5.3 Equipment and Vehicle Wash**

Vehicle and equipment wash operations contain contaminants such as fuels, oils and fluids as well as the detergents, soaps, or solvents used in the wash process.

- Soaps, detergents and other cleaning chemicals must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.2).

## Examples of Wash Area Controls

### *Wash Areas*

- See section 4.5 Sediment Track-Out Controls.
- Vehicle and equipment washing can occur at any designated location on site that is separate from maintenance and fueling areas.

### 5.3.1 Installation

- See section 4.5 Sediment Track-Out Controls.
- Vehicle and equipment wash areas can be installed as needed.

### 5.3.2 Maintenance Requirements

- See section 4.5 Sediment Track-Out Controls.

## **5.4 Applicator and Container Wash**

Waste water from the cleaning of applicators or containers of stucco, grout, concrete, curing compounds, form release oils, paints, fuels, oils, petroleum products and other chemicals can permanently damage storm sewers or receiving streams.

- Wash-out areas of the types listed below should be clearly marked and communicated to the construction team and located as far as possible from surface waters or stormwater conveyance systems.
- Soaps, detergents and cleaning chemicals must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.2).

### Examples of Material and Tool Wash Controls

#### *Cementitious Material Wash Areas*

- Wash-out water containing cementitious materials is highly caustic, with a pH near 12. Operations must be conducted on a maintenance deck (section 5.2) or otherwise limited within leak-proof container or pit, designed such that overflow cannot occur due to the combination of stormwater and wash activities. Untreated wash-out water cannot be infiltrated on site or discharged to municipal stormwater or surface waters.
- Untreated wash-out water, filtered particulates and hardened material must be disposed of according to section 5.6.
- To treat cementitious material wash-out water, it must first be filtered for particulates and its pH reduced below 8.5 before being released.
- After filtration and neutralization, waste water from these processes may be directed into a sediment trap that is separate from the rest of the site's stormwater management systems, and designed such that overflow cannot occur due to the combination of stormwater and wash activities.

#### *Hazardous Material Wash Areas*

- Operations must be conducted on a maintenance deck (section 5.2) or otherwise limited within leak-proof container or pit, designed such that overflow cannot occur due to the combination of stormwater and wash activities.
- Remove and dispose of liquid waste according to section 5.6.

#### 5.4.1 Installation

- Wash areas must be prepared prior to conducting wash-out activities.

#### 5.4.2 Maintenance Requirements

- All wash area controls shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Cementitious waste receiving areas should be allowed to infiltrate before exceeding 75% capacity, and hardened sediment should be removed before permeability of the sediment trap is reduced by more than 50%.
- Hazardous waste receiving areas should be emptied and properly disposed before exceeding 75% capacity.
- Any lax in requirements should be determined and an action plan executed to improve compliance.

### **5.5 Landscaping and Construction Products**

Many construction products can leach harmful chemicals into the soil if staged together in large quantities and left exposed. Examples include asphalt sealants, copper flashing, roofing materials, adhesives and concrete admixtures. Additionally, construction chemicals such as paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds or acids can spill in areas where they are stored. Landscaping products also have particularly direct effects on local and regional water systems.

- If any of the construction materials listed below will be washed prior to installation, or if their containers will be washed out after use, refer to guidance under section 5.3.

### Examples of Product Controls

#### *Building Products That Leach Hazardous Substances*

- Must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.1).

#### *Pesticides, Herbicides, Insecticides, Fertilizers*

- Must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.1).
- Should be applied no more frequently than the rate specified by the manufacturer and should be applied at a time of year, and in a manner that allows maximum uptake by vegetation to reduce runoff.
- Additionally, these products should never be applied within 24 hours of a rain event (see section 3.0), to frozen ground or stormwater conveyance channels.
- All local and national regulations must be followed.

#### *Fuels, Oils, Hydraulic Fluids, Petroleum Products and Chemicals*

- Areas for the storage of these liquids require containment controls (section 5.1).

#### 5.5.1 Installation

- Storage areas should be prepared prior to receiving potentially hazardous construction materials on site. If this is unfeasible, they should be erected immediately after a shipment arrives if the products are not to be installed or used up within 24 hours.

#### 5.5.2 Maintenance Requirements

- All material storage areas shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- Any lax in requirements should be determined and an action plan executed to improve compliance.

### **5.6 Demolition and Construction Waste**

Litter, construction debris, and construction chemicals that could be exposed to storm water must be prevented from becoming a pollutant source in storm water discharges. Special care is required for hazardous demolition and construction waste.

Effective measures for reducing blown or waterborne construction debris include policing material staging, waste handling and construction housing areas for loose trash and designating only closable dumpsters for lightweight construction waste such as paper and plastic.

- Waste control areas should be located away from municipal stormwater inlets, surface waters or site stormwater conveyance measures.
- The area should not receive substantial quantities of stormwater from neighboring areas.
- Dispose of or recycle hazardous waste per local and national requirements.

### Examples of Waste Controls

#### *Receptacles*

- Provide sufficient containers for domestic, demolition and construction landfill waste, recyclables, and hazardous materials. Waste receptacles should not be allowed to overflow.

- Waste receptacles for lightweight materials should have lids or placed within a shelter to prevent waste from blowing out.
- Waste receptacles for building products that leach hazardous chemicals must be covered by temporary or permanent waterproof measures (such as plastic sheeting, a roof, or integrated lids) to prevent hazardous liquid spills.

#### **Hazardous and Toxic Waste including Chemicals and Containers**

- Separate hazardous and/or toxic waste from construction and domestic waste.
- Must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.2).
- Ensure adequate supplies are available at all times handle spills, leaks, and disposal of hazardous liquids in waste handling areas.
- Upon identification of a spill or leak, immediately stop the source of the leak and contain the spill.
- Clean up spills using a dry clean procedure whenever possible. Never clean an area by hosing it down, as the pollutants will become suspended and cannot be controlled.
- Dispose of according to local and national requirements.

#### **5.6.1 Installation**

- Waste storage areas should be prepared prior to receiving potentially hazardous construction materials on site. If this is unfeasible, they should be erected immediately after a shipment arrives if the products are to be installed or used within 24 hours.

#### **5.6.2 Maintenance Requirements**

- All waste handling areas shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis.
- The construction site in general shall be inspected on a monthly basis for sources of loose trash. The source of any accumulation of loose debris should be determined and an action plan executed to improve compliance.

#### ***5.7 Sanitary Waste***

- Untreated sanitary waste cannot be discharged to the municipal stormwater system, to surface waters or infiltrated on site.
- On-site septic or composting facilities must meet local and national standards.
- Any separately stored sanitary waste must be stored in closed, water-tight containers and either covered by temporary or permanent waterproof measures (such as plastic sheeting or a roof) and kept elevated at least 5cm (2") off the ground, or protected by spill containment controls (section 5.1).
- Any sanitary waste removed from the site must be disposed of in a manner according to local and national laws.

#### **Examples of Sanitary Controls**

##### ***Portable Toilet Facilities***

- Portable toilets should be placed on solid, flat ground, preferably elevated at least 5cm (2") above grade. They should be secured to prevent tipping over.

##### ***Temporary Toilet Facilities***

- Temporary toilets should be securely piped to a holding tank which can be emptied directly into the municipal sanitary system or treated at an appropriate facility Installation

**5.7.1 Maintenance Requirements**

- All temporary sanitary handling areas shall be inspected after each rain event (>0.5cm or 0.25" of rain), and on a bi-weekly basis for leakage or overflow.
- Any lax in requirements should be determined and an action plan executed to improve compliance.



## Section 6: Training and Inspection

### **6.0 ESC Training**

The following are the individuals responsible for training personnel listed under training requirements:

Construction Manager(s) ESC Trainer

### Training Requirements

The following personnel, at a minimum, must receive training on the content and directions in this plan:

- Personnel responsible for the design, installation, maintenance, and/or repair of stormwater controls (including pollution prevention measures).
- Personnel responsible for conducting inspections and taking corrective actions.

The required personnel must be trained to understand the following as related to the scope of their duties:

- The location of all stormwater controls to be used on site, and how they are to be maintained.
- The proper procedures to follow with respect to the permit's pollution prevention requirements.
- When and how to conduct inspections, record applicable findings, and take corrective actions.
- How to apply and store treatment chemicals (if applicable).

### Training Report

Appendix B contains a sample inspection report form.

### **6.1 ESC Inspections and Corrective Action**

The following are the individuals responsible for regular inspections and implementation of corrective actions noted in section 6.4:

Construction Manager(s) ESC Inspector

### Inspection Procedure

Inspections must occur bi-weekly and after every rain event of more than 0.5 cm or 0.25 inches of rain.

The controls or protections to be inspected are detailed in section 3 and 4.

### Inspection Report

Appendix C contains a sample inspection report form.

**Corrective Action Procedure**

Corrective actions required in each case be situational, but will generally fall under the identification and repair of failing or failed measures.

Corrective actions may also include initiative-taking actions such as preparing for known upcoming events, changing, relocating, adding, removing or improving control methods in order to best address issues on the ground with the current conditions. This is encouraged and no portion of this plan is meant to limit the construction team to measures that they are not familiar with or were not positioned effectively in the planning phase.

**Corrective Action Report**

Appendix D contains a sample inspection action form.

## ESC Appendices

Attach the following documentation to the ESC:

- Appendix A – Site Maps
- Appendix B – Sample Training Report
- Appendix C – Sample Inspection Report
- Appendix D – Sample Corrective Action Report

*Appendix A – Site Maps*

**Appendix B – Sample ESC Training Log**

Stormwater Pollution Prevention Training Log

Project Name:  
 Project Location:  
 Instructor's Name(s):  
 Instructor's Title(s):  
 Training Location:  
 Training Date:  
 Training Length:  
 Training Topic(s):

- Sediment and Erosion Controls
- Stabilization Controls
- Pollution Prevention Measures

- Emergency Procedures
- Inspections/Corrective Actions

Attendees:

Name of Attendee	Company	Role

**Appendix C – Sample Inspection and Corrective Action Report**

Date of Inspection	Location of Control Inspected	Description of Control Condition	Recommended Actions	Date of Completion

***Appendix D – Sample Corrective Action Report***