STORM WATER POLLUTION PREVENTION PLAN FOR CONSTRUCTION

FOR

THE SANCTUARY

Prepared for

Tim Charlwood

March 31, 2008

Updated

Aug. 9, 2012

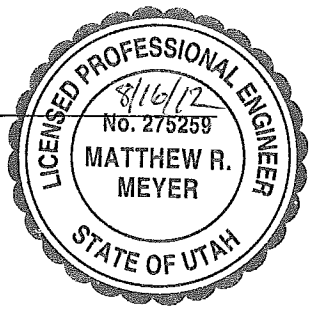
Prepared by

Hansen and Associates
538 N. Main

07-129
SWPPP

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Matthew R. Meyer, PE
Civil Engineer



SITE CONTACT INFORMATION

SITE OWNER	*PHONE/FAX/MOBILE*	*ADDERSS*
Tim Charlwood *Signature*	*801-901-2337*	*P.O. Box 980400* *Park City, UT 84098*
PROJECT CONTRACTOR		
Dig-It Excavating *Pat Brennan* *Signature*	*801-430-7217*	*P.O. Box 1037* *Eden, UT 84310*
PROJECT EROSION LEAD	*24-HOUR CONTACT*	
Pat Brennan *801-430-7217*	*Pat Brennan* *801-430-7217*	

Revision Schedule

This storm water pollution prevention plan (SWPPP) should be revised and updated to address changes in site conditions, new or revised government regulations, and additional on-site storm water pollution controls.

All revisions to the SWPPP must be documented on the SWPPP Revision Documentation Form, which should include the information shown below. The authorized facility representative who approves the SWPPP should be an individual at or near the top of the facility's management organization, such as the president, vice president, construction manager, site supervisor, or environmental manager. The signature of this representative attests that the SWPPP revision information is true and accurate. Previous authors and facility representatives are not responsible for the revisions.

SWPPP Revision Documentation Form

Number	Date	Author	Company Representative Signature
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

FIGURES AND DRAWINGS

Following Report

Figures

1 CONSTRUCTION ENVIRONMENTAL SUMMARY

1.1 Summary

In September of 2007, S & S Excavation began construction of a single family subdivision located at Maple Drive in Huntsville, Utah. The project site's latitude is 41° 17' 10" North and the longitude is 111° 43' 05" West.

The site ultimately drains to the west into drainage channel that will convey flow westerly to the Pine View Resevoir and finally to Willard Bay. Prior to leaving the site, the runoff will pass through several desilting basins including stream check dams, and a detention pond. This *Storm water Pollution Prevention Plan* details all of the protective environmental measures, which will be employed during construction of the project.

Perhaps most innovative and protective of all measures designed for use is the storm water treatment system which treats all storm water collected during construction to produce clear, clean, and non-toxic water for discharge into the drainage basin stream. Designed as an integrated *Best Management Practice* (BMP) to complement the other BMPs described in this plan, the storm water treatment system provides a fail-safe method for ensuring only clean water leaves the site.

1.1.1 Project Description

The 323.3 acre site is Part of Section 3 & 4, Township 6 North, Range 2 East of the Salt Lake Base and Meridian. The site will be developed as a single family subdivision consisting of 6 lots and all associated roads and drives. There will be a single point of ingress/egress for this project at Maple Drive.

1.1.2 Existing Site Conditions

The existing site construction is underway with the majority of the excavation completed. The roads have the first layer of granular borrow placed and have the rough grading complete. The previous SWPPP silt fencing other BMP's are still in place. The site is vegetated with native grasses, shrubs and trees. The site topography is mountainous and slopes range from 5% to greater than 30%. The slope of the entry drive and adjacent channel range from 5% to 15%.

1.1.3 Adjacent Areas

Due to the area of the site, runoff from adjacent areas around the project site will enter the project site and drain as historically to the Maple Canyon Creek (snow melt and storm runoff). Ultimately, onsite and offsite runoff will drain to the Pineview Reservoir and discharge into the Willard Bay.

1.1.4 Critical Areas

There are no protected bodies of water, public rights of way on streams or lakes and therefore no critical areas onsite. Threatened and endangered species will be identified at a later date.

1.1.5 Soils

The project site lies within four soil groups. Approximately 6% of the site lies within the Foxol-Rock outcrop complex (FrG) soils group. This soil is a rock outcrop with 22.5% clays, 39.8% sands, and 37.7% silts. The depth to any restrictive layer is 36cm . The Kw factor for the soil is .10 on a scale of 0.2 to 0.69 with larger numbers being more suseptable to erosion. The wind erosion factor is 0 tons per acre per year. The soil is rated very limited for development due primarily to steep slopes and large stones. An additional 14% of the site lies within the Patio gravally loam (PdG) soils group. This is soil has a gravally loam texture with 26.8% clays, 37.6% sands, and 35.6% silts. The depth to any restrictive layer is 66cm. The Kw factor for the soil .10 on a scale of 0.2 to 0.69 with larger numbers being more suseptable to erosion. The wind erosion factor is 38 tons per acre per year. The soil is rated very limited for development due primarily to steep slopes and large stones. An additional 34% of the site lies within the Durfee stony loam (DeG) soils group. This is soil has a stony loam texture with 37.8% clays, 30.6% sands, and 31.6% silts. The depth to any restrictive layer is exceeds 200cm which means they have not been determined. The Kw factor for the soil .10 on a scale of 0.2 to 0.69 with larger numbers being more suseptable to erosion. The wind erosion factor is 0 tons per acre per year. The soil is rated very limited for development due primarily to steep slopes and large stones. An additional 46% of the site lies within the Smarts loam (SfG) soils group. This is soil has a loam texture with 28.3% clays, 36.8% sands, and 34.9% silts. The depth to any restrictive layer is exceeds 200cm which means they have not been determined. The Kw factor for the soil .24 on a scale of 0.2 to 0.69 with larger numbers being more suseptable to erosion. The wind erosion factor is 48 tons per acre per year. The soil is rated very limited for development due primarily to steep slopes and large stones.

1.1.6 Erosion Problem Areas

The project site is situated in a mountainous area and due to the steep nature of the site, portions of the site have been identified to have debris flow risks. These areas are beyond the areas disturbed by development with this project. Propertly stabilized soils should not be an erosion problem. Again, due to the steep nature of the site, it will be important to stabilize disturbed soils.

1.1.7 Construction Phasing

The project is planned for one phase. However, due to the nature of the winter season in the mountains in Huntsvilleand the approval process with Weber County, the project is being constructed in mutiple phases. Phase 1 began construction of rough grading roadways and contruction of retaining walls. Phase 2 will include final grade and construction of the roadways and installation of power and phone utilities.

1.1.8 Construction Schedule

Phase 1
Rough grade roads – (9.9 AC) disturbed
Commence – September 2007
Completion – December 2007
Retaining Walls – (0.1 AC) disturbed
Commence – October 2007
Completion – December 2008

Phase 2
Pavement – (0AC) Previously disturbed
Commence – August 2012
Completion – August 2013
Utilities – (0.8AC) disturbed
Commence – August 2012
Completion – August 2013

1.1.9 Financial/Ownership Responsibilities

Tim Charlwood is financially responsible for the implementation of this Stormwater Pollution Prevention Plan. Dig-It Excavating will provide all BMP installation, modification and upkeep. Hansen and Associates will provide all site inspections for the duration of the project.

1.1.10 Engineering Calculations

The recommended detention volume is 3600 cubic feet per acre. The project site is 323.3 acres. However, approximately 10 acres will be disturbed. This generally requires a detention pond / desilting basin of 0.8 acre feet. The existing and proposed site topography will not allow for such a large pond. The county has agreed to allow two detention ponds with a total capacity of 0.22 acre-feet due to site topography and level of disturbance. It should be noted that multiple check dams will be utilized to reduce sediment migration. In addition to this, other BMP's will be employed to further mitigate sediment conveyance. These BMP's include gravel wattles, sand bags, rip rap velocity dissipation and other BMP's mentioned throughout this SWPPP. The existing site runoff coefficient is 0.22. The fully developed runoff coefficient is 0.23.

2 INTRODUCTION

2.1 Storm water Pollution Prevention Plan Requirements

This Storm water Pollution Prevention Plan (SWPPP) was developed consistent with the requirements of the National Pollutant Discharge Elimination System (NPDES) General Storm water Permit for Construction Activities (see Appendix A for a copy of the general permit). This SWPPP meets the requirements of Special Condition S9 of the general permit. The primary consideration determining the adequacy of the SWPPP is compliance with State Surface Water Quality Standards (Chapter R317-2 – see Appendix A).

The Plan, properly implemented, should result in the discharge of water to the environment without the violation of Water Quality Standards.

2.2 Purpose

The purpose of this SWPPP is to:

- Describe best management practices (BMPs) to minimize erosion and sediment runoff at the site
- Identify, reduce, eliminate, or prevent the pollution of storm water
- Prevent violations of surface water quality or groundwater quality standards

2.3 SWPPP Organization

This plan consists of a detailed narrative section and the appendices, which contain illustrations, maps, and drawings. The narrative section includes descriptions of potential pollution problems associated with site features, and then discusses the selection of specific pollution prevention BMPs to reduce or eliminate the threat of causing pollution during the actual construction project. The illustrations, maps, and drawings in the appendices show the site location, topography, sensitive environmental receptors, placement of BMPs, and BMP specifications and performance expectations.

The narrative section of this plan is organized in numbered sections around the 12 required elements of an SWPPP listed below:

1. Mark project clearing limits
2. Establishing the construction entrance(s)
3. Storm water detention
4. Selection and installation of sediment controls
5. Soil stabilization
6. Slope protection
7. Drain inlet protection
8. Storm water outlet protection
9. Chemical spill prevention and response
10. Site Storm water Treatment
11. BMP maintenance
12. Project management

In the narrative section, each of the above elements will be discussed in relation to the specific conditions at the development. BMPs for each element will be screened, resulting in selection of those BMPs deemed most appropriate for use. Specifications and engineering drawings of the selected BMPs are referenced at the end of each section and can be found in Appendix B.

3 CLEARING LIMITS

3.1 Site Plans

Figure 1 is a topographic map of the site showing all natural drainages associated with the area. Figure 2 is the Storm water Site Map showing any surface water in the area and showing placement of all relevant storm water BMPs such as detention basins, storm drains, spill kit locations, storm water treatment system location, etc

3.2 Marking Clearing Limits

Prior to beginning additional earth-disturbing activities, including clearing and grading, all clearing limits, easements, setbacks, sensitive areas and their buffers, trees and drainage courses will be clearly marked to prevent environmental damage both on and off site.

3.3 Special Consideration

Special consideration will be given treatment of storm water leaving the Maple Canyon via the existing storm creek.

3.4 Selected BMPs

- BMP EC-2: Preservation of Existing Vegetation
- BMP SE-1: Silt Fence

4 CONSTRUCTION ACCESS

4.1 Site Access

The main construction access will be established via Maple Drive. All construction vehicles exiting the site will be limited to this point of access. The access will be stabilized with a vehicle tracking pad consistent of 3" to 6" stones 8" thick designed to vibrate any mud on the trucks prior to entrance to the roadways. For offsite sweeping, see section 4.2 below.

4.2 Street Cleaning

If sediment is accidentally transported on to the street it will be removed from the street surface on a daily basis. Sediment will be shoveled and/or swept from the street and disposed of in a manner, which prevents contamination with storm water or surface water (e.g., covered soil stockpile). In addition, a street sweeper may be used to maintain clean roads on an as-needed basis.

4.3 Wheel Wash

A wheel wash is not required for this due to the limited number of lots to be developed and the limited infrastructure required.

Selected BMPs

- BMP TC-1: Stabilized Construction Entrance/Exit
- BMP TC-3: Entrance/Outlet Tire Wash
- BMP SE-7: Street Sweeping and Vacuuming

5 STORM WATER DETENTION

5.1 Primary Storm water Detention System

The construction site slopes slightly to the southwest. The runoff from the east half of the site will sheet flow to the west and be captured by drop inlets and conveyed to a detention pond located near the south center of the site. The remainder of the site runoff is collected by inlet boxes and piped to a detention pond located near the southwest corner of the site. All storm water contaminated with sediment or otherwise affected by construction activities will be directed to drainage ways that are protected by bmps, which will cause sediment to settle out prior to leaving the site. (See figure 2).

Any ditches and other water conveyances draining construction-active areas to the detention system will be stabilized with rock, matting, or other stabilizing method with check dams placed as needed to reduce water velocities and settle out sediment prior to entering the detention ponds. Temporary sediment traps may also be installed as needed to further reduce sediment loads in water draining from construction areas.

5.2 Run-on Bypass

There are not offsite or run-on drainage flows entering the project site.

5.3 Selected BMPs

- BMP SE-2: Sediment Basin
- BMP SE-3: Sediment Trap
- BMP SE-4: Check Dams
- BMP SE-6: Gravel Bag Berms
- BMP EC-7: Geotextiles and Mats

6 SEDIMENT CONTROLS

6.1 Site Sediment Control System

Before being discharged from the construction site, sediment-contaminated storm water will be detained by means of various BMPs such as check dams. Sediment ponds and traps, vegetated buffer strips, sediment barriers or filters, dikes, and other BMPs intended to trap sediment on site will be constructed as one of the first steps in grading. These BMPs will be installed before other land-disturbing activities take place.

6.2 Selected BMPs

- BMP EC-9: Earth Dikes and Drainage Swales
- BMP SE-1: Silt Fence
- BMP SE-2: Sediment Basin
- BMP SE-3: Sediment Trap
- BMP SE-4: Check Dams
- BMP SE-6: Gravel Bag Berm
- BMP SE-10: Storm Drain Inlet Protection
- BMP WE-1: Wind Erosion Control

7 SOIL STABILIZATION

This section describes the stabilization and structural BMPs that will be implemented to minimize erosion and transport of sediment from the project site into receiving waters.

7.1 Soil Stabilization

Stabilization BMPs to be implemented at this site include:

- **Soil Covering.** All exposed soils will be stabilized with vegetation or covered prior to the onset of the rainy season. All exposed soils will be stabilized by the 14th day excepting for conditions of snow cover or frozen ground. Under such conditions stabilization will occur as soon as practical. The primary stabilization method used will be covering soils with an approved matting and/or hydroseeding. This will be done on all slopes as well as drainage ditches, swales, and exposed flat surfaces as deemed necessary by the erosion and sediment control lead. Virtually all exposed soils will be stabilized to protect surface water quality. Areas of the project, which have not been properly stabilized by vegetation by the onset of the wet season, will be covered with transparent plastic sheeting to prevent sediment transport. Plastic sheeting will also be used as an emergency BMP to cover previously stabilized areas, which begin to erode. Loose straw and mulch covers are not to be used as they may be washed into drainage structures.

- **Stockpile Covering.** All temporary soil stockpiles will be covered with plastic. Long-term stockpiles will be compacted and hydroseeded prior to the onset of wet weather.

- **Polymer Soil Treatment.** Smaller areas of the site may be actively worked throughout the wet season to support the installation of utilities. These smaller areas of exposed soils may be temporarily stabilized with the application of a granular anionic polyacrylamide (PAM). PAM may be applied as an aqueous solution (0.5 pounds per 1,000 gallons of water) or as a granular solid evenly dispersed over the surface of soils using a seed spreader (3 to 5 pounds of PAM per acre).

- **Maintenance of Existing Vegetation.** Existing and new vegetation will be maintained to the maximum extent practicable to prevent the contamination of storm water with sediment. Vegetated areas beginning to show signs of erosion or soil transport will be covered with plastic sheeting and the clean runoff conveyed to a storm water drain.

- **Outlet Protection.** Adequate energy dissipation, erosion control, and soil stabilization measures (e.g., rock or other energy dissipation techniques) will be provided for all point source discharges of storm water, including run-on discharges and outlets from onsite discharges.

- **Inlet protection.** All existing storm drain inlets, including those made operable during the project, will be properly protected and maintained using approved inlet protection devices.

7.2 Structural BMPs

Structural BMPs. Structural BMPs are practices designed to divert flows from exposed soil, store storm water runoff, and limit runoff and the discharge of pollutants from exposed areas of the project. The goal of structural BMPs on this project is to protect receiving water downstream of the site from turbid water, phosphorus, sediment, oil, and other contaminants, which may mobilize in storm water flows.

- **Temporarily Modified Catchment Structures.** Catch basins, manholes, vaults and swales may have to be modified on a temporary basis so that dirty water can be intercepted before leaving the site. This may be done in several different ways generally resulting in temporarily blocking an outlet structure and installing a pump to transfer the storm water inflow to a settling, infiltration, or treatment system. Automatic float level controllers built into the pump prevent the pump from running dry and conserve power use.

- **Drainage Swales, Ditches, and Check Dams.** Swales and ditches will be used on a permanent and temporary basis to convey storm water in a way that minimizes the potential for contamination by sediment. Because some sediment will always be present in storm water, check dams will be used in swales and ditches to reduce the velocity of the water and allow some settling of larger particles.

- **Temporary Slope Drains.** In some cases unstable slopes will be temporarily covered with plastic to prevent erosion and to protect water quality. When soil is disturbed downstream of the covered slope the slope drainage must be conveyed around the soil to prevent erosion. This can be done by collecting the slope runoff at the toe of the slope and piping it directly to the nearest drain.

Solid-wall flexible drainpipe and sandbags are commonly used to create temporary slope drains.

- **Sedimentation Swales and Ponds.** Temporary and permanent swales and small detention ponds will be used as necessary to reduce the velocity of runoff and enhance particle settling.

- **Infiltration/Dispersal Systems.** On sites with substantial areas of vegetation and/or porous soils, it may be advantageous to install an infiltration/dispersal system for the disposal of site storm water. This system is comprised of a pump, conveyance piping, and dispersal piping. It is best to follow topographical contours when installing the dispersal piping to avoid ponding and channeling. Dirty water should be allowed to gravity settle at least 24 hours before dispersal to avoid clogging the infiltration area with sediment. Also, observe the dispersal area frequently when discharging water to prevent over-saturation of soils.

7.3 Selected BMPs

- BMP EC-3: Hydraulic Mulch
- BMP EC-4: Hydroseeding
- BMP EC-6: Straw Mulch
- BMP EC-7: Geotextiles and Mats
- BMP EC-9: Earth Dikes and Drainage Swales
- BMP EC-10: Velocity Dissipation Devices
- BMP EC-12: Polyacrylamide
- BMP SE-4: Check Dams
- BMP SE-5: Fiber Rolls
- BMP SE-6: Gravel Bag Berm
- BMP SE-8: Sand Bag Barrier
- BMP SE-10: Storm Drain Inlet Protection

8 SLOPE PROTECTION

8.1 General Practices

Cut and fill slopes on this project have been designed and will be constructed so as to minimize erosion. Soil types have been analyzed and considered for their potential to erode also. In addition, slope runoff velocities will be reduced by terracing, creating diversions, and surface contouring.

Upslope drainage and uncontaminated run-on water from off-site will be intercepted at the top of the slope and diverted around the active construction area. Down slope flows will be contained in pipes, slope drains, and/or stabilized channels.

8.2 Suggested BMPs

- BMP SE-1: Silt Fence
- BMP SE-4: Check Dams
- BMP SE-6: Gravel Bag Berms

9 DRAIN INLET PROTECTION

9.1 Existing Storm Drains

Existing storm drain inlets will be protected to prevent storm water from entering without first being filtered or treated to remove sediment.

9.2 Newly Constructed Storm Drains

All storm drain inlets made operable during construction will be protected to prevent storm water from entering without first being filtered or treated to remove sediment.

9.3 Suggested BMP

- BMP SE-10: Storm Drain Inlet Protection

10 STORM WATER OUTLET PROTECTION

10.1 Treatment System Outlet to Stream

The treatment system will discharge treated storm water to the storm drainage system located just south of the site. The storm drainage system will route flows to the Black Slough.

10.2 Street Drainage to Stream

Storm water will be cleaned of sediment and other pollutants and drained from the site. At the point where road runoff enters the swales, outlet protection will be provided using riprap channel lining or other armoring material to prevent erosion of the swales.

10.3 Bypass Drainage to Stream

Not applicable.

10.4 Suggested BMPs

- BMP EC-10: Velocity Dissipation Devices
- BMP SE-4: Check Dams

11 SPILL PREVENTION AND RESPONSE

Consistent with the general permit requirements, all potential pollutants other than sediment will be handled and disposed of in a manner that does not cause contamination of storm water. Non-sediment pollutants that may be present during construction activities include:

- Petroleum products including fuel, lubricants, hydraulic fluids, and form oils
- Polymer used for soil stabilization
- Water treatment chemicals (coagulant, acid, sodium bicarbonate)
- Concrete
- Paints
- Fertilizers

These materials, and other materials used during construction with the potential to impact storm water, will be stored, managed, used, and disposed of in a manner that minimizes the potential for releases to the environment and especially into storm water.

Emergency contacts for the project will be posted at the project office and are included at the end of this section.

11.1 General Materials Handling Practices

The following general practices will be used throughout the project to reduce the potential for spills.

- Potential pollutants will be stored and used in a manner consistent with the manufacturer's instructions in a secure location. To the extent practicable, material storage areas should not be located near storm drain inlets and should be equipped with covers, roofs, or secondary containment as needed to prevent storm water from contacting stored materials. Chemicals that are not compatible (such as sodium bicarbonate and hydrochloric acid) shall be stored in segregated areas so that spilled materials cannot combine and react.

- Materials disposal will be in accordance with the manufacturer's instructions and applicable local, state, and federal regulations.

- Materials no longer required for construction will be removed from the site as soon as practicable.

- Adequate garbage, construction waste, and sanitary waste handling and disposal facilities will be provided to the extent necessary to keep the site clear of obstruction and BMPs clear and functional. Portable toilets will be located away from waterways and storm drain inlets.

11.2 Specific Materials Handling Practices

- All pollutants, including waste materials and demolition debris, that occur on-site during construction will be handled in a way that does not contaminate storm water.

- All chemicals including liquid products, petroleum products, water treatment chemicals, and wastes stored on site will be covered and contained and protected from vandalism.

- Maintenance and repair of all equipment and vehicles involving oil changes, hydraulic system drain down, de-greasing operations, fuel tank drain down and removal, and other activities which may result in the accidental release of contaminants, will be conducted under cover during wet weather and on an impervious surface to prevent the release of contaminants onto the ground. Materials spilled during maintenance operations will be cleaned up immediately and properly disposed of.

- Wheel wash water will be settled and discharged on site by infiltration. Wheel wash water will not be discharged to the storm water system or the storm water treatment system.

- Application of agricultural chemicals, including fertilizers and pesticides, will be conducted in a manner and at application rates that will not result in loss of chemical to storm water runoff. Manufacturers' recommendations will be followed for application rates and procedures.

- pH-modifying sources will be managed to prevent contamination of runoff and storm water collected on site. The most common sources of pH-modifying materials are bulk cement, cement kiln dust (CKD), fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters.

11.3 Spill Response

The primary objective in responding to a spill is to quickly contain the material(s) and prevent or minimize their migration into storm water runoff and conveyance systems. If the release has impacted on-site storm water, it is critical to contain the released materials on site and prevent their release into receiving waters.

If a spill of pollutants threatens storm water at the site, the spill response procedures outlined below must be implemented in a timely manner to prevent the release of pollutants.

- The site superintendent will be notified immediately when a spill, or the threat of a spill, is observed. The superintendent will assess the situation and determine the appropriate response.

- If spills represent an imminent threat of escaping ESC facilities and entering the receiving waters, facility personnel will respond immediately to contain the release and notify the superintendent after the situation has been stabilized.

- Spill kits containing materials and equipment for spill response and cleanup will be maintained at the site. Each spill kit may contain:

  - Oil absorbent pads (one bale)

  - Oil absorbent booms (40 feet)

  - 55-gallon drums (2)

  - 9-mil plastic bags (10)

  - Personal protective equipment including gloves and goggles

- If an oil sheen is observed on surface water (e.g., settling ponds, detention pond, swales), absorbent pads and/or booms will be applied to contain and remove the oil. The source of the oil sheen will also be identified and removed or repaired as necessary to prevent further releases.

- The site superintendent, or his designee, will be responsible for completing the spill reporting form and for reporting the spill to the appropriate state or local agency (see Forms at the end of this section).

- Facility personnel with primary responsibility for spill response and cleanup will receive training from the site superintendent. This training will include identifying the location of spill kits and other spill response equipment and the use of spill response materials.

- Spill response equipment will be inspected and maintained as necessary to replace any materials used in spill response activities.

11.4 Notification

In the event of a spill, make the appropriate notification(s) consistent with the following procedures:

- Any spill of oil which 1) violates water quality standards, 2) produces a "sheen" on a surface water, or 3) causes a sludge or emulsion must be reported immediately by telephone to the National Response Center Hotline at (800) 424-8802.

- Any oil, hazardous substance, or hazardous waste release which exceeds the reportable quantity must be reported immediately by telephone to the National Response Center Hotline at (800) 424-8802.

- Any spill of oil or hazardous substance to waters of the state must be reported immediately by telephone to the Utah Division of Water Quality at (801)538-6146 or (801)536-4123(after hours).

- Any release of a hazardous substance that may be a threat to human health or the environment must be reported to the Utah Division of Solid and Hazardous Waste at (801)538-6170 immediately upon discovery.

11.5 Suggested BMPs

- BMP NS-2: Dewatering Operations
- BMP NS-8: Vehicle and Equipment Cleaning
- BMP WM-1: Material Delivery and Storage
- BMP WM-3: Stockpile Management
- BMP WM-8: Concrete Waste Management
- BMP WM-9: Sanitary/Septic Waste Management

12 STORM WATER TREATMENT

12.1 Storm Water Collection System

During all phases of construction and grading the contractor will provide storm water collection and conveyance systems to collect and direct sediment contaminated water to temporary sediment traps as needed to prevent offsite discharge of sediment laden storm water. Construction will occur in phases as much as practicable to avoid unnecessarily exposing vegetated areas of the site. Clean storm water, generated from stabilized and undisturbed portions of the site, will be collected and conveyed to stabilized discharge areas whenever necessary to avoid contact with disturbed portions of the site. All conveyance and collection systems will be constructed consistent with State and local BMP requirements.

12.2 Temporary Sediment Traps

During construction, sediment contaminated storm water will be conveyed to temporary sediment traps, as designed by the project engineer and shown on the temporary erosion and sediment control (TESC) plan. The sediment traps will gravity-settle large particles down to silt size particles.

13 BMP MAINTENANCE

All temporary and permanent erosion and sediment control BMPs will be maintained and repaired as needed to assure continued performance of their intended function. All maintenance and repair will be conducted in accordance with BMPs. Recommended BMP maintenance requirements are listed in Tables 1 and 2 included in this section. Following Tables 1 and 2 is a BMP Inspection Checklist for use in routine inspections of the construction site.

All temporary erosion and sediment control BMPs will be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment will be removed or stabilized on site. Disturbed soil areas resulting from removal of BMPs or vegetation will be permanently stabilized as soon as possible.

14 PROJECT MANAGEMENT

Implementation and management of the environmental aspects of this project under the SWPPP are the responsibilities of Tim Charlwood, Dig-It Excavating and their assigned sub-contractors. Communication between all parties performing work on the site is essential for proper implementation of the SWPPP. The prime contractor, utility installation contractor, and grading contractor should all be familiar with the SWPPP and their responsibilities under the plan. To help delegate these responsibilities the following outline has been provided:

14.1 Phasing of Construction

The project is planned for one phase. However, due to the nature of the winter season in the mountains in Huntsville, the project is being constructed in two phases. Phase 1 began construction of rough grading roadways and contruction of retaining walls. Phase 2 will include final grade and construction of the roadways and installation of power and phone utilities.

14.2 Seasonal Work

The storm water treatment system has been designed to allow for work on the project during the winter months without impacting the water quality in the drainage basin to the west of the site. While not seasonal, some construction activities may need to be postponed if scheduled during ongoing storm events. Activities such as grading and trenching in areas directly adjacent to the drainage basin during rainstorms could easily result in sediment-contaminated storm water reaching the stream. This work would therefore be performed within a window of dry weather predicted on the basis of weather reports.

14.3 Training

Hansen & Associates will provide onsite training to key personnel responsible for compliance with the SWPPP. The contractor's superintendent and project manager will be familiarized with the major elements of the plan. Construction workers and others at the site will be given appropriate training information at the conclusion of site safety meetings or on an as-needed basis.

14.4 Pre-construction Conference

Weber County to coordinate the Pre-Construction Conferance.`

14.5 Coordination with Utilities and other Contractors

All contractors providing services on the project which may cause storm water pollution will be given a copy of the SWPPP and appropriate training regarding storm water pollution prevention.

14.6 Subcontractor Oversight

Subcontractor oversight to ensure compliance with the SWPPP will be provided by the prime contractor's superintendent or project manager. Informal, on-the-job tailgate training will be the first level of communication followed by onsite observation of training compliance. Non-compliance with SWPPP policies will trigger a more intensive training session to correct the problem(s). Chronic non-compliance with SWPPP policies may require the intervention of local and/or state regulatory personnel.

14.7 Monitoring/Reporting

Water quality conditions at the site will be monitored by a qualified technician and water quality reports submitted to the proper regulatory authorities on a regular basis. Additional reports such as erosion and sediment control inspections will be the responsibility of the prime contractor or a designated consultant. Spill reports will be completed and submitted by the prime contractor on the project.

14.8 SWPPP Update

The SWPPP will be updated as necessary by Dig-It Excavating and/or Hansen & Associates.

FIGURES

Figure 1 Site Topograpy Map

Figure 2 (Storm water Site Map)

DRAWINGS

FINAL PLAT

THE SANCTUARY

A Part of Section 3 & 4, T6N, R2E of the Salt Lake Base and Meridian. Weber County, Utah

NOTE: 10 FT PUBLIC UTILITY AND DRAINAGE EASEMENTS EACH SIDE OF PROPERTY LINES AS INDICATED BY DASHED LINES, UNLESS OTHERWISE SHOWN.

Surveyor's Certificate

I, K. Greg Hansen, a registered land surveyor in the State of Utah in accordance with Title 58, Chapter 22, Professional Engineers and Land Surveyors Licensing Act, do hereby certify that this plat of THE SANCTUARY in Weber County, Utah has been correctly drawn to the designated scale and is a true and correct representation of the following description of lands included in said subdivision, based on data compiled from records in the Weber County Recorder's Office, and of a survey completed of the property described on the plat in accordance with Section 17-23-17 and have verified all measurements, made on the ground, and placed monuments as represented on the plat, and meets the Weber County zoning requirements.

Signed this day of , 2012

K. Greg Hansen License No. 167819

PROFESSIONAL LAND SURVEYOR 167819 K. GREG HANSEN STATE OF UTAH

Scale: 1" = 300'

Boundary Description

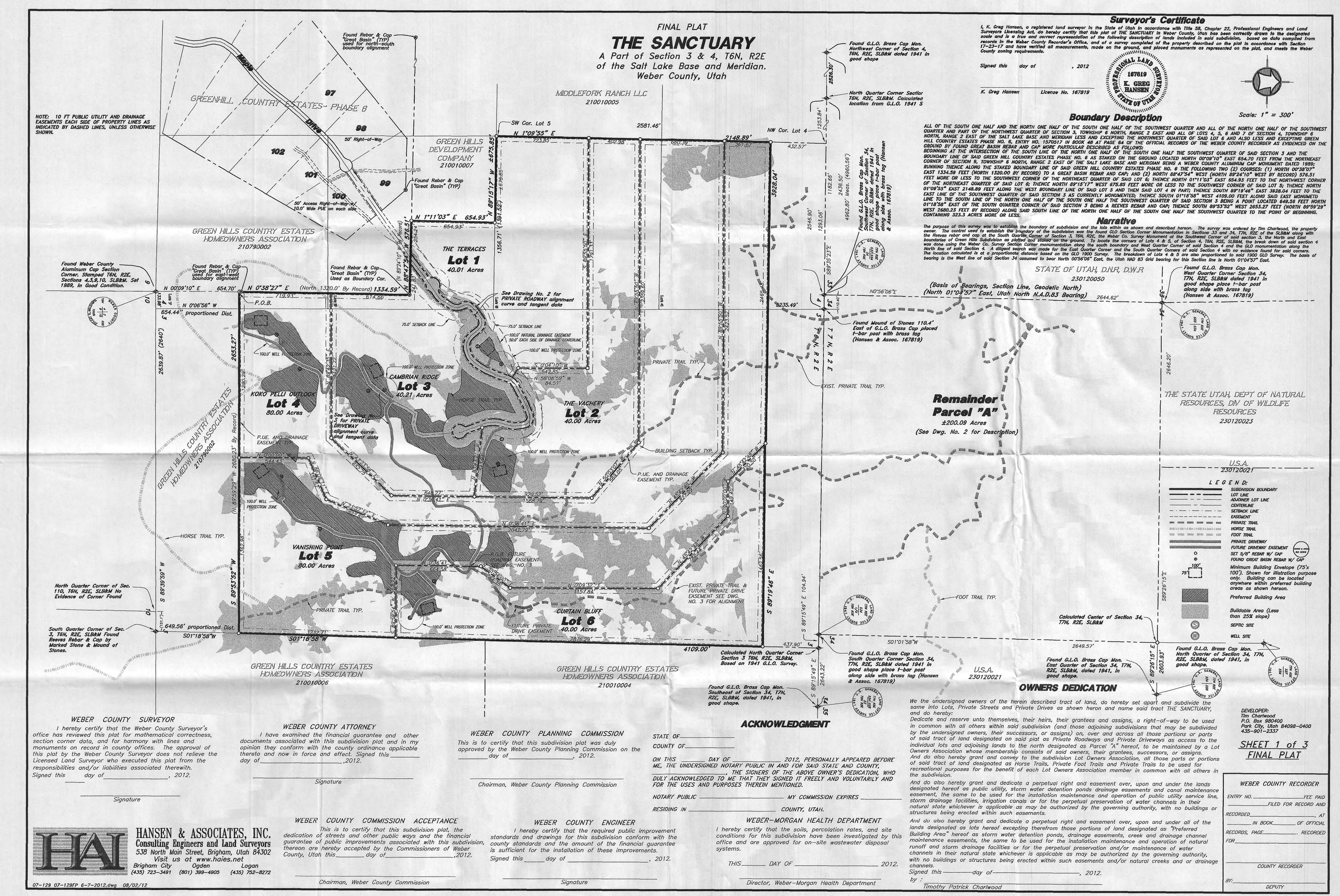
ALL OF THE SOUTH ONE HALF AND THE NORTH ONE HALF OF THE SOUTH ONE HALF OF THE SOUTHWEST QUARTER AND ALL OF THE NORTH ONE HALF OF THE SOUTHWEST QUARTER AND PART OF THE NORTHWEST QUARTER OF SECTION 3, TOWNSHIP 6 NORTH, RANGE 2 EAST AND ALL OF LOTS 4, 5, 6 AND 7 OF SECTION 4, TOWNSHIP 6 NORTH, RANGE 2 EAST OF THE SALT LAKE BASE AND MERIDIAN LESS AND EXCEPTING THE NORTHWEST QUARTER OF SAID LOT 6 AND ALSO LESS AND EXCEPTING GREEN HILL COUNTRY ESTATES PHASE NO. 6, ENTRY NO. 1570517 IN BOOK 48 AT PAGE 64 OF THE OFFICIAL RECORDS OF THE WEBER COUNTY RECORDER AS EVIDENCED ON THE GROUND BY FOUND GREAT BASIN REBAR AND CAP MORE PARTICULAR DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE SOUTH LINE OF THE NORTH ONE HALF OF THE SOUTH ONE HALF THE SOUTHWEST QUARTER OF SAID SECTION 3 AND THE BOUNDARY LINE OF SAID GREEN HILL COUNTRY ESTATES PHASE NO. 6 AS STAKED ON THE GROUND LOCATED NORTH 00°09'10" EAST 654.70 FEET FROM THE NORTHEAST CORNER OF SECTION 9, TOWNSHIP 6 NORTH, RANGE 2 EAST OF THE SALT LAKE BASE AND MERIDIAN BEING A WEBER COUNTY ALUMINUM CAP MONUMENT DATED 1989; RUNNING THENCE ALONG THE STAKED BOUNDARY LINE OF SAID GREEN HILL COUNTRY ESTATES PHASE NO. 6 THE FOLLOWING TWO (2) COURSES: (1) NORTH 00°38'07" EAST 1334.59 FEET (NORTH 1320.00 BY RECORD) TO A GREAT BASIN REBAR AND CAP; AND (2) NORTH 88°47'54" WEST (NORTH 89°24'10" WEST BY RECORD) 576.51 FEET MORE OR LESS TO THE SOUTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID LOT 6; THENCE NORTH 01°11'03" EAST 654.93 FEET TO THE NORTHWEST CORNER OF THE NORTHEAST QUARTER OF SAID LOT 6; THENCE NORTH 89°15'17" WEST 675.85 FEET MORE OR LESS TO THE SOUTHWEST CORNER OF SAID LOT 5; THENCE NORTH 01°09'55" EAST 2148.89 FEET ALONG THE WEST BOUNDARY LINE OF SAID LOT 5 AND THEN SAID LOT 4 IN PART; THENCE SOUTH 89°19'46" EAST 3928.04 FEET TO THE EAST LINE OF THE SOUTHWEST QUARTER OF SAID SECTION 3 AS CURRENTLY MONUMENTED; THENCE SOUTH 01°18'58" WEST 4109.00 FEET ALONG SAID EAST MONUMETD LINE TO THE SOUTH LINE OF THE NORTH ONE HALF OF THE SOUTH ONE HALF THE SOUTHWEST QUARTER OF SAID SECTION 3 BEING A POINT LOCATED 649.56 FEET NORTH 01°18'58" EAST OF THE SOUTH QUARTER CORNER OF SAID SECTION 3 BEING A REEVES REBAR AND CAP; THENCE SOUTH 89°53'52" WEST 2653.27 FEET (NORTH 89°59'29" WEST 2680.23 FEET BY RECORD) ALONG SAID SOUTH LINE OF THE NORTH ONE HALF OF THE SOUTH ONE HALF THE SOUTHWEST QUARTER TO THE POINT OF BEGINNING.

CONTAINING 323.3 ACRES MORE OR LESS.

Narrative

The purpose of this survey was to establish the boundary of subdivision and the lots within as shown and described hereon. The survey was ordered by Tim Charlwood, the property owner. The control used to establish the boundary of the subdivision was the found GLO Section Corner Monumentation in Sections 33 and 34, T7N, R2E of the SLB&M along with the Reeves rebar and cap at the South Quarter Corner of Section 3, T6N, R2E, the Weber Co. Survey Monument at the Southwest Corner of said section 3, the North and East boundaries of Green Hills Subdivision as platted and staked on the ground. To locate the corners of Lots 4 & 5, of Section 4, T6N, R2E, SLB&M, the break down of said section 4 was done using the Weber Co. Survey Section Corner monumentation along the south boundary and West Quarter Corner of said Section 4 and the GLO monumentation along the North line of said Section 4. A diligent search was made for the East Quarter Corner and the South Quarter Corners of said section 4 with no evidence found for said corners. The location calculated is at a proportionate distance based on the GLO 1900 Survey. The breakdown of Lots 4 & 5 are also proportioned to said 1900 GLO Survey. The basis of bearing is the West line of said Section 34 assumed to bear North 00°56'06" East, the Utah NAD 83 Grid bearing for this Section line is North 01°04'57" East.



OWNERS DEDICATION

We the undersigned owners of the herein described tract of land, do hereby set apart and subdivide the same into Lots, Private Streets and Private Drives as shown heron and name said tract THE SANCTUARY, and do hereby:

Dedicate and reserve unto themselves, their heirs, their grantees and assigns, a right-of-way to be used in common with all others within said subdivision (and those adjoining subdivisions that may be subdivided by the undersigned owners, their successors, or assigns) on, over and across all those portions or parts of said tract of land designated on said plat as Private Roadways and Private Driveways as access to the individual lots and adjoining lands to the north designated as Parcel "A" hereof, to be maintained by a Lot Owners Association whose membership consists of said owners, their grantees, successors, or assigns.

And do also hereby grant and convey to the subdivision Lot Owners Association, all those parts or portions of said tract of land designated as Horse Trails, Private Foot Trails and Private Trails to be used for recreational purposes for the benefit of each Lot Owners Association member in common with all others in the subdivision.

And do also hereby grant and dedicate a perpetual right and easement over, upon and under the lands designated hereof as public utility, storm water detention ponds drainage easements and canal maintenance easement, the same to be used for the installation maintenance and operation of public utility service line, storm drainage facilities, irrigation canals or for the perpetual preservation of water channels in their natural state whichever is applicable as may be authorized by the governing authority, with no buildings or structures being erected within such easements.

And do also hereby grant and dedicate a perpetual right and easement over, upon and under all of the lands designated as lots hereof excepting therefrom those portions of land designated as "Preferred Building Area" hereof as storm water detention ponds, drainage easements, creek and drainage channel maintenance easements, the same to be used for the installation maintenance and operation of natural runoff and storm drainage facilities or for the perpetual preservation and/or maintenance of water channels in their natural state whichever is applicable as may be authorized by the governing authority, with no buildings or structures being erected within such easements and/or natural creeks and or drainage channels.

Signed this day of , 2012.

by :

Timothy Patrick Charlwood

ACKNOWLEDGMENT

STATE OF

COUNTY OF

ON THIS DAY OF 2012, PERSONALLY APPEARED BEFORE ME, THE UNDERSIGNED NOTARY PUBLIC IN AND FOR SAID STATE AND COUNTY, , THE SIGNERS OF THE ABOVE OWNER'S DEDICATION, WHO DULY ACKNOWLEDGED TO ME THAT THEY SIGNED IT FREELY AND VOLUNTARILY AND FOR THE USES AND PURPOSES THEREIN MENTIONED.

NOTARY PUBLIC MY COMMISSION EXPIRES

RESIDING IN COUNTY, UTAH.

DEVELOPER:
Tim Charlwood
P.O. Box 980400
Park City, Utah 84098-0400
435-901-2337

SHEET 1 of 3
FINAL PLAT

WEBER COUNTY SURVEYOR

I hereby certify that the Weber County Surveyor's office has reviewed this plat for mathematical correctness, section corner data, and for harmony with lines and monuments on record in county offices. The approval of this plat by the Weber County Surveyor does not relieve the Licensed Land Surveyor who executed this plat from the responsibilities and/or liabilities associated therewith.

Signed this day of , 2012.

Signature

WEBER COUNTY ATTORNEY

I have examined the financial guarantee and other documents associated with this subdivision plat and in my opinion they conform with the county ordinance applicable thereto and now in force and effect. Signed this day of ,2012.

Signature

WEBER COUNTY PLANNING COMMISSION

This is to certify that this subdivision plat was duly approved by the Weber County Planning Commission on the day of , 2012.

Chairman, Weber County Planning Commission

WEBER COUNTY COMMISSION ACCEPTANCE

This is to certify that this subdivision plat, the dedication of streets and other public ways and the financial guarantee of public improvements associated with this subdivision, thereon are hereby accepted by the Commissioners of Weber County, Utah this day of ,2012.

Chairman, Weber County Commission

WEBER COUNTY ENGINEER

I hereby certify that the required public improvement standards and drawings for this subdivision conform with the county standards and the amount of the financial guarantee is sufficient for the installation of these improvements.

Signed this day of , 2012.

Signature

WEBER-MORGAN HEALTH DEPARTMENT

I hereby certify that the soils, percolation rates, and site conditions for this subdivision have been investigated by this office and are approved for on-site wastewater disposal systems.

THIS DAY OF 2012.

Director, Weber-Morgan Health Department

WEBER COUNTY RECORDER

ENTRY NO. FEE PAID

FILED FOR RECORD AND

RECORDED , AT

IN BOOK OF OFFICIAL

RECORDS, PAGE . RECORDED

FOR

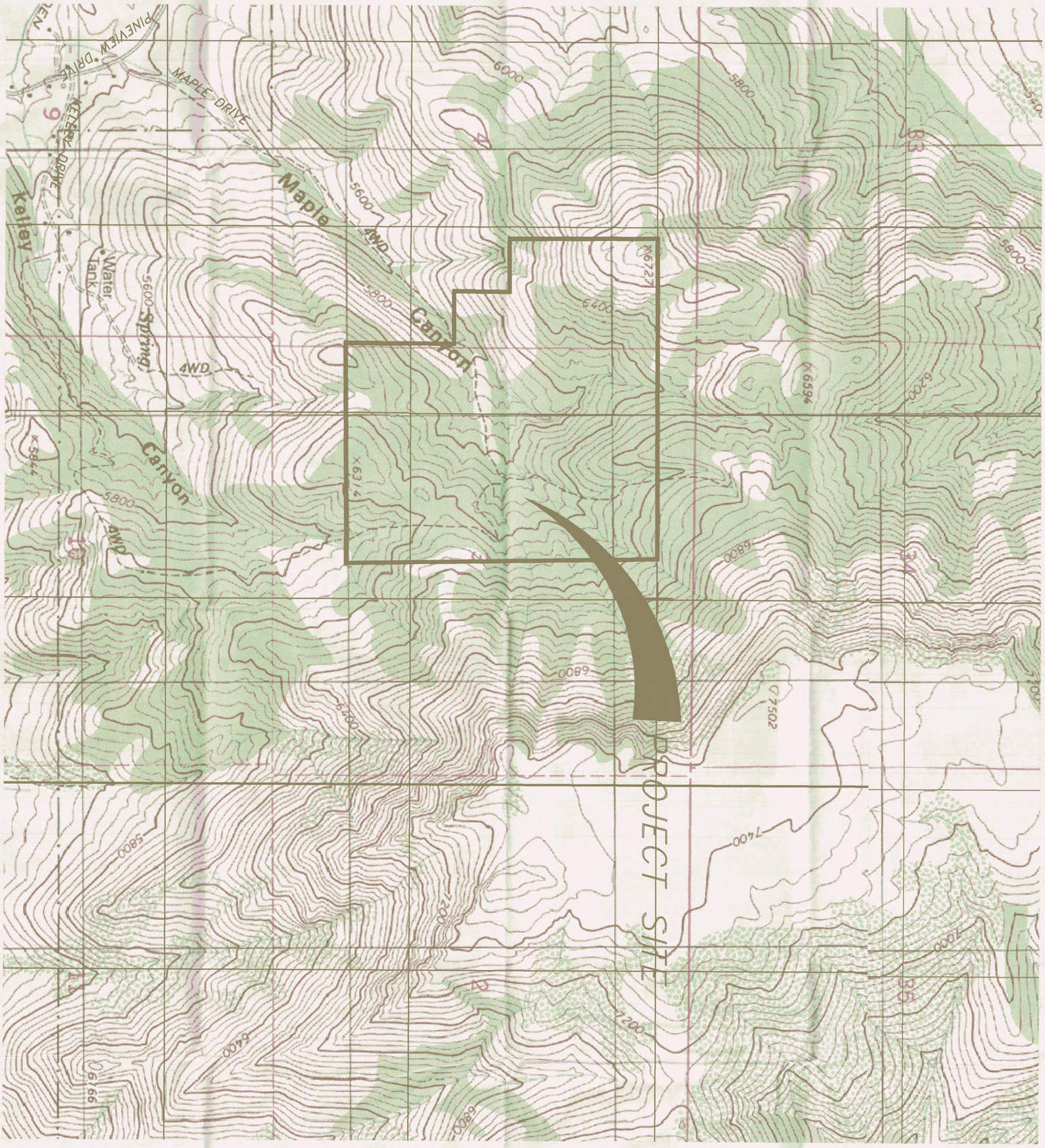
COUNTY RECORDER

BY:

DEPUTY

HANSEN & ASSOCIATES, INC.
Consulting Engineers and Land Surveyors
538 North Main Street, Brigham, Utah 84302
Visit us at www.haies.net
Brigham City (435) 723-3491 Ogden (801) 399-4905 Logan (435) 752-8272

07-129 07-129FP 6-7-2012.dwg 08/02/12



SITE TOPO MAP FOR

THE SANCTUARY SUBD.

SHEET 1 OF 1

Drawn By: WLW Date: APR 2008
Designed By:
Checked By:
Approved By:
Scale: 1"=600'
Drawing File: 07-129TOPO MAP.dwg
JOB NUMBER: 07-129

HANSEN & ASSOCIATES, INC.
Consulting Engineers and Land Surveyors
538 North Main, Brigham City, Utah 84302
67 East 100 North, Logan, Utah 84321
Brigham City (435) 723-3491 (435) 723-7663
Ogden (801) 399-4905
Logan (435) 752-9197 (435) 752-8272

No.	Date	By	Revision

APPENDIX A

NPDES STORM WATER PERMIT, AND STATE WATER QUALITY STANDARDS

STATE OF UTAH
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER QUALITY
SALT LAKE CITY, UTAH 84114-4870

Authorization to Discharge Under the Utah Pollutant Discharge Elimination System

Storm Water General Permit for Construction Activities

In compliance with the provisions of the *Utah Water Quality Act, Title 19, Chapter 5, Utah Code Annotated 1953*, as amended (the *Act*) except as provided in *Part I.B.3.* of this permit, operators of storm water discharges from construction activities anywhere within the State of Utah except Indian Lands, identified on a properly submitted Notice of Intent (NOI) form (see Addendum), are authorized to discharge from the construction site specified in the NOI, to waters of the State in accordance with the conditions and requirements set forth herein.

Only those operators of storm water discharges listed and identified in the properly submitted NOI are authorized under this general permit.

This permit shall become effective on October 1, 2002.

This permit and the authorization to discharge shall expire at midnight, September 30, 2007.

Signed this 18th day of September, 2002

Don A. Ostler, P.E.
Executive Secretary
Utah Water Quality Board

TABLE OF CONTENTS **Permit No.: UTR100000**

PART I
Permit No.: UTR100000

I. PERMIT SCOPE AND COVERAGE

A. Permit Area The permit covers all areas of the State of Utah except for Indian lands[1].

B. Eligibility

1. **This permit authorizes discharges** of storm water **from construction activities** as defined in *UAC R317-8-3.9(6)(d)10.* (construction activity which grades $ five acres per common plan), *UAC R317-8-3.9(6)(e)1* (construction activity which grades $ 1 acre and < five acres per common plan), and those construction site discharges designated by the *Executive Secretary* as needing a storm water permit under *UAC R317-8-3.9(6)(e)2.*, except for discharges identified under *Part I.C.* Any discharge authorized by a different UPDES permit may be commingled with discharges authorized by this permit.

2. **This permit also authorizes** storm water discharges from **support activities** related to a construction site (e.g. concrete or asphalt batch plants, equipment staging yards, material storage areas, etc.) from which there is a storm water discharge. **The permittee must assume responsibility to ensure proper storm water permit coverage for** storm water discharges from **support activities**. The support activity may be covered under a separate permit or under the conditions of this permit (pollution prevention plan requirements, see *Part III.*) if it is in accordance with *Part II.E* and provided it satisfies the following:

a) the **support activity is not** a commercial operation **serving multiple unrelated** construction **projects**, and **does not operate beyond** the **completion** of the construction activity; and

b) appropriate **controls and measures are identified** in the storm water pollution prevention plan for the discharges from the support activity areas.

C. Limitations on Coverage. The following storm water discharges from construction sites are not authorized by this permit:

1. Post Construction Discharges. Storm water discharges that originate from the site after construction activities have been completed and the site has undergone final stabilization.

---

[1] The State of Utah, *Division of Water Quality*, does not have permit authority for Indian lands. Storm water permits for Indian lands within the State must be acquired through EPA Region VIII, except for facilities on the Navajo Reservation or on the Goshute Reservation which must acquire storm water permits through EPA Region IX.

2. Discharges Mixed with Non-storm Water. Discharges that are mixed with sources of non-storm water other than discharges which are identified in *Part II.A.2 & 3* of this permit and in compliance with *Part III.D.5* (non-storm water discharges) of this permit.

3. Discharges Covered by Another Permit. Storm water discharges associated with construction activity that have been issued an individual permit or are required to obtain coverage under an alternative general permit in accordance with *Part V.L*;

4. Discharges Threatening Water Quality. Storm water discharges from construction sites that the *Executive Secretary* determines will cause, or have the reasonable potential to cause excursions above water quality standards. (Where such determinations have been made, the discharger will be notified by the *Executive Secretary* of additional requirements for treatment or handling of the discharge or that an individual permit application is necessary, see *Part II.D.*). The *Executive Secretary* may authorize coverage under this permit after appropriate controls and implementation procedures, designed to bring the discharges into compliance with water quality standards, have been included in the pollution prevention plan;

D. Authorization to Discharge.

1. Except as defined in number 4. of this section below, in order for storm water discharges from construction sites to be authorized to discharge under this general permit, a discharger must:

a) first **develop a Pollution Prevention Plan** (covering either the entire site or all portions of the site for which they are operators) according to the requirements in *Part III.* (preparation and implementation of the Plan may be a cooperative effort where there are more than one operators at a site), and then

b) **submit a notice of intent** (*NOI*) (prior to the commencement of construction activities, see paragraph 3 below) using the *NOI* form found in the addendum of this permit, or a photocopy thereof. The Pollution Prevention Plan (see *Part III.*) must be implemented upon commencement of construction activities. If construction activities has been permitted under previous storm water permit coverage before the reissuance of this permit, the permittee must submit a new *NOI* within ninety (90) days of the effective date of this permit in order to continue authorization to discharge. Permittees must continue to comply with the terms and conditions of the previous industrial general permit until covered by this permit. *NOIs* must be submitted to: the *Division of Water Quality* (*DWQ*) at PO Box 144870, Salt Lake City, Utah, 84114-4870.

c) **submit a permit fee**, the amount for which is determined by the current yearly State of Utah Appropriations Act.

2. Changing the Operator After Commencing. For construction sites where the operator changes or where a new operator is selected after the submittal of an *NOI*, a new *Notice of Intent* (NOI) form must be submitted with the proper corrections, prior to the change.

3. Permit Delay Time/Denial of Coverage. Unless notified by the *Executive Secretary* to the contrary, dischargers are authorized to discharge storm water from construction sites under the terms and conditions of this permit immediately after conditions in paragraphs 1 and/or 2 (above) are completed. The *Executive Secretary* may deny coverage under this permit and require submittal of an application for an individual UPDES permit based on a review of the NOI or other information (see *Part V.L* of this permit).

4. Notice of Intent Waiver for Storm Water Discharges Associated with Small Construction Activity Located within a Phase I or Phase II MS4 Covered under a UPDES Municipal Storm Water Permit. As authorized by the *Executive Secretary* under authority of 40cfr122.28(b)(2)(v.) small construction sites as defined in *UAC R317-8-3.9(6)(e)1* which are located within the confines of a State permitted Municipal Separate Storm Sewer are waived from submitting a notice of intent for coverage under this permit. In this case the operator of a small construction site must comply with all local requirements for sediment and erosion control.

E. Terminating Coverage.

1. Operators wishing to terminate coverage under this permit must submit a notice of termination (NOT) found in the addendum of this permit.

2. All permittees must submit a NOT within thirty (30) days after completion of their construction activities and final stabilization of their portion of the site, or another operator taking over all of their responsibilities at the site. A permittee cannot submit an NOT without final stabilization unless another party has agreed to assume responsibility for final stabilization of the site. Appropriate enforcement actions may be taken for permit violations where a permittee submits a NOT but the permittee has not transferred operational control to another permittee or the site has not undergone final stabilization.

F. Low Rainfall Erosivity Waiver for Small Construction Activities

A condition of low erosivity exists at a construction site when the construction activity will commence and reach final stabilization between January 1 and April 30 of the same year. Small construction activities include sites which will grade $\geq$ 1 acre and $<$ 5 acres per common plan (calculation to include all phases of development and areas of support activities.) If final stabilization is not achieved by April 30 then coverage under this general permit is required. If an operator of a small construction activity wishes to claim a waiver then an erosivity waiver certification form must be submitted to the State Division of Water Quality prior to the commencement of such activities.

Submission of the Erosivity Waiver Certification constitutes notice that the operator does not require permit authorization for its storm water discharges associated with construction activity in the State of Utah due to the existence of a condition of low erosivity potential at the site of grading. Submission of the form does not relieve the operator of permitting requirements for other regulated activities/discharges which may pertain to the construction activity (e.g. dewatering activities, process waste water discharges, non-storm water discharges, etc.)

An erosivity waiver certification form must be submitted for each small construction site qualifying for the waiver. By signing and submitting the form, the operator is certifying that conditions of low erosivity stated above will exist at the construction site.

PART II
Permit No.: UTR100000

I. SPECIAL CONDITIONS, MANAGEMENT PRACTICES, RESPONSIBILITIES, AND OTHER NON-NUMERIC LIMITATIONS

A. Prohibition of non-storm water discharges.

1. Except as provided in *Part I.B.* and *C.* and *Part II.A.2. & 3.* (below) **all discharges** covered by this permit **shall be** composed **entirely of storm water.**

2. **Discharges** of material **other than storm water** that are **in compliance with a UPDES permit** (other than this permit) issued for that discharge **may be mixed** with discharges authorized by this permit.

3. **The following non-storm water discharges occuring at construction sites identified in the associated *NOI=s* may be authorized** by this permit provided the non-storm water component of the discharge is in compliance with *Part III.D.5.*: discharges from fire fighting activities; fire hydrant flushings; waters used to wash vehicles or control dust in accordance with *Part III.D.2.c.(2)* (Off-site Tracking); potable water sources including waterline flushings; irrigation drainage; routine external building wash down which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials (including oils and fuels) have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

B. Releases in excess of Reportable Quantities. The discharge of hazardous substances or oil in the storm water discharge(s) from a facility shall be prevented or minimized in accordance with the applicable storm water pollution prevention plan for the facility. This permit does not relieve the permittee of the reporting requirements of *40 CFR part 117, 40 CFR 110,* and *40 CFR part 302.* Where a release containing a hazardous substance in an amount equal to or in excess of a reportable quantity established under either *40 CFR 117, 40 CFR 110,* or *40 CFR 302*, occurs during a 24 hour period:

1. The permittee is required to **notify** the National Response Center (NRC) (**800-424-8802**) in accordance with the requirements of *40 CFR 117*, *40 CFR 110*, and *40 CFR 302* and the *Division of Water Quality* (DWQ) (**801-538-6146**; or the 24 hour *DWQ* answering service at **801-536-4123**) as soon as he or she has knowledge of the discharge;

2. **The permittee shall submit within 14 calendar days** of knowledge of the release **a written description of: the release** (including the type and estimate of the amount of material released), **the date** that such release occurred, **the circumstances** leading to the release, **the measures** taken and/or planned to be taken to cleanup the release, **and steps** to be taken to minimize the chance of future occurrences to the *Executive Secretary*; and

3. **The storm water pollution prevention plan** required under *Part IV* of this permit **must be modified within 14 calendar days** of knowledge of the release to provide a description of the release, the circumstances leading to the release, and the date of the release. In addition, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate.

C. Spills. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

D. Discharge Compliance with Water Quality Standards. Dischargers seeking coverage under this permit shall not be causing or have the reasonable potential to cause or contribute to a violation of a water quality standard. Where a discharge is already authorized under this permit and is later determined to cause or have the reasonable potential to cause or contribute to the violation of an applicable Water Quality Standard, the *Executive Secretary* will notify the operator of such violation(s) and the permittee shall take all necessary actions to ensure future discharges do not cause or contribute to the violation of a water quality standard and document these actions in the pollution prevention plan. If violations remain or re-occur, then coverage under this permit will be terminated by the *Executive Secretary* and an alternative permit may be issued or denied. Compliance with this requirement does not preclude any enforcement activity as provided by the *Water Quality Act* for the underlying violation.

E. Identification and Responsibilities of Operator(s). The *DWQ* finds the owner, developer, or project instigator and controller (the entity responsible for obtaining funding, procuring initial contracts or agreements, selecting [or assuming the position of] a general contractor, and that has control over site specifications) as the ultimate party responsible for pursuing permit procurement and compliance responsibilities.

1. Avenues to satisfy permitting obligations.

a) The party responsible for obtaining a construction storm water permit may retain permit responsibility alone (or for any party that does not sign on as a co-permittee) and must:

(1) **specify conditions in a contract** or a binding agreement with the party(ies) selected to perform the actual construction that binds the party(ies) performing the construction activity to meet the conditions in the permit pertaining to their activities, and

(2) assume **all penalties and administrative procedures** for noncompliance enforcement.

b) The party responsible for obtaining a construction storm water permit may **require the party(ies)** performing construction activity affected by permit conditions **to sign as a co-permittee(s)** on the *NOI* for this permit, thus:

(1) placing culpability on each co-permittee to satisfy permit conditions pertaining to activities on the construction site concerning their portion of the construction activities.

(2) all penalties and administrative actions for noncompliance shall be directed at the culpable party(ies), or at the group as a whole if culpability is not clear.

III. STORM WATER POLLUTION PREVENTION PLANS.

A storm water pollution prevention plan shall be developed and implemented for each construction site covered by this permit. For more effective coordination of BMPs, a cooperative effort by the different parties involved in construction at a site is encouraged to prepare and participate in a comprehensive pollution prevention plan. Individual co-permittees (if any) at a site may, but are not required, to develop separate pollution prevention plans that cover only their portion of the project provided reference is made to other co-permittees at the site. Storm water pollution prevention plans shall be prepared in accordance with good engineering practices. It is recommended that the plan be signed by a Professional Engineer (P.E.) registered in the State. The plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges from the construction site. The plan shall describe and ensure the implementation of practices which will be used to reduce the pollutants in storm water discharges associated with construction activity at the construction site and to assure compliance with the terms and conditions of this permit. Permittees must implement the applicable provisions of the storm water pollution prevention plan required under this part as a condition of this permit.

A. Deadlines for Plan Preparation and Compliance.

1. **The plan shall be completed prior to the submittal of an *NOI*** to be covered under this permit and updated as appropriate and warranted as per *Part III.C.*.

2. **The plan shall provide for compliance** with the terms and schedule of the plan beginning **with the initiation of construction activities.**

3. **For permittees continuing permit coverage from an expired general storm water permit for construction activity,** the plan shall be modified to meet the conditions in this permit and it shall be implemented by ninety (90) days from the issuance of this permit.

B. Signature and Plan Review and Making Plans Available.

1. Plan Location. The plan shall be signed in accordance with *Part V.G*, and be retained on-site at the facility which generates the storm water discharge in accordance with *Part IV* (Retention of Records) of this permit. If the site is inactive or does not have an onsite location adequate to store the pollution prevention plan, the location of the plan, along with a contact phone number, shall be posted on site. Reasonable local access to the plan, during normal working hours, must be provided as described below.

2. Plan Availability. The permittee shall make plans available upon request to the *Executive Secretary*; other local agencies approving sediment and erosion plans, grading plans, or storm water management plans; interested members of the public; local government officials; or to the operators of a municipal separate storm sewer receiving discharges from the site. Viewing by the public shall be at reasonable times during regular business hours (advance notice by the public of the desire to view the plan may be required, not to exceed two working days). The permit does not require that free copies of the plan be provided to interested members of the public, only that they have access to view the document and copy it at their own expense. The

copy of the plan required to be kept onsite (or locally available) must be made available to the *Executive Secretary* (or authorized representative) for review at the time of an onsite inspection.

3. Compelled Revisions. The *Executive Secretary*, or authorized representative, may notify the permittee (co-permittees) at any time that the plan does not meet one or more of the minimum requirements of this *Part*. Such notification shall identify those provisions of the permit which are not being met by the plan, and identify which provisions of the plan require modifications in order to meet the minimum requirements of this *Part*. Within 7 days of such notification from the *Executive Secretary*, (or as otherwise provided by the *Executive Secretary*), or authorized representative, the permittee shall make the required changes to the plan and shall submit to the *Executive Secretary* a written certification that the changes have been made. The *Executive Secretary* may take appropriate enforcement action for the period of time the permittee was operating under a plan that did not meet the minimum requirements of the permit.

C. Keeping Plans Current. The permittee shall amend the plan whenever:

1. there is a **change in design, construction, operation, or maintenance**, which has a significant effect on the discharge of pollutants to the waters of the State and which has not otherwise been addressed in the plan;

2. **inspections or investigations** by site operators, local, state, or federal officials **indicate the storm water pollution prevention plan is** proving **ineffective** in eliminating or significantly minimizing pollutants from sources identified under *Part III.D.1* of this permit, or is otherwise not achieving the general objectives of controlling pollutants in storm water discharges associated with construction activity; and

3. **a new contractor and/or subcontractor** will implement a measure of the storm water pollution prevention plan in order to identify their role and responsibility for the SWP3. Amendments to the plan may be reviewed by the *Executive Secretary* (or authorized representative) in the same manner as *Part III.B.2.*

D. Contents of Plan. The storm water pollution prevention plan shall include the following items:

1. Site Description. Each plan shall provide a description of pollutant sources and other information as indicated:

a) **A description** of the nature **of the construction activity**;

b) **A description of** the intended **sequence of major activities** which disturb soils for major portions of the site (e.g. grubbing, excavation, grading, utilities, and infrastructure installation, etc.);

c) **Estimates of the total area** of the site and the total area of the site that is expected to be **disturbed** by excavation, grading, or other activities;

d) **An estimate of the runoff coefficient** of the site **after construction activities are completed** and existing data describing the soil or the quality of any discharge from the site;

e) A general **location map** (e.g. portion of a city or county map or similar scale) and a site map indicating:

(1) drainage patterns and approximate slopes anticipated after major grading activities;
(2) construction boundaries and a description of existing vegetation prior to grading activities;
(3) areas of soil disturbance, and areas of no disturbance;
(4) the location of major structures and nonstructural controls identified in the plan;
(5) the location of areas where stabilization practices are expected to occur;
(6) surface waters (including wetlands); and
(7) locations where storm water is discharged to a surface water.

f) **A description of any discharge associated with industrial activity** other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants) covered by the permit; and the location of that activity.

g) **The name of the receiving water**(s), and areal extent of wetland acreage at the site.

h) A **copy of the permit requirements** (may simply attach copy of permit language);

2. Controls. Each plan shall include a description of appropriate controls and measures that will be implemented during construction activity and while the site is unstablized. The plan must clearly describe for each major activity identified in *Part III.D.1.b*: a) appropriate control measures and the timing during the construction process that the measures will be implemented and b) which permittee is responsible for implementation (e.g., perimeter controls for one portion of the site will be installed by Contractor A after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site. Perimeter controls will be actively maintained by Contractor B until final stabilization of those portions of the site upward of the perimeter control. Temporary perimeter controls will be removed by Owner after final stabilization). The description and implementation of controls shall address the following minimum components:

a) Erosion and Sediment Controls.

(1) Short and Long Term Goals and Criteria:

(a) The construction-phase erosion and **sediment controls** should be **designed to retain sediment on site** to the maximum extent practicable.

(b) **All control measures must be properly selected, installed, and maintained** in accordance with the manufacturers specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately, or incorrectly, the permittee must replace or modify the control for site situations.

(c) If sediments escapes the construction site, **off-site accumulations of sediment must be removed** at a frequency sufficient to minimize offsite impacts (e.g., fugitive sediment in street could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).

(d) **Sediment must be removed** from sediment traps or sedimentation ponds **when design capacity has been reduced by 50%**.

(e) **Litter, construction debris, and construction chemicals** exposed to storm water shall be picked up prior to anticipated storm events (e.g. forecasted by local weather reports), or otherwise **prevented from becoming a pollutant source for storm water discharges** (e.g. screening outfalls, picked up daily, etc.).

(f) offsite **material storage areas** (also including overburden and stockpiles of dirt, etc.) used solely by the permitted project are considered a part of the project and **shall be addressed in the pollution prevention plan.**

(2) Stabilization Practices. A description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized. Stabilization practices may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Use of impervious surfaces for stabilization should be

avoided. A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be included in the plan. Except as provided in *Parts III.D.2.a.(2)(a), (b),and (c)* below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

(a) **Where** the initiation of **stabilization** measures **by the 14th day** after construction activity temporary or permanently cease **is precluded by snow cover or frozen ground** conditions, stabilization measures shall be initiated as soon as practicable.

(b) **Where construction activity** on a portion of the site **is temporarily ceased, and** earth disturbing activities will be **resumed within 21 days**, temporary stabilization measures do not have to be initiated on that portion of site.

(c) **In arid areas** (areas with an average annual rainfall of 0-10 inches), semi-arid areas (areas with an average annual rainfall of 10 to 20 inches), and areas experiencing droughts where the initiation of stabilization measures by the 14th day after construction activity has temporarily or permanently ceased is precluded by seasonal arid conditions, **stabilization measures shall be initiated as soon as practicable.**

(3) Structural Practices. A description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Such practices may include silt fences, earth dikes, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. Placement of structural practices in floodplains should be avoided to the degree attainable. The installation of these devices may be subject to *Section 404* of the *CWA*.

(a) 10 Acre Sediment Basin Requirement. Where attainable, for common drainage locations that serve areas with 10 or more acres disturbed at one time, the permittee shall provide a temporary (or permanent) sediment basin that provides storage for a 10 year, 24 hour storm event, a calculated volume of runoff for disturbed acres drained, or equivalent

control measures, until final stabilization of the site. Where calculations are not performed, a sediment basin providing 3,600 cubic feet of storage per acre drained (a 1 inch storm event), or equivalent control measures, shall be provided where attainable until final stabilization of the site. The required sizing of the sediment basin does not include flows from offsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether installing a sediment basin is attainable, the permittee may consider factors such as site soils, slope, available area on site, etc. For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable, smaller sediment basins and/or sediment traps (with comparable storage) must be used, or;

(i) at a minimum, equivalent controls in silt fences, vegetative buffer strips, sod, mulch, geotextiles, stepped check dams, pipe slope drains or other sediment or erosion controls are required for all erodible areas, downslope boundaries of the construction area and side slope boundaries deemed appropriate as dictated by individual site conditions;

(ii) it can be shown that site meteorological conditions does not warrant equivalent storage during the time period the 10-acres are destabilized (little or no chance of precipitation for the period of surface destabilization).

(b) Less Than 10 Acre BMP Requirement. For drainage locations serving less than 10 acres, sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all downslope boundaries (and those sideslope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for 3,600 cubic feet of storage per acre drained is provided.

b) Storm Water Management. A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. The installation of these devices may be subject to *Section 404* of the *CWA*. This permit only addresses the installation of storm water

construction related materials which are stored onsite including an inventory of construction materials (including waste materials), storage practices to minimize exposure of the materials to storm water, and spill prevention and response.

(5) Support Areas. A description of pollutant sources from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants), and a description of controls and measures that will be implemented at those sites.

d) Other Laws and Requirements.

(1) Local Storm Water Control Requirements. This permit does not relieve the permittee from compliance with other laws effecting erosion and sediment control or requirements for the permanent storm water system. Where applicable, compliance efforts to these requirements should be reflected in the SWP3.

(2) Threatened or Endangered Species & Historic Properties. This permit does not relieve the permittee from compliance with Federal or State laws pertaining to threatened or endangered species or historic properties. Where applicable compliance efforts to these laws should be reflected in the SWP3

(3) Variance of Permit Requirements. Dischargers seeking alternative permit requirements shall submit an individual permit application in accordance with *Part V.L* of the permit at the address indicated in *Part IV.C* of this permit, along with a description of why requirements in approved State or local plans or permits, should not be applicable as a condition of a UPDES permit.

3. Maintenance. A description of procedures to ensure the timely maintenance of vegetation, erosion and sediment control measures and other protective measures identified in the site plan are maintained in good and effective operating condition. Maintenance needs identified in inspections or by other means shall be accomplished before the next anticipated storm event, or as necessary to maintain the continued effectiveness of storm water controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance must be scheduled and accomplished as soon as practicable.

4. Inspections. Qualified personnel (provided by the permittee) shall inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures, and locations where vehicles enter or exit the site at least once every fourteen calendar days, before anticipated storm events (or series of storm events such as intermittent showers over one or more days) expected to cause a significant

amount of runoff, and within 24 hours of the end of a storm that is 0.5 inches or greater. Where sites have been finally or temporarily stabilized, runoff is unlikely due to winter conditions (e.g. site covered with snow, ice, or frozen ground), or during seasonal arid periods in arid areas (areas with an average annual rainfall of 0-10 inches) and semi-arid areas (areas with an average annual rainfall of 10-20 inches) such inspection shall be conducted at least once every month.

a) Points, Areas, BMPs, and Activities to be Inspected. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

b) Inspection Induced Plan Revisions. Based on the results of the inspection, the site description identified in the plan in accordance with *Part III.D.1* of this permit and pollution prevention measures identified in the plan in accordance with *Part III.D.2* of this permit shall be revised as appropriate, but in no case later than 7 calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.

c) Inspection Report. A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan (including the location(s) of discharges of sediment or other pollutants from the site and of any control device that failed to operate as designed or proved inadequate for a particular location), and actions taken in accordance with *Part III.D.4.b* (above) of the permit shall be made and retained as part of the storm water pollution prevention plan for at least three years from the date that the site is finally stabilized. Such reports shall identify any incidents of non-compliance. Where a report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the storm water pollution prevention plan and this permit. The report shall be signed in accordance with *Part V.G* of this permit.

5. Non-Storm Water Discharges - Except for flows from fire fighting activities, sources of non-storm water listed in *Part II.A.2 & 3.* of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

IV. RETENTION OF RECORDS

A. Documents. The permittee shall retain copies of storm water pollution prevention plans and all reports required by this permit, and records of all data used to complete the *Notice of Intent* to be covered by this permit, for a period of at least three years from the date that the site is finally stabilized. This period may be extended by request of the *Executive Secretary* at any time.

B. Accessibility. The permittee shall retain a copy of the storm water pollution prevention plan required by this permit (including a copy of the permit language) at the construction site (or other local location accessible to the *Executive Secretary* and the public) from the date of project initiation to the date of final stabilization. The permittees with day to day operational control over pollution prevention plan implementation shall have a copy of the plan available at a central location onsite for the use of all operators and those identified as having responsibilities under the plan whenever they are on the construction site.

C. Addresses. All written correspondence under this permit shall be directed to the *Division of Water Quality* at the following addresses:

Department of Environmental Quality
Division of Water Quality
288 North 1460 West
PO Box 144870
Salt Lake City, Utah 84114-4870

V. STANDARD PERMIT CONDITIONS

A. Duty to Comply.

1. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the *Act* and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions.

a) Negligent Violations. The *Act* provides that any person who negligently violates permit conditions implementing the *Act*, this permit, or the Utah wastewater rules is subject to a fine of $10,000 per day.

b) Willful or Gross Negligence. The *Act* provides that any person who willfully or with gross negligence violates *UCA 19-5-107(1)* (discharges a pollutant to waters of the State). Or a condition or limitation of this permit is subject to a fine of $25,000 per day or $50,000 per day for any person twice convicted.

c) False Statements. The *Act* provides that any person who knowingly makes any false material statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under the *Act* or who knowingly falsifies, tampers with, or renders inaccurate, any monitoring device or method required to be maintained under the *Act* shall upon conviction , be punished by a fine of not more than $10,000 or by imprisonment by 6 months, or by both.

B. Continuation of the Expired General Permit. This permit, expires on September 30, 2007. However, an expired general permit may continue in force and effect after the expiration date until a new permit is issued if a timely reapplication is made for the new permit (*UAC R317-8-3.1(1)(d)*). If this permit is not renewed by the *Division of Water Quality*, for some reason, the *Executive Secretary* will notify the permittee and provide instructions concerning how to stay in compliance with the the *Utah Water Quality Act* and the *Utah Wastewater Rules* (*UAC R317-8*) with the discharge(s) that is(are) covered by this permit.

C. Need to halt or reduce activity not a defense. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to Provide Information. The permittee shall furnish to the *Executive Secretary* or an authorized representative any information which is requested to determine compliance with this permit or other information.

F. Other Information. When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the *Notice of Intent* or in any other report to the *Executive Secretary*, he or she shall promptly submit such facts or information.

G. Signatory Requirements. All *Notices of Intent*, storm water pollution prevention plans, reports, certifications or information either submitted to the *Executive Secretary* or the operator of a large or medium municipal separate storm sewer system, or that this permit requires be maintained by the permittee, shall be signed as follows:

1. All Notices of Intent shall be signed as follows:

a) For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25,000,000 (in second-quarter 1980 dollars) if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b) For a partnership of sole proprietorship: by a general partner or the proprietor, respectively; or

c) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g. Regional Administrators of EPA).

2. All reports required by the permit and other information requested by the *Executive Secretary* or by an authorized representative of the *Executive Secretary* shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a) The authorization is made in writing by a person described above and submitted to the *Executive Secretary*.

b) The authorization specifies either an individual or a position having responsibility for overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).

c) Changes to authorization. If an authorization under *Part I.D.1.* is no longer accurate because a different operator has responsibility for the overall operation of the construction site, a new notice of intent satisfying the requirements of *Part I.D.* must be submitted to the *Executive Secretary* prior to or together with any reports, information, or applications to be signed by an authorized representative.

d) Certification. Any person signing documents under *Part V.G.* shall make the following certification:

AI certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.@

H. Penalties for Falsification of Reports. The *"Act"* provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six months, or by both.

I. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under the "*Act*".

J. Property Rights. The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

L. Requiring an Individual Permit or an Alternative General Permit.

1. The *Executive Secretary* may require any person authorized by this permit to apply for and/or obtain either an individual *UPDES* permit or an alternative *UPDES* general permit. Any interested person may petition the *Executive Secretary* to take action under this paragraph. Where the *Executive Secretary* requires a discharger

authorized to discharge under this permit to apply for an individual UPDES permit, the *Executive Secretary* shall notify the discharger in writing that a permit application is required. This notification shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the discharger to file the application, and a statement that on the effective date of issuance or denial of the individual *UPDES* permit or the alternative general permit as it applies to the individual permittee, coverage under this general permit shall automatically terminate. Applications shall be submitted to the address of the *Division of Water Quality* shown in *Part IV.C* of this permit. The *Executive Secretary* may grant additional time to submit the application upon request of the applicant. If a discharger fails to submit in a timely manner an individual *UPDES* permit application as required by the *Executive Secretary* under this paragraph, then the applicability of this permit to the individual *UPDES* permittee is automatically terminated at the end of the day specified for application submittal.

2. Any discharger authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. In such cases, the permittee shall submit an individual application in accordance with the requirements of *Utah Administrative Code ("UAC") R317-8-3.9(2)(b)2* with reasons supporting the request, to the *Executive Secretary* at the address for the *Division of Water Quality* in *Part IV.C* of this permit. The request may be granted by issuance of any individual permit or an alternative general permit if the reasons cited by the permittee are adequate to support the request.

3. When an individual *UPDES* permit is issued to a discharger otherwise subject to this permit, or the discharger is authorized to discharge under an alternative *UPDES* general permit, the applicability of this permit to the individual *UPDES* permittee is automatically terminated on the effective date of the individual permit or the date of authorization for coverage under the alternative general permit, whichever the case may be. When an individual *UPDES* permit is denied to a discharger otherwise subject to this permit, or the discharger is denied for coverage under an alternative *UPDES* general permit, the applicability of this permit to the individual *UPDES* permittee is automatically terminated on the date of such denial, unless otherwise specified by the *Executive Secretary*.

M. State Laws.

1. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by *UCA 19-5-117*.

2. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper Operation and Maintenance. The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances)

which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of storm water pollution prevention plans. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

O. Inspection and Entry. The permittee shall allow the *Executive Secretary* or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

P. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

VI. REOPENER CLAUSE.

A. Reopener Due to Water Quality Impacts. If there is evidence indicating that the storm water discharges authorized by this permit cause, have the reasonable potential to cause or contribute to, a violation of a water quality standard, the discharger may be required to obtain an individual permit or an alternative general permit in accordance with *Part V.L* of this permit or the permit may be modified to include different limitations and/or requirements.

B. Reopener Guidelines. Permit modification or revocation will be conducted according to *UAC R317-8-5.6* and *UAC R317-8-6.2*.

VII. DEFINITIONS

A. Definitions related to this permit and construction activity.

1. "Act" means the "*Utah Water Quality Act*"

2. "Best Management Practices" ("BMPs") means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

3. "Commencement of Construction" means the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

4. AControl Measure@ as used in this permit, refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the State.

5. "*CWA*" means *Clean Water Act* or the *Federal Water Pollution Control Act.*

6. "Dedicated portable asphalt plant" means a portable asphalt plant that is located on or contiguous to a construction site and that provides asphalt only to the construction site that the plant is located on or adjacent to.

7. "Dedicated portable concrete plant" means a portable concrete plant that is located on or contiguous to a construction site and that provides concrete only to the construction site that the plant is located on or adjacent to.

8. "Dedicated sand or gravel operation" means an operation that produces sand and/or gravel for a single construction project.

9. ADischarge of Storm Water Associated with Construction Activity@ as used in this permit, refers to storm water Apoint source@ discharges from areas where soil disturbing activities (e.g. clearing, grading, or excavating, etc.), construction material or equipment activities (e.g. fill piles, concrete truck washout, fueling, etc.), or other industrial storm water directly related to the construction process (e.g. concrete or asphalt batch plants, etc.) are located.

10. "*EPA*" means the United States Environmental Protection Agency.

11. "*Executive Secretary*" means *Executive Secretary* of the *Utah Water Quality Board.*

12. "Final Stabilization" means that all soil disturbing activities at the site have been completed, and that a uniform (e.g. evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. In some parts of the country,

background native vegetation will cover less than 100% of the ground (e.g. arid areas). Establishing at least 70% of the natural cover of native vegetation meets the vegetative cover criteria for final stabilization. For example, if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover for final stabilization.

13. ALarge and Medium municipal separate storm sewer system@ means all municipal separate storm sewers that are either:

a) located in an incorporated place (city) with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census; or

b) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal separate storm sewer that are located in the incorporated places, townships or towns within such counties ; or

c) owned or operated by a municipality other than those described in paragraph a. or b. (above) and that are designated by the *Executive Secretary* as part of the large or medium municipal separate storm sewer system.

14. "*NOI*" means notice of intent to be covered by this permit (see the *Addendum* to this permit).

15. A*NOT*@ means notice of termination (see the *Addendum* to this permit).

16. "Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

17. "Runoff coefficient" means the fraction of total rainfall that will appear at a conveyance as runoff.

18. ASmall Construction Activity@ means all construction activities including clearing and grading that result in land disturbance of equal to or greater than one acre and less than five acres. Small construction activity also includes the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one and less than five acres.

19. ASmall Municipal Separate Storm Sewer System refers to all separate storm sewers that are owned or operated by the United States, a State, city, town, county, district, association, or other public body having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State

law such as a sewer districts, flood control districts or drainage districts, or similar entity that discharges to waters of the State, but are not defined as Alarge@ or Amedium@municipal separate storm sewer systems.

20. "Storm water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

21. "Storm water discharge associated with industrial activity" is defined in the *Utah Administrative Code (AUAC@) R317-8-3.9(6)(c) & (d)* and incorporated here by reference. Most relevant to this permit is *AUAC@ R317-8-3.9(6)(d)10*, which relates to construction activity including clearing, grading and excavation activities.

22. ASWP3" means storm water pollution prevention plan, referring to the plan required in the permit *Part III.*

23. AWaters of the State@ means all streams, lakes, ponds, marshes, water-courses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, which are contained within, flow throw, or border upon this state or any portion thereof, except that bodies of water confined to and retained within the limits of private property, and which do not develop into or constitute a nuisance, or a public health hazard, or a menace to fish and wildlife, shall not be considered to be Awaters of the state@ under this definition (*AUAC@ R317-1-1.32*).

24. "Waste pile" means any noncontainerized accumulation of solid, nonflowing waste that is used for treatment or storage.

STATE OF UTAH, DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER QUALITY
288 North 1460 West, P.O. Box 144870, Salt Lake City, Utah 84114-4870

NOT

Notice of Termination (NOT) for Storm Water Discharges Associated with Construction Activity Under the UPDES General Permit No. UTR100000. SEE REVERSE FOR INSTRUCTIONS

Submission of this Notice of Termination constitutes notice that the operator identified in Section II of this form is no longer authorized to discharge storm water associated with industrial activity under the UPDES program. ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.

I. Permit Information

UPDES Storm Water General Permit Number: _____

Check Here if You are No Longer the Operator of the Facility: ☐ Check Here if the Storm Water Discharge is Being Terminated: ☐

II. Facility Operator Information

Name: _____ Phone: _____

Address: _____

City: _____ State: _____ Zip: _____

III. Facility Site/Location Information

Name: _____

Address: _____ County: _____

City: _____ State: _____ Zip: _____

Latitude: _____ Longitude: _____

IV. Certification: I certify under penalty of law that either: a) all storm water discharges associated with construction activity from the portion of the identified facility where I was an operator have ceased or have been eliminated or b) I am no longer an operator at the construction site and a new operator has assumed operational control for those portions of the construction site where I previously had operational control. I understand that by submitting this notice of termination, I am no longer authorized to discharge storm water associated with construction activity under this general permit, and that discharging pollutants in storm water associated with construction activity to waters of the State is unlawful under the State of Utah Water Quality Act where the discharge is not authorized by a UPDES permit. I also understand that the submittal of this notice of termination does not release an operator from liability for any violations of this permit or the Water Quality Act.

Print Name: Date:

_____ _____

Signature: _____

Instructions for Completing Notice of Termination (NOT) Form

Who May File A Notice Of Termination (NOT) Form

Permittees who are presently covered under the State issued Utah Pollutant Discharge Elimination System (UPDES) General Storm Water Permit for Construction Activity may submit a notice of termination (NOT) form when their facilities no longer have any storm water discharges associated with industrial activity as defined in the storm water regulations at UAC R317-8-3.9(b)(c) and (d), or when they are no longer the operator of the facilities.

For construction activities, elimination of all storm water discharges associated with industrial activity occurs when disturbed soils at the construction site have been finally stabilized and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with construction activity from the construction site that are authorized by a UPDES general permit have otherwise been eliminated. Final stabilization means that all soil-disturbing activities at the site have been completed, and that a uniform perennial vegetative cover with a density of 70% of the cover for unpaved areas and areas not covered by permanent structures has been established, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed

Where to File NOT Form

Send this form to the following address:

Division of Water Quality
288 North 1460 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870

Completing the Form

Type or print, using upper-case letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use only one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions about this form, call the Division of Water Quality at (801) 538-6146.

Section I - Permit Information

Enter the existing UPDES Storm Water General Permit number assigned to the facility or site identified in Section III. If you do not know the permit number, contact the Division of Water Quality at (801) 538-6146.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box:

If there has been a change of operator and you are no longer the operator of the facility or site identified in Section III, Check the corresponding box.

If all storm water discharges at the facility or site identified in Section III have been terminated, check the corresponding box.

Section II - Facility Operator Information

There may be more than one operator for a construction project. This form must be filled out and submitted by each of the operators listed on the notice of intent (NOI) that was submitted for receiving coverage under this permit. In this section give the legal name of the person, firm, public organization, or any other entity that is filed as an operator at the facility or site described in this application that is desiring to terminate coverage. The name of the operator may or may not be the same name as the facility. The operator of the facility is the legal entity which controls the facility's operation (referring to operation of construction activity) or a portion of it, rather that the plant or site manager of the finished or rehabilitated facility. Do not use a colloquial name. Enter the complete address and telephone number of the operator.

Section III - Facility/Site Location Information

Enter the facility's or site's official or legal name and complete address, including city, state and ZIP code and the latitude and longitude of the facility to the nearest 15 seconds of the approximate center of the site. It is preferred that the location address be the same as that which the site used in the submission of the NOI.

Section IV - Certification

State statues provide for severe penalties for submitting false information on this application form. State regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (1) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

For a municipality, State, Federal, or other public facility: by either a principal executive officer or ranking elected official.

STATE OF UTAH, DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER QUALITY
288 North 1460 West, P.O. Box 144870, Salt Lake City, Utah 84114-4870 (801)538-6146

NOI

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under the UPDES General Permit No. UTR100000. SEE REVERSE FOR INSTRUCTIONS

Submission of this Notice of Intent constitutes notice that the party(s) identified in Section I of this form intends to be authorized by UPDES General Permit No. UTR100000 issued for storm water discharges associated with construction activity in the State of Utah. Becoming a permittee obligates such discharger to comply with the terms and conditions of the permit. ALL NECESSARY INFORMATION MUST BE PROVIDED ON THIS FORM.

I. OPERATOR INFORMATION

Name (Main operator): _____ Phone: _____

Address: _____ Status of Owner/Operator: ☐

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Name (1st Co-permittee): _____ Phone: _____

Address: _____ Status of Owner/Operator: ☐

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Name (2nd Co-permittee): _____ Phone: _____

Address: _____ Status of Owner/Operator: ☐

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Name (3rd Co-permittee): _____ Phone: _____

Address: _____ Status of Owner/Operator: ☐

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Please copy this form if you have more co-permittees than what is allowed on this form.

II. FACILITY SITE / LOCATION INFORMATION

Name: _____

Project No. (if any): _____

Is the facility located on Indian Lands? (Y or N) ☐

Address: _____ County: _____

City: _____ State: _____ Zip: _____

Latitude: Longitude:

INSTRUCTIONS

Notice Of Intent (NOI) For Covered Under the UPDES General Permit Storm Water Discharges From Construction Activities

Who Must File A Notice Of Intent (NOI) Form

State law at UAC R317-8-3.9 prohibits point source discharges of storm water from construction activities to a water body(ies) of the State without a Utah Pollutant Discharge Elimination System (UPDES) permit. The operator of a construction activity that has such a storm water discharge must submit a NOI to obtain coverage under the UPDES Storm Water General Permit. If you have questions about whether you need a permit under the UPDES Storm Water program, or if you need information as to whether a particular program is administered by EPA or a state agency, contact the storm water coordinator at (801) 538-6146.

Where To File NOI Form

NOIs, with fee payment(s), must be sent to the following address:

Department of Environmental Quality
Division of Water Quality
P.O. Box 144870
Salt Lake City, UT 84114-4870

Completing The NOI Form

You must type or print, using upper-case letters, in the appropriate areas only. Please place each character between the marks. Abbreviate if necessary to stay within the number of characters allowed for each item. Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions on this form please call the storm water coordinator at (801) 538-6146.

Beginning of Coverage

Storm Water General Permits cover a facility quickly avoiding delays, therefore coverage is immediate after NOI with submission of the permit fee. The permittee should be aware that though you may not have a permit in hand, if you have sent in a completed NOI with the permit fee you are covered by the conditions in the permit and will be expected to comply with these conditions. If you wish, contact the Division of Water Quality at (801) 538-6146 to receive a generic copy of the permit. After we receive the NOI and the permit fee we will send you an official copy of the permit with your permit number.

Permit Fees (*MAKE CHECKS PAYABLE TO: DIVISION OF WATER QUALITY*)

Construction projects are prorated from the time they begin disturbing ground until the time the disturbed surface is stabilized, and the permit is terminated by the permittee with a submittal of a Notice of Termination (NOT) form. Fees are prorated at $8.34 per month of coverage needed, except a $100 minimum. EXAMPLE: if you need 9 months of coverage: 9 x $8.34 = $75.06, then you will need to submit the $100 minimum, if 18 months of coverage is needed: 18 x $8.34 = $150.12, your total fee will be $150.12. Permit coverages extending beyond the expiration date of the general permit will be extended under the reissued general permit. State or local political subdivisions are exempt from the permit fee. The fee must be received with the NOI before permit coverage is given.

General

Facilities within Salt Lake City or Salt Lake County must contact the city or county and notify them of the new permit status for the facility.

SECTION I - FACILITY OPERATOR INFORMATION

Give the legal name(s) of the person(s), firm(s), public organization(s), or any other entity(ies) that conducts the construction operation at the facility or site described in this application. The name of the operator(s) may be the developer, the owner, the general contractor, the design firm, the excavation contractor and/or others (e.g. anyone that fits the definition of operator). An operator is anyone that has control over site/project specifications and/or control of day to day operational activities. Do not use a colloquial name. Enter the complete address and telephone number of the operator(s).

Enter the appropriate letter to indicate the legal status of the operator of the facility.
F = Federal M = Public (other than Fed or State) S = State P = Private

SECTION II - FACILITY/SITE LOCATION INFORMATION

Enter the facility's or site's official or legal name and project number (if any) and complete street address, including city, state and ZIP code. If the facility or site lacks a street address, indicate the latitude and longitude of the facility to the nearest 15 seconds of the approximate center of the site.

Indicate whether the facility is located on Indian Lands.

If the facility is located on Indian Lands EPA form 3510-6 should be used and submitted to EPA Region VIII except for facilities on the Navajo Reservation or on the Goshute Reservation which should submit EPA form 3510-6 to Region IX.

SECTION III - SITE ACTIVITY INFORMATION

If the storm water discharges to a municipal separate storm sewer system (MS4), enter the name of the operator of the MS4 (e.g., municipality name, county name) and the receiving water of the discharge from the MS4 if it is known. (A MS4 is defined as a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by a state, city, town, county, district, association or other public body which is designed or used for collecting or conveying storm water).

SECTION IV - TYPE OF CONSTRUCTION

Check each type of construction that applies to this application.

SECTION V - MANAGEMENT PRACTICES

Check each type of management practices that will be used to control storm water runoff at the job site.

SECTION VI - ADDITIONAL INFORMATION REQUIRED

Enter the project start date and the estimated completion date for the entire development plan.

Provide an estimate of the total number of acres of the site on which soil will be disturbed (round to the nearest acre).

Indicate whether the storm water pollution prevention plan for the site is in compliance with approved state and/or local sediment and erosion plans, permits, or storm water management plans.

SECTION VII - CERTIFICATION

State statutes provide for severe penalties for submitting false information on this application form. State regulations require this application to be signed as follows:

For a corporation: by a responsible corporate officer, which means: (I) president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions, or (ii) the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

For a partnership or sole proprietorship: by a general partner or the proprietor; or

For a municipality, state, Federal, or other public facility: by either a principal executive officer or ranking elected official.

POLLUTION PREVENTION PLAN

A storm water pollution prevention plan (SWP3) is required to be in hand before the NOI can be submitted. It is important to know SWP3 requirements (contained in the permit) even during the design portion of the project. A copy of the permit can be obtained from the Division of Water Quality. Guidance material for developing a SWP3 can be obtained from EPA (NTIS) or copied from EPA material at the Division of Water Quality.

NOTICE OF TERMINATION (NOT)

A completed Notice of Termination (NOT) form is required to terminate your permit at the end of construction. Please complete the NOT form, including the project's assigned permit number, and return it to the Division of Water Quality. Please contact the storm water coordinator at (801) 538-6146 for any questions or for a copy of the NOT form.

10/30/97

III. SITE ACTIVITY INFORMATION

Municipal Separate Storm Sewer System (MS4) Operator Name: _____

Receiving Water Body: _____ How far to the nearest water body? _____ ft. miles. (circle one)

List the Number of any other UPDES permits at the site: _____

IV. TYPE OF CONSTRUCTION (Check all that apply)

1. Residential 2. Commercial 3. Industrial 4. Road 5. Bridge 6. Utility 7. Contouring, Landscaping

8. Other (Please list) _____

V. BEST MANAGEMENT PRACTICES

Identify proposed Best Management Practices (BMPs) to reduce pollutants in storm water discharges: (Check all that apply)

1. Silt Fences 2. Sediment Pond 3. Seeding/Preservation of Vegetation 4. Mulching/Geotextiles 5. Check Dams 6. Structural Controls (Berms, Ditches, etc.)

7. Other (Please list) _____

VI. ADDITIONAL INFORMATION REQUIRED

Project Start Date: _____ Completion Date: _____ Estimated Area to be Disturbed (in Acres): _____ (Y or N) ☐

A storm water pollution prevention plan has been prepared for this site and is to the best of my knowledge in Compliance with State and/or Local Sediment and Erosion Plans and Requirements.

(A pollution prevention plan is required to be on hand before submittal of the NOI)

VII. CERTIFICATION: I certify under penalty of law that I have read and understand the *Part I.B.* eligibility requirements for coverage under the general permit for storm water discharges from construction activities. I further certify that to the best of my knowledge, all discharges and BMPs that have been scheduled and detailed in a pollution prevention plan will satisfy requirements of *Part I.B.* , and *Part III.* of this permit. I understand that continued coverage under this storm water general permit is contingent upon maintaining eligibility as provided for in *Part I.B.*

I also certify under penalty of law that this document and all attachments were prepared under the direction or supervision of those who have place their signature below, in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name (of responsible person for the main operator from first page): _____ Date: _____

Signature: _____

Print Name (of responsible person for the 1st co-permittee from first page): _____ Date: _____

Signature: _____

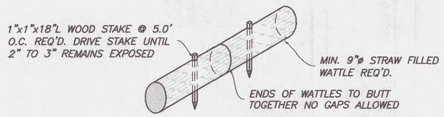
Print Name (of responsible person for the 2nd co-permittee from first page): _____ Date: _____

Signature: _____

Print Name (of responsible person for 3rd co-permittee from first page): _____ Date: _____

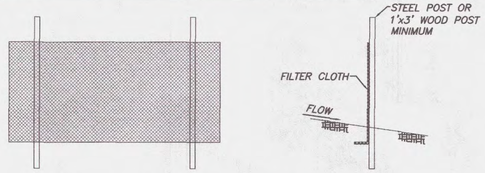
Signature: _____

Amount of Permit Fee Enclosed: $_____



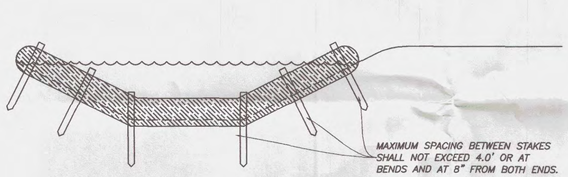
TYPICAL WADDLE/ FILTER SOCK

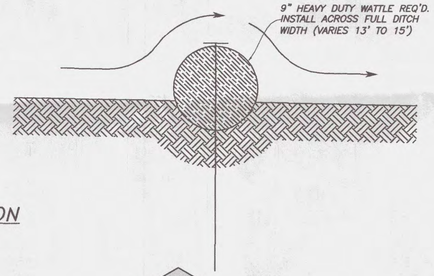
NOT TO SCALE



SILT FENCE DETAIL

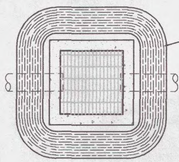
NOT TO SCALE

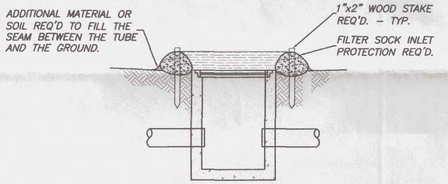




STORM DRAIN DITCH PROTECTION

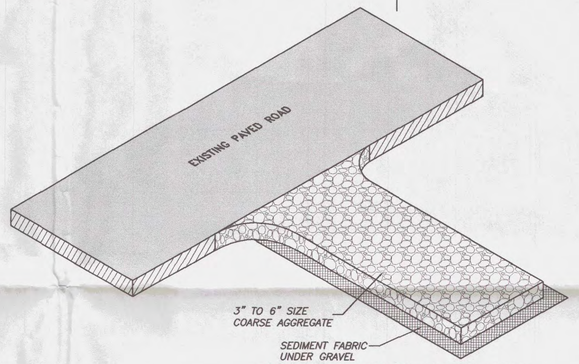
NOT TO SCALE





STORM DRAIN INLET PROTECTION

NOT TO SCALE



CONSTRUCTION ENTRANCE

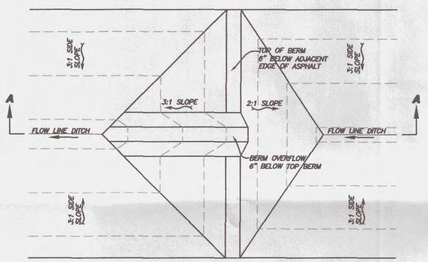
NOT TO SCALE

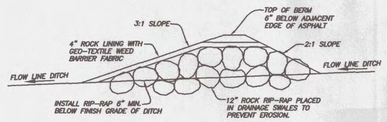
STABILIZED CONSTRUCTION ENTRANCE NOTES:

INSTALLATION/APPLICATION CRITERIA:
1. CLEAR AND GRUB AREA AND GRADE TO PROVIDE MAXIMUM SLOPE OF 2%.
2. COMPACT SUBGRADE AND PLACE FILTER FABRIC IF DESIRED (RECOMMENDED FOR ENTRANCES TO REMAIN FOR MORE THAN 3 MONTHS)
3. PLACE COARSE AGGREGATE, 3" TO 6" IN SIZE, TO A MINIMUM DEPTH OF 8".

LIMITATIONS:
1. REQUIRES PERIODIC TOP DRESSING WITH ADDITIONAL STONES.
2. SHOULD BE USED IN CONJUNCTION WITH STREET SWEEPING ON ADJACENT PUBLIC RIGHT-OF-WAY.

MAINTENANCE:
1. INSPECT DAILY FOR LOSS OF GRAVEL OR SEDIMENT BUILDUP.
2. INSPECT ADJACENT ROADWAY FOR SEDIMENT DEPOSIT AND CLEAN BY SWEEPING OR SHOVELING.
3. REPAIR ENTRANCE AND REPLACE GRAVEL AS REQUIRED TO MAINTAIN CONTROL IN GOOD WORKING CONDITION.
4. EXPAND STABILIZED AREA AS REQUIRED TO ACCOMMODATE TRAFFIC AND PREVENT EROSION AT DRIVEWAYS.





TYPICAL ROCK CHECK DAM DETAIL

SCALE: NONE

NOTE:

CONTRACTOR SHALL PROVIDE AN INTERMEDIATE CHECK DAM EVERY 400' TO 500' OR MORE FREQUENT AS SLOPE AND CONTRIBUTION AREAS DICTATE. (SEE DETAIL THIS SHEET)

GENERAL NOTES:

1. THE CONTRACTOR SHALL CONTROL WASTE, GARBAGE, DEBRIS, WASTEWATER, AND OTHER SUBSTANCES ON THE SITE IN SUCH A WAY THAT THEY SHALL NOT BE TRANSPORTED FROM THE SITE BY THE ACTION OF WINDS, STORM WATER RUNOFF, OR OTHER FORCES. PROPER DISPOSAL OR MANAGEMENT OF ALL WASTES AND UNUSED BUILDING MATERIALS, APPROPRIATE TO THE NATURE OF THE WASTE OR MATERIAL, IS REQUIRED.

2. PUBLIC OR PRIVATE ROADWAYS SHALL BE KEPT CLEAR OF ACCUMULATED SEDIMENT. BULK CLEARING OF ACCUMULATED SEDIMENT SHALL NOT INCLUDE FLUSHING THE AREA WITH WATER. CLEARED SEDIMENT SHALL BE RETURNED TO THE LIKELY ORIGIN OR OTHER SUITABLE LOCATION.

3. THIS EROSION CONTROL PLAN SHALL BE IMPLEMENTED ON ALL DISTURBED AREAS WITHIN THE CONSTRUCTION SITE FOR ALL ROAD AND UTILITY CONSTRUCTION. ANY OTHER DISTURBANCES FOR HOME CONSTRUCTION IS NOT COVERED UNDER THIS PLAN. ALL MEASURES INVOLVING EROSION CONTROL PRACTICES SHALL BE INSTALLED UNDER THE GUIDANCE OF QUALIFIED PERSONNEL EXPERIENCED IN EROSION CONTROL AND ACCORDING TO THE PLANS, SPECIFICATIONS, AND LOCAL REGULATION.

4. THE CONTRACTOR SHALL IMPLEMENT MEASURES TO REDUCE DUST DURING CONSTRUCTION.

MAINTENANCE SCHEDULE AND REQUIREMENTS:

1. CONTRACTOR SHALL NOTIFY THE OWNERS REPRESENTATIVE OF ALL EROSION/SEDIMENT CONTROL MEASURES. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CHECKED BY THE CONTRACTOR ON A DAILY BASIS AND AFTER EACH STORM EVENT.

2. AT THE COMPLETION OF THE CONSTRUCTION AND AFTER THE AREA HAS BEEN STABILIZED, THE CONTRACTOR SHALL REMOVE EROSION CONTROL MEASURES IN A MANNER THAT MINIMIZES DISTURBANCE TO THE SITE. CONTRACTOR IS RESPONSIBLE TO TRANSFER MAINTENANCE RESPONSIBILITY TO OWNER BEFORE SITE TURNOVER. ALL O&M MANUALS AND MAINTENANCE INSTRUCTIONS SHALL BE GIVEN TO THE OWNER BY THE CONTRACTOR BEFORE SUBSTANTIAL COMPLETION OF THE PROJECT.

INSTALLATION SCHEDULE:

1. PERIMETER SILT FENCE SHALL BE INSTALLED PRIOR TO INITIAL LAND DISTURBANCE ACTIVITIES OR AS SOON AS PRACTICAL. CONTRACTOR SHALL MAINTAIN A 3' BUFFER STRIP OF EXISTING VEGETATION BETWEEN ANY DISTURBED AREA AND THE SILT FENCE AROUND THE PERIMETER OF THE SITE TO REDUCE OFF-SITE EROSION AND SEDIMENTATION.

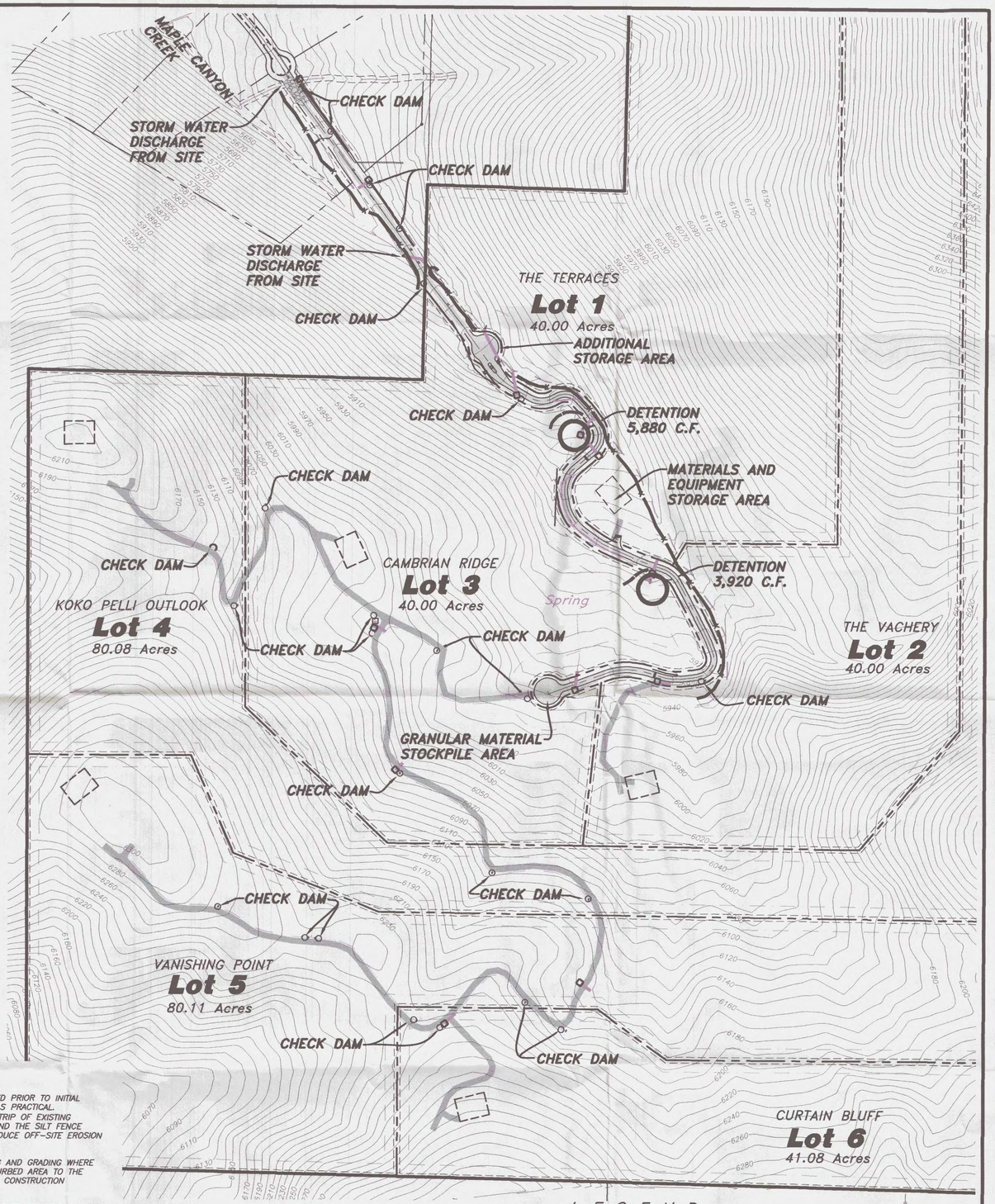
2. CONTRACTOR SHALL USE STAGED CLEARING AND GRADING WHERE PRACTICAL TO REDUCE THE AMOUNT OF DISTURBED AREA TO THE ABSOLUTE MINIMUM REQUIRED FOR IMMEDIATE CONSTRUCTION ACTIVITIES.

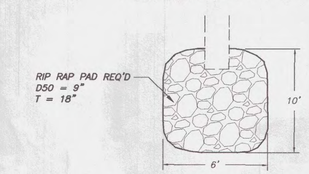
3. EXCEPT AS PREVENTED BY INCLEMENT WEATHER CONDITIONS, STABILIZING MEASURES, SUCH AS TEMPORARY SEEDING OR PERMANENT VEGETATION, SODDING, MULCHING, SEDIMENT BASINS, EROSION CONTROL BLANKETS, OR OTHER SPECIFIED PROTECTIVE PRACTICES SHALL BE INSTALLED ON ALL DISTURBED AREAS LEFT INACTIVE FOR SEVEN DAYS.

4. ALL DISTURBED AREAS SHALL HAVE PERMANENT SEEDING WITHIN SEVEN DAYS AFTER GRADING OPERATIONS.

IMPORTANT:

IT IS THE CONTRACTOR'S RESPONSIBILITY TO IMPLEMENT EROSION CONTROL MEASURES FOR ALL CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS PROJECT. EROSION CONTROL MEASURES SHALL BE IN FULL COMPLIANCE WITH STATE AND LOCAL ORDINANCES.





RIP RAP OUTLET PROTECTION

LEGEND:

- PROPERTY BOUNDARY
- EXISTING CONTOUR
- STORM DRAIN PIPE
- SILT FENCE OR WADDLES REQ'D
- CATCH BASIN INLET PROTECTION
- CONSTRUCTION ENTRANCE
- CHECK DAM
- DETENTION POND

SCALE: 1"=200'

0 200 400

Scale in Feet

No.	Date	By	Revision
2.	8-16-2012	MBJ	Revise to include items on SWPPP Checklist
1.	7-16-2012	MBJ	Revise drawing to match new storm drain study

HANSEN & ASSOCIATES, INC.
Consulting Engineers and Land Surveyors
538 North Main Street, Brigham, Utah 84302
Visit us at www.hoes.net
Logan Ogden Brigham City
(435) 723-3491 (801) 399-4905 (435) 752-8272

HAI

LICENSED PROFESSIONAL ENGINEER No. 275350 MATTHEW B. MEYER STATE OF UTAH

Drawn By: MJB Date: 9/29/10
Designed By:
Checked By:
Approved By:
Scale: 1"=200'
Drawing File: 07-129 DRAINAGE
JOB NUMBER: 07-129

EROSION CONTROL DRAWING FOR

THE SANCTUARY

A PART OF SECTION 3 & 4, T6N, R2E, AND A PART OF SECTION 34, T7N, R2E, SL B&M
WEBER COUNTY, UTAH

SHEET 1 OF 1 SHEETS

APPENDIX B

STANDARDS AND SPECIFICATIONS FOR SELECTED BMPs

Table 1

BMP Maintenance and Inspection Schedule
(Source Control BMPs)

Tim Charlwood
P.O. Box 980400
Park City, UT 84098

BMP Designation	BMP Name	Recommended Maintenance	Recommended Schedule of Maintenance
EC-2	Preservation of Existing Vegetation	Inspect flagged areas to make sure flagging has not been removed. If tree roots have been exposed or injured, recover and/or seal them.	Daily
EC-3 EC-6	Mulching	Maintain specified thickness of mulch cover. Eroded areas must be corrected and re-mulched. Drainage problems must be corrected.	Weekly and following storms
EC-4	Hyrdoseeding	Re-seed areas failing to establish 80% cover within one month (during growing season). If re-seeding is ineffective, use sodding or nets/blankets. Eroded areas shall be corrected, re-planted, and irrigated as required.	Inspect to ensure growth weekly
EC-7	Geotextiles and Mats	Inspect to ensure good contact with ground and no erosion of soils. Replace damaged material and re-staple where required. Correct erosion problems immediately.	Weekly and following storms
EC-13	Polyacrylamide	Reapply PAM to actively worked soils at 48-hr. intervals not to exceed 7 application per month. Reapply PAM to undisturbed soils at 2-month intervals.	Daily
SE-1	Silt Fence	If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.	Daily
TC-1	Stabilized Construction Entrance/Exit & Tire Wash	If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.	Daily
TC-3	Entrance/ Outlet Tire Wash	Wheel wash water shall not be discharged into a storm drain or the site's storm water collection system. Use closed-loop recirculation or land application.	Daily

BMP Designation	BMP Name	Recommended Maintenance	Recommended Schedule of Maintenance
WE-1	Wind Erosion Control	Re-apply dust control measures as necessary to keep dust to a minimum.	Daily during dry weather

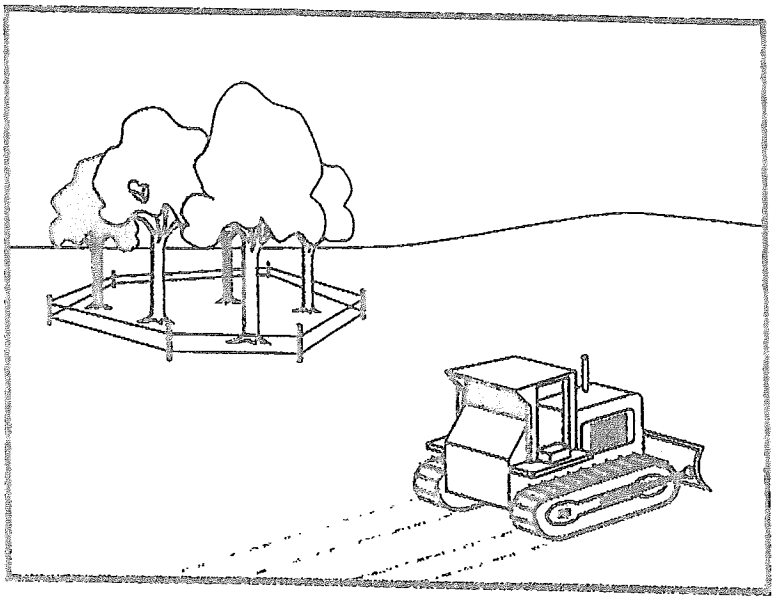
Table 2

BMP Maintenance and Inspection Schedule
(Runoff, Conveyance, and Treatment BMPs)

Tim Charlwood
P.O. Box 980400
Park City, UT 84098

BMP Designation	BMP Name	Recommended Maintenance	Recommended Schedule of Maintenance
EC-9	Earth Dikes and Drainage Swales	Inspect to insure structural integrity. Repair as needed	Weekly and following storms
EC-10	Velocity Dissipation Devices	Inspect to ensure underlain soils are not eroding. Inspect for slippage on slopes.	Weekly and following storms
EC-12	Streambank Stabilization	During growth period, inspect grass after rainstorms. Remove accumulated sediments. Inspect outlets to prevent scouring and erosion.	Weekly and following storms
SE-1	Silt Fence	Repair damaged fencing immediately. Intercept concentrated flows and reroute. Remove sediment accumulations at 6-inches. Replace deteriorated fencing material. Properly dispose of used fencing.	Weekly and following storms
SE-2	Sediment Basin	Remove sediment when it reaches a depth of one foot. Repair damage to pond embankments and slopes.	Weekly and following storms
SE-3	Sediment Trap	Remove sediment when it reaches a depth of one foot. Repair damage to trap embankments and slopes.	Weekly and following storms
SE-4	Check Dams	Remove sediment when one half the sump depth. Check for erosion around edges of dams.	Weekly and following storms
SE-5 SE-6 SE-8	Fiber Rolls Gravel Bag Berm Sand Bag Barrier	Inspect daily during rainy periods. Check for undercutting, end runs, and damaged bales. Remove accumulated sediment when one half the barrier height.	Daily during prolonged rainy periods.
SE-10	Storm Drain Inlet Protection	Replace clogged filter fabric. Clean sediment from stone filters. Do not wash collected sediments into storm drains – remove to soil stockpile.	Weekly and following storms

Preservation Of Existing Vegetation EC-2



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

EC-2 Preservation Of Existing Vegetation

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

County of Sacramento Tree Preservation Ordinance, September 1981.

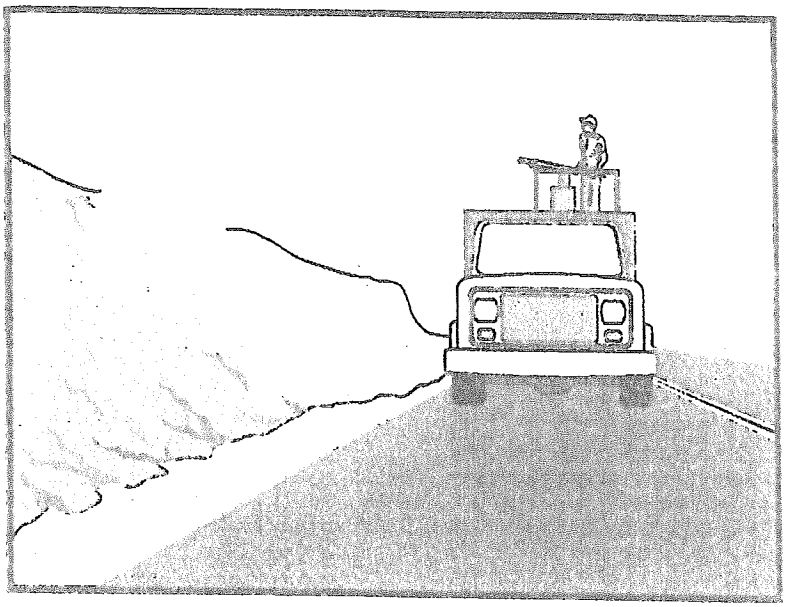
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch

EC-3



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Description and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

Suitable Applications

Hydraulic mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

Wood fiber hydraulic mulches are generally short lived and need 24 hours to dry before rainfall occurs to be effective. May require a second application in order to remain effective for an entire rainy season.

Implementation

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- To be effective, hydraulic matrices require 24 hours to dry before rainfall occurs.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

- Paper based hydraulic mulches alone shall not be used for erosion control.

Hydraulic Mulches

Wood fiber mulch can be applied alone or as a component of hydraulic matrices. Wood fiber applied alone is typically applied at the rate of 2,000 to 4,000 lb/acre. Wood fiber mulch is manufactured from wood or wood waste from lumber mills or from urban sources.

Hydraulic Matrices

Hydraulic matrices include a mixture of wood fiber and acrylic polymer or other tackifier as binder. Apply as a liquid slurry using a hydraulic application machine (i.e., hydro seeder) at the following minimum rates, or as specified by the manufacturer to achieve complete coverage of the target area: 2,000 to 4,000 lb/acre wood fiber mulch, and 5 to 10% (by weight) of tackifier (acrylic copolymer, guar, psyllium, etc.)

Bonded Fiber Matrix

Bonded fiber matrix (BFM) is a hydraulically applied system of fibers and adhesives that upon drying forms an erosion resistant blanket that promotes vegetation, and prevents soil erosion. BFMs are typically applied at rates from 3,000 lb/acre to 4,000 lb/acre based on the manufacturer's recommendation. A biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM should also be biodegradable and should not dissolve or disperse upon re-wetting. Typically, biodegradable BFMs should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Costs

Average cost for installation of wood fiber mulch is $900/acre. Average cost for installation of BFM is $5,500/acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

References

Controlling Erosion of Construction Sites Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

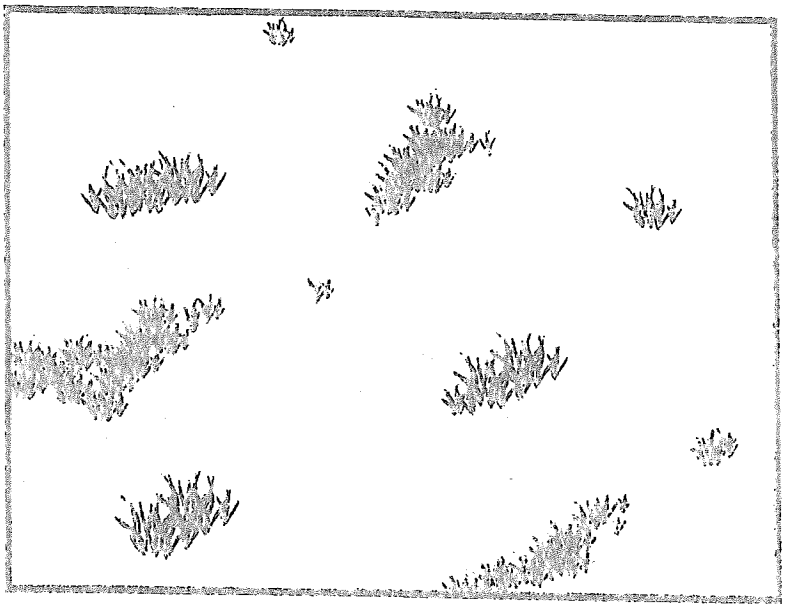
Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding

EC-4



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

☒ Secondary Objective

Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, to temporarily protect exposed soils from erosion by water and wind.

Suitable Applications

Hydroseeding is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short term inactivity.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Implementation

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps shall be followed for implementation:

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Hydroseeding can be accomplished using a multiple step or one step process. The multiple step process ensures maximum direct contact of the seeds to soil. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the area to be seeded with the furrows trending along the contours.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.
- Follow up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average cost for installation and maintenance may vary from as low as $300 per acre for flat slopes and stable soils, to $1600 per acre for moderate to steep slopes and/or erosive soils.

Hydroseeding		Installed Cost per Acre
High Density	Ornamentals	$400 - $1600
	Turf Species	$350
	Bunch Grasses	$300 - $1300
Fast Growing	Annual	$350 - $650
	Perennial	$300 - $800
Non-Competing	Native	$300 - $1600
	Non-Native	$400 - $500
Sterile	Cereal Grain	$500

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

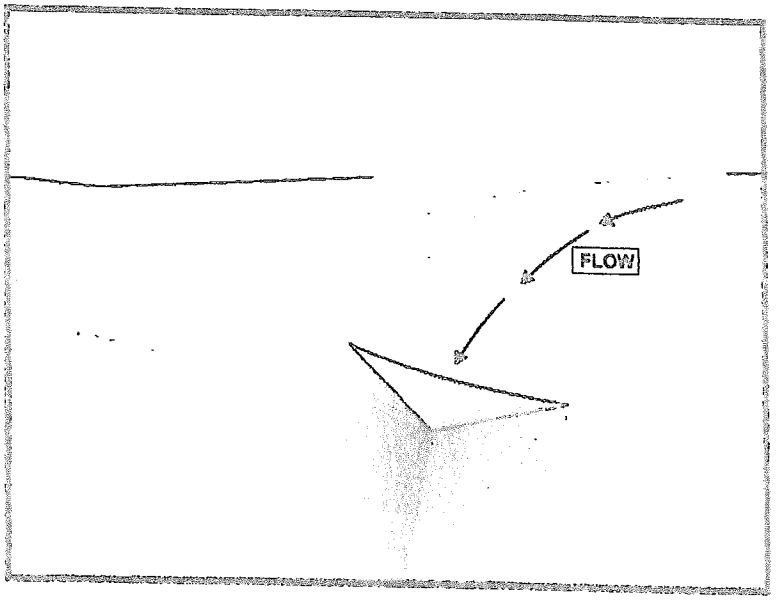
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems shall be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Earth Dikes and Drainage Swales EC-9



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

Potential Alternatives

None

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and

compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.

- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

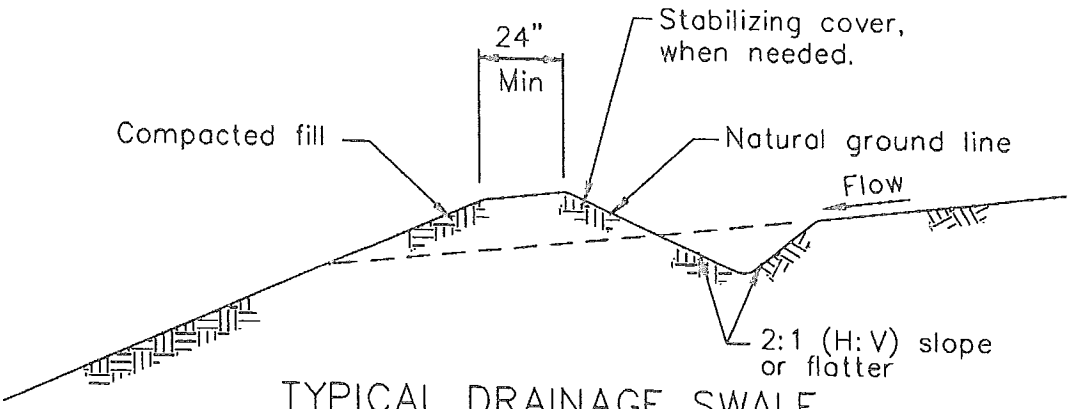
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

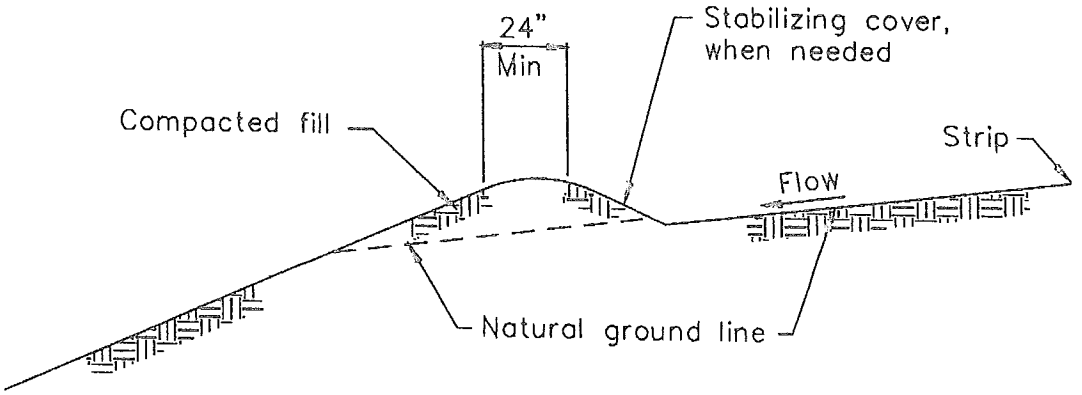
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL DRAINAGE SWALE
NOT TO SCALE

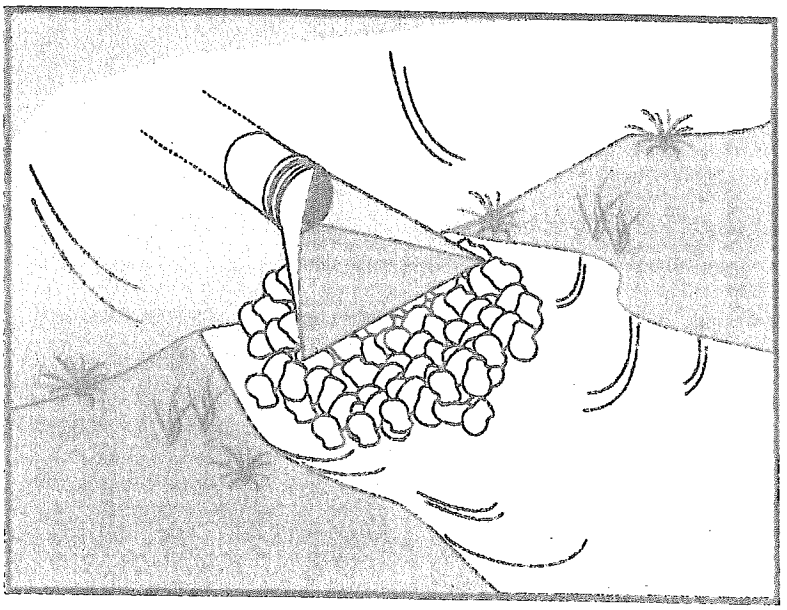
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Velocity Dissipation Devices EC-10



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
  - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
  - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

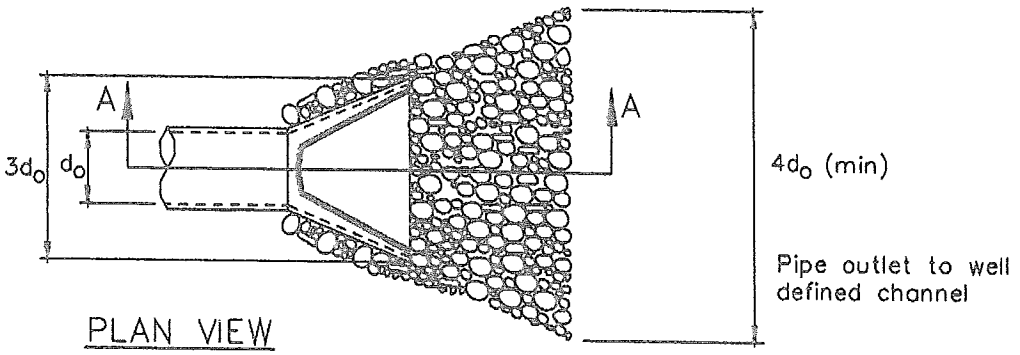
Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

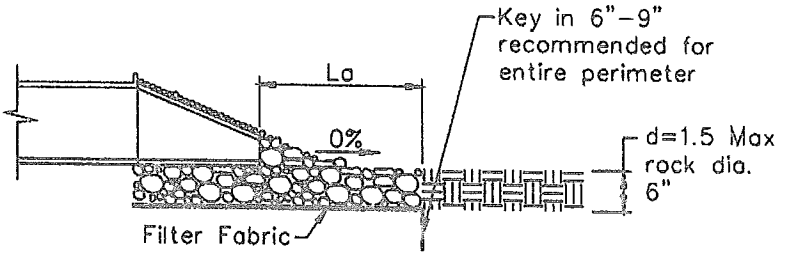
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



PLAN VIEW

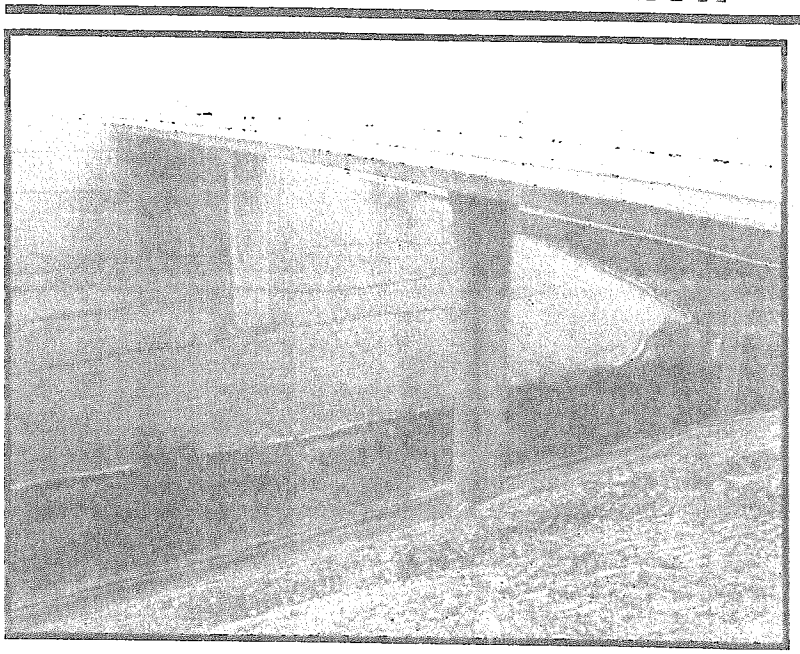


SECTION A–A

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Streambank Stabilization EC-12



Objectives

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to conduct sampling

to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.

- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).

- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.

- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in^2, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence,

on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- Padding - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.

- Clean, washed gravel - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- Excavation using a large bucket - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.

- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an "in-channel" sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.

- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.

- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed "in the dry", and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.

- The use of this technique requires consideration of time of year and timing of expected stream flows.

- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.

- Apply water slowly and evenly to prevent runoff and erosion.

- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

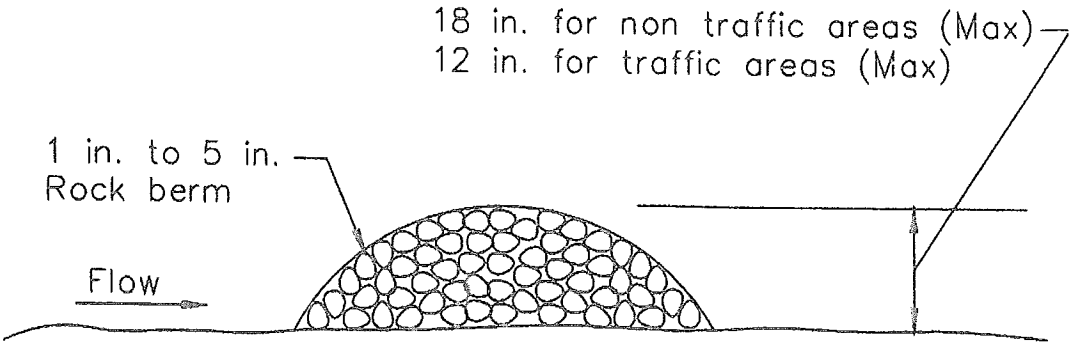
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), UESPA, 1990.

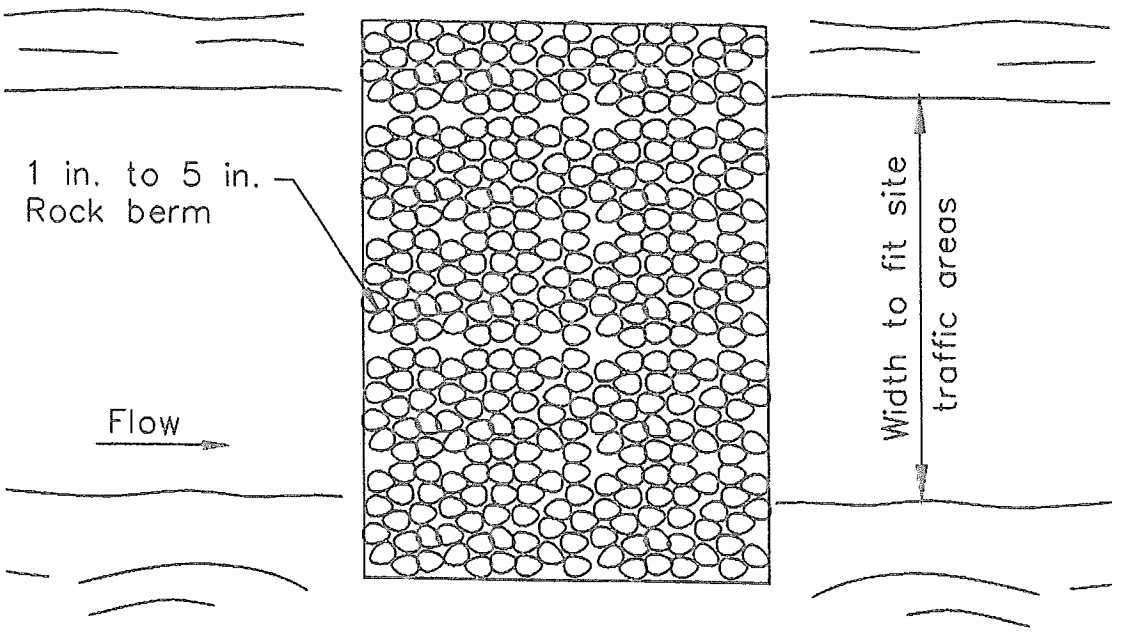
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



SECTION

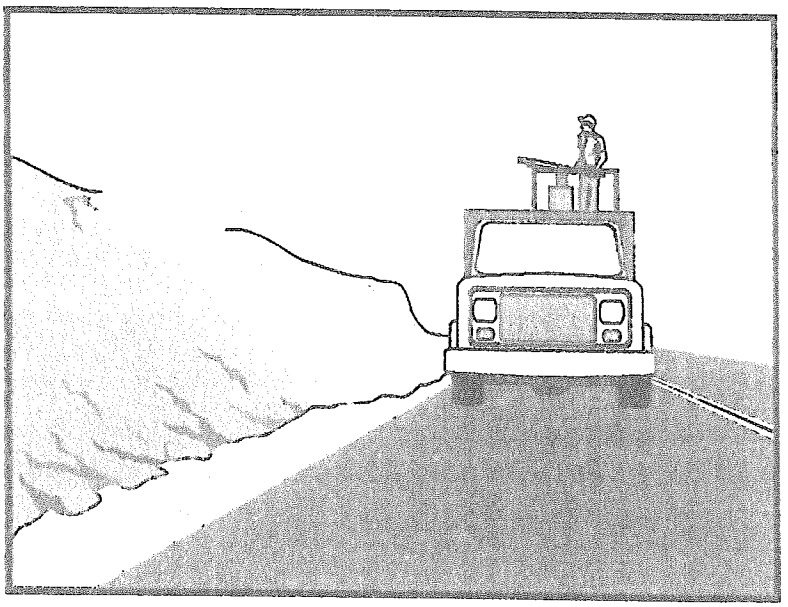


PLAN

TYPICAL ROCK FILTER
NOT TO SCALE

Polyacrylamide

EC-13



Objectives

EC	Erosion Control
SE	Sediment Control
TR	Tracking Control
WE	Wind Erosion Control
NS	Non-Stormwater Management Control
WM	Waste Management and Materials Pollution Control

Legend:

☑ **Primary Objective**

☑ **Secondary Objective**

Description and Purpose

Polyacrylamide (PAM) is a chemical that can be applied to disturbed oils at construction sites to reduce erosion and improve settling of suspended sediment.

PAM increases the soil's available pore volume, thus increasing infiltration and reducing the quantity of stormwater runoff that can cause erosion. Suspended sediments from PAM treated soils exhibit increased flocculation over untreated soils. The increased flocculation aids in their deposition, thus reducing stormwater runoff turbidity and improving water quality.

Suitable Applications

PAM is suitable for use on disturbed soil areas that discharge to a sediment trap or sediment basin. PAM is typically used in conjunction with other BMPs to increase their performance.

PAM can be applied to the following areas:

- Rough graded soils that will be inactive for a period of time.
- Final graded soils before application of final stabilization (e.g., paving, planting, mulching).
- Temporary haul roads prior to placement of crushed rock surfacing.
- Compacted soil road base.
- Construction staging, materials storage, and layout areas.

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics

Potential Alternatives

None

- Soil stockpiles.
- Areas that will be mulched.

Limitations

- There is limited experience in California with use of PAM for erosion and sediment control.
- PAM shall not be directly applied to water or allowed to enter a water body.
- Do not use PAM on a slope that flows into a water body without passing through a sediment trap or sediment basin.
- PAM will work when applied to saturated soil but is not as effective as applications to dry or damp soil.
- Some PAMs are more toxic and carcinogenic than others. Only the most environmentally safe PAM products should be used.
- The specific PAM copolymer formulation must be anionic. **Cationic PAM shall not be used in any application because of known aquatic toxicity problems.** Only the highest drinking water grade PAM, certified for compliance with ANSI/NSF Standard 60 for drinking water treatment, will be used for soil applications.
- PAM designated for erosion and sediment control should be "water soluble" or "linear" or "non-cross linked".
- A sampling and analysis plan must be incorporated into the SWPPP as PAM may be considered to be a source of non-visible pollutants.

Implementation

General

PAM shall be used in accordance with the following general guidance:

- Pam shall be used in conjunction with other BMPs and not in place of other BMPs, including both erosion controls and sediment controls.
- Stormwater runoff from PAM treated soils should pass through a sediment control BMP prior to discharging to surface waters.
  - When the total drainage area is greater than or equal to 5 acres, PAM treated areas shall drain to a sediment basin.
  - Areas less than 5 acres shall drain to sediment control BMPs, such as a sediment trap, or a minimum of 3 check dams per acre. The total number of check dams used shall be maximized to achieve the greatest amount of settlement of sediment prior to discharging from the site. Each check dam shall be spaced evenly in the drainage channel. Through which stormwater flows are discharged off site.
- Do not add PAM to water discharging from site.

- On PAM treated sites, the use of silt fence and fiber rolls shall be maximized to limit the discharges of sediment to sediment traps and sediment basins.
- All areas not being actively worked one should be covered and protected from rainfall. PAM should not be the only cover BMP used.
- PAM can be applied to wet soil, but dry soil is preferred due to less sediment loss.
- Keep the granular PAM supply out of the sun. Granular PAM loses its effectiveness in three months after exposure to sunlight and air.
- Proper application and re-application plans are necessary to ensure total effectiveness of PAM usage.
- PAM, combined with water, is very slippery and can be a safety hazard. Care must be taken to prevent spills of PAM powder onto paved surfaces. During an application of PAM, prevent over spray from reaching pavement, as pavement will become slippery. If PAM powder gets on skin or clothing, wipe it off with a rough towel rather than washing with water this only makes cleanup messier and longer.
- Recent high interest in PAM has resulted in some entrepreneurial exploitation of the term "polymer". All PAMs are polymer, but not all polymers are PAM, and not all PAM products comply with ANSI/NSF Standard 60. PAM use shall be reviewed and approved by the local permitting authority.
- The PAM anionic charge density may vary from 2-30%; a value of 18% is typical. Studies conducted by the United States Department of Agriculture (USDA)/ Agricultural Research Service (ARS) demonstrated that soil stabilization was optimized by using very high molecular weight (12-15 mg/mole), highly anionic (>20% hydrolosis) PAM.
- PAM tackifiers are available and being used in place of guar and alpha plantago. Typically, PAM tackifiers should be used at a rate of no more than 0.5-1 lb per 1,000 gallons of water in hydro mulch machine. Some tackifier product instructions say to use at a rate of 3-5 lbs per acre, which can be too much. In addition, pump problems can occur at higher rates due to increased viscosity.

Preferred Application Method

PAM may be applied in dissolved form with water, or it may be applied in dry, granular, or powered form. The preferred application method is the dissolved form.

PAM is to be applied at a maximum rate of ½ pound PAM per 1000 gallons water per 1 acre of bare soil. Table 1 and Figure 1 can be used to determine the PAM and water application rate for a disturbed soil area. Higher concentrations of PAM do not provide any additional effectiveness.

Table 1 PAM and Water Application Rates		
Disturbed Area (acre)	PAM (lbs)	Water (gallons)
0.50	0.25	500
1.00	0.50	1,000
1.50	0.75	1,500
2.00	1.00	2,000
2.50	1.25	2,500
3.00	1.50	3,000
3.50	1.75	3,500
4.00	2.00	4,000
4.50	2.25	4,500
5.00	2.50	5,000

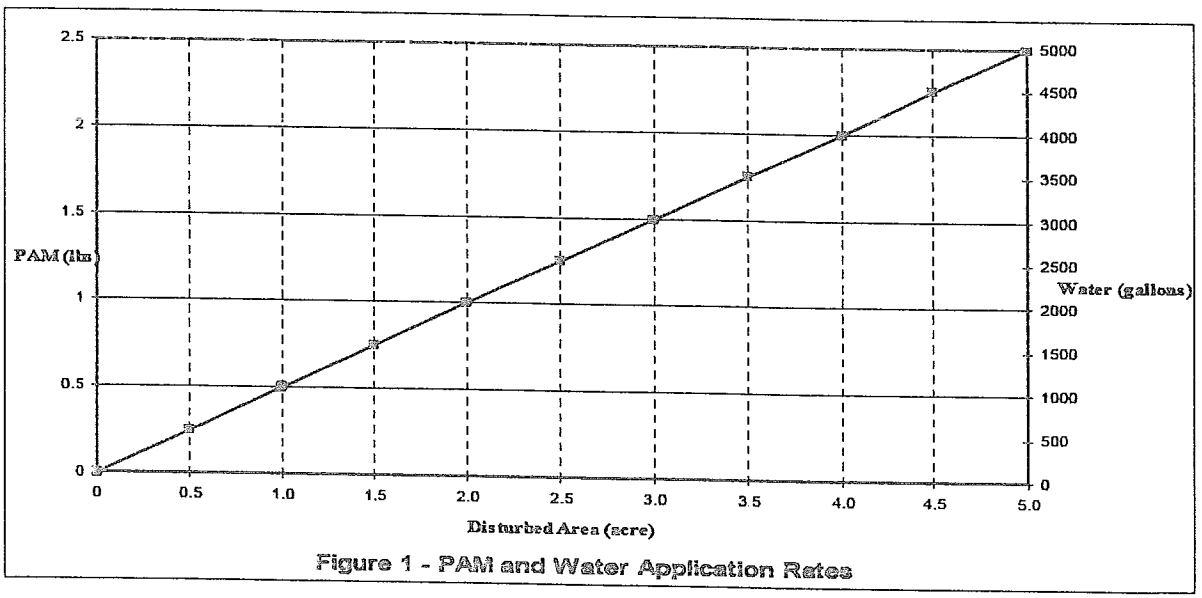


Figure 1 - PAM and Water Application Rates

- Pre-measure the area where PAM is to be applied and calculate the amount of product and water necessary to provide coverage at the specified application rate (1/2 pound PAM/1000 gallons/acre).

- PAM has infinite solubility in water, but dissolves very slowly. Dissolve pre-measured dry granular PAM with a known quantity of clean water in a bucket several hours or overnight. Mechanical mixing will help dissolve the PAM. Always add PAM to water – not water to PAM.

- Pre-fill the water truck about 1/8 full with water. The water does not have to be potable, but it must have relatively low turbidity – in the range of 20 NTU or less.
- Add the dissolved PAM and water mixture to the truck.
- Fill the water truck to specified volume for the amount of PAM to be applied.
- Spray the PAM/water mixture onto dry soil until the soil surface is uniformly and completely wetted.

Alternate Application Method

PAM may also be applied as a powder at the rate of 5 lbs per acre. This must be applied on a day that is dry. For areas less than 5-10 acres, a hand held "organ grinder" fertilizer spreader set to the smallest setting will work. Tractor mounted spreaders will work for larger areas.

Costs

- PAM: $1.30 - $5.50/lb (material cost only).

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- PAM must be reapplied on actively worked areas after a 48-hour period if PAM is to remain effective.
- Reapplication is not required unless PAM treated soil is disturbed or unless turbidity levels show the need for an additional application.
- If PAM treated soil is left undisturbed a reapplication may be necessary after two months.
- More PAM applications may be required for steep slopes, silty and clayey soils (USDA Classification Type "C" and "D" soils), long grades, and high precipitation areas.
- When PAM is applied first to bare soil and then covered with straw, a reapplication may not be necessary for several months.
- Discharges from PAM treated areas must be monitored for non-visible pollutants.

References

Entry, J.A., and R.E. Sojka. Polyacrylamide Application to Soil Reduces the Movement of Microorganisms in Water. In 1999 Proceedings of the International Irrigation Show. Irrigation Associations, Orlando, FL, November, 1999.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

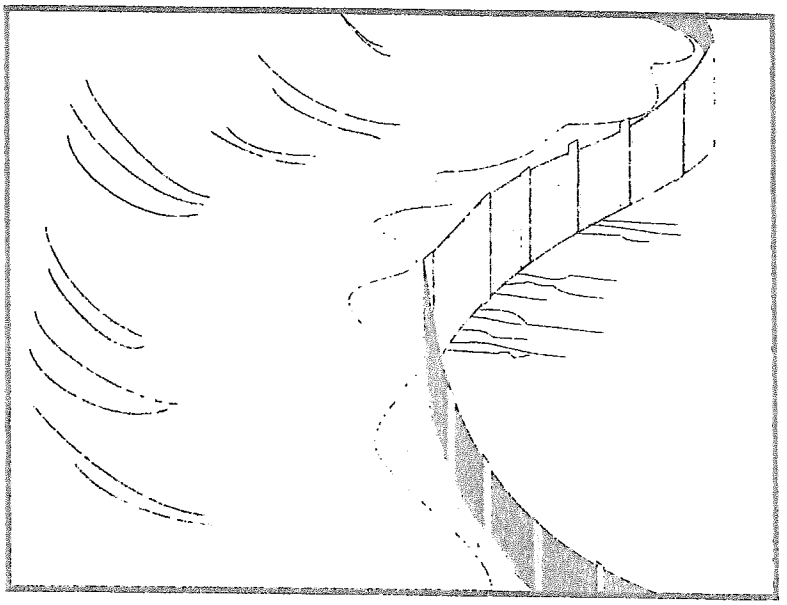
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Sojka, R.E., and R.D. Lentz, eds. Managing Irrigation Induced Erosion and Infiltration with Polyacrylamide. In Proceedings from Conference held at College of Southern Idaho, Twin Falls, Idaho, University of Idaho Miscellaneous Publication No. 101-96, May, 1996

Stormwater Management Manual for Western Washington, Volume II – Construction Stormwater Pollution Prevention, Washington State Department of Ecology, August 2001.

Silt Fence

SE-1



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

Implementation

General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, and then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

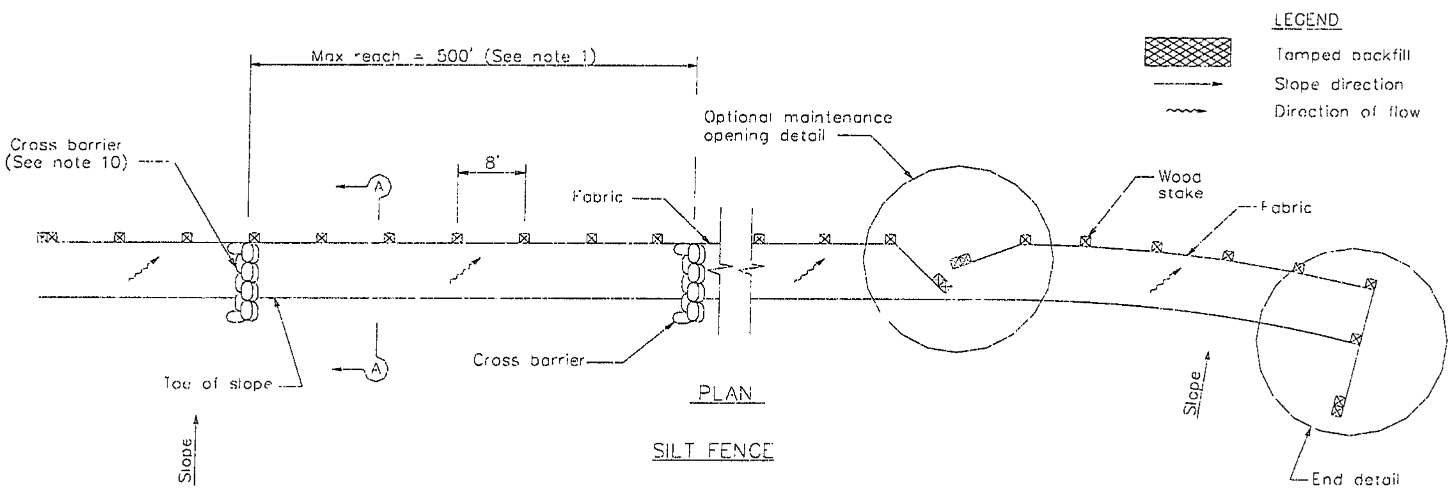
- The trench should be backfilled with compacted native material.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

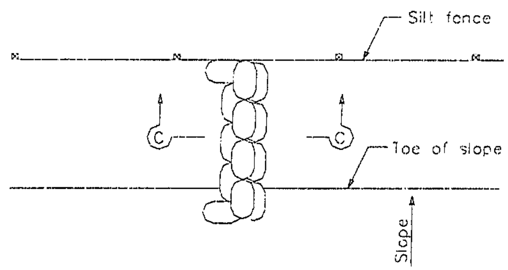


PLAN

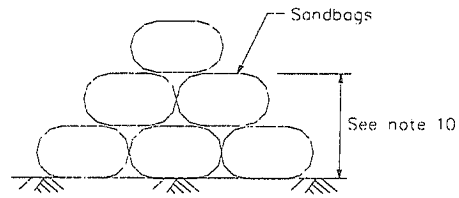
SILT FENCE

NOTES

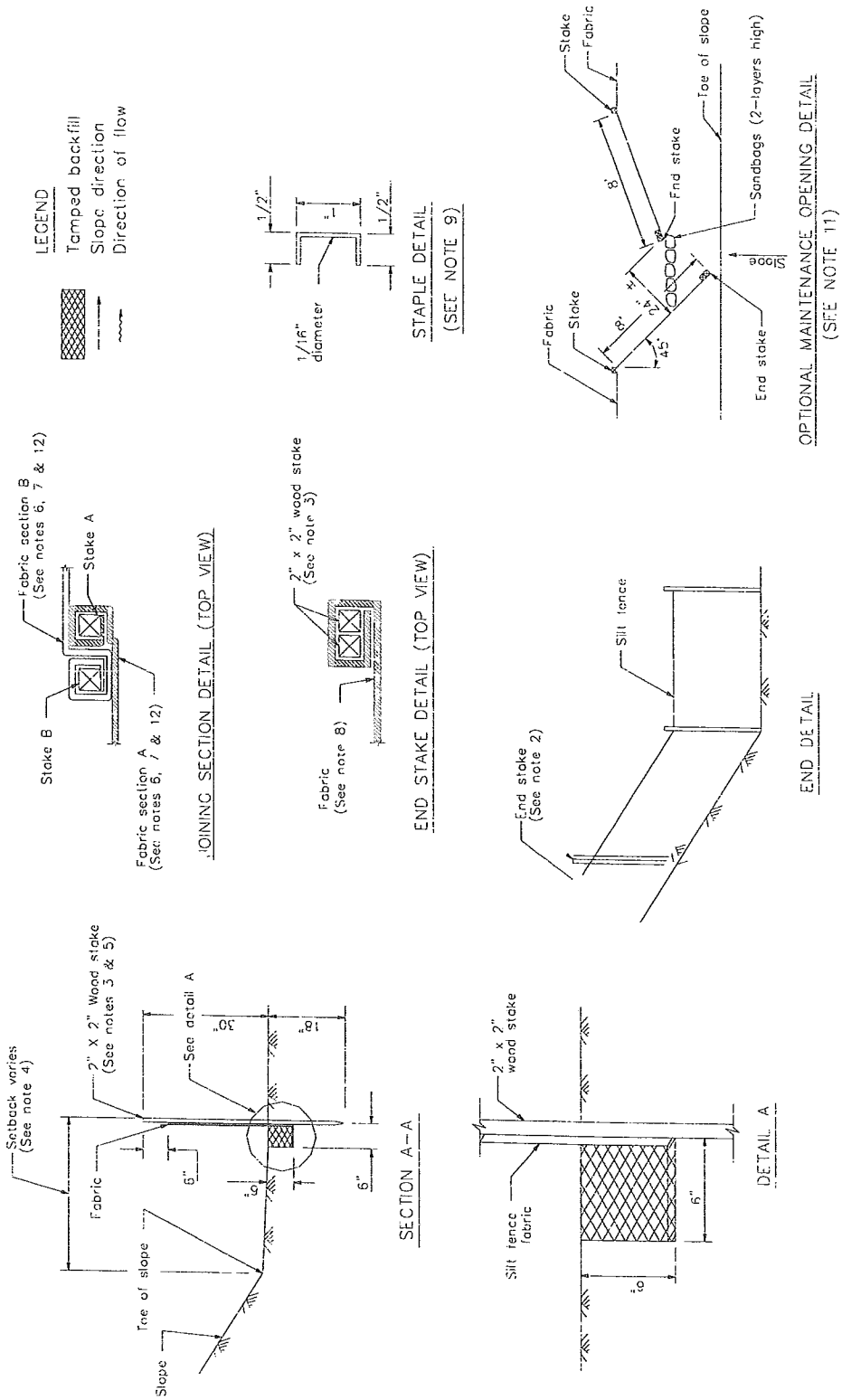
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'-0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.



CROSS BARRIER DETAIL

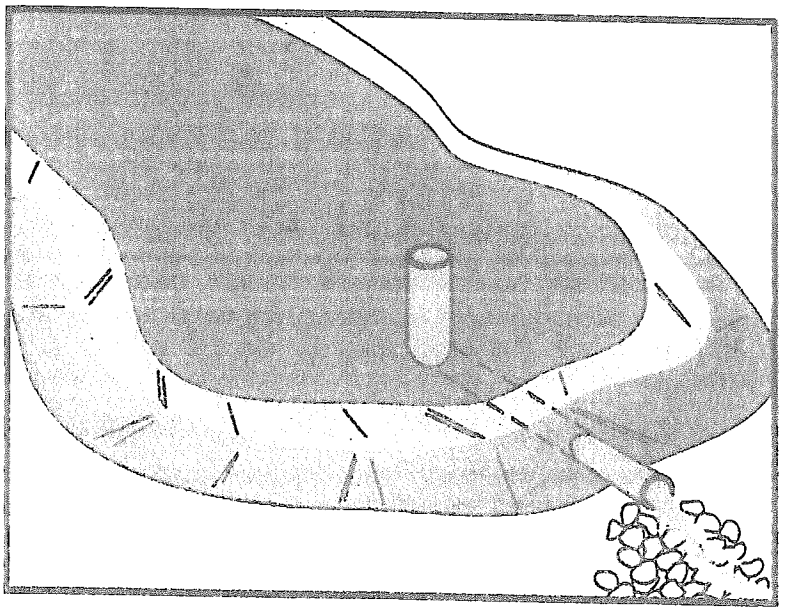


SECTION C-C


LEGEND
Tamped backfill
Slope direction
Direction of flow
1/2"
1/16" diameter
1/2"
STAPLE DETAIL
(SEE NOTE 9)
Fabric section B
(See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A
(See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake
(See note 3)
Fabric
(See note 8)
END STAKE DETAIL (TOP VIEW)
Stake
Fabric
8'
End stake
Toe of slope
Sandbags (2-layers high)
Slope
Fabric
Stake
8"
4"
45°
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SITE NOTE 11)
Silt fence
End stake
(See note 2)
END DETAIL
Setback varies
(See note 4)
2" X 2" Wood stake
(See notes 3 & 5)
See detail A
30"
8"
Fabric
6"
6"
Toe of slope
Slope
SECTION A-A
2" x 2"
wood stake
Silt fence
fabric
6"
DETAIL A

Sediment Basin

SE-2



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres
- At the outlet of large disturbed watersheds, as necessary
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of

public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- Generally, sediment basins are limited to drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical treatment is used in addition to the sediment basin.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitoes or other pests to breed.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure with a design life of 12 to 28 months in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 % of the sediment that flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as

temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas. Drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin must not be located in a stream but it should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

- Construct before clearing and grading work begins when feasible.
- Do not locate in a stream.
- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Large basins are subject to state and local dam safety requirements.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

Sediment basins must be designed in accordance with Section A of the State of California NPDES General Permit for Stormwater Discharges Associated with Construction Activities (General Permit) where sediment basins are the only control measure proposed for the site. If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate design standards specified herein may be used.

Sediment basins designed per the General Permit shall be designed as follows:

Option 1:

Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

OR

Option 2:

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet (133 yd^3) of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The

length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency.

OR

Option 3:
Sediment basin(s) shall be designed using the standard equation:

$$As=1.2Q/Vs \quad \text{(Eq. 1)}$$

Where:

As = Minimum surface area for trapping soil particles of a certain size

Vs = Settling velocity of the design particle size chosen

Q = C I A

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient

I = Precipitation intensity for the 10-year, 6-hour rain event

A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 2 ft of capacity.

OR

Option 4:
The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Other design considerations are:

- The volume of the settling zone should be sized to capture runoff from a 2-year storm or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 % of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- Sediment basins are best used in conjunction with erosion controls. Sediment basins that will be used as the only means of treatment, without upstream erosion and sediment controls, must be designed according to the four options required by the General Permit (see Options 1-4 above). Sediment basins that are used in conjunction with upstream erosion and sediment controls should be designed to have a capacity equivalent to 67 yd^3 of sediment storage per acre of contributory area.
- The length of the basin should be more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet.
- The depth must be no less than 3 ft.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- Basins should be designed to drain within 72 hours following storm events. If a basin fails to drain within 72 hours, it must be pumped dry.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

g = gravity (32.2 ft/s²)

H = elevation when the basin is full (ft)

Ho = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75x10^{-6})A(H - Ho)^{0.5}}{C} \qquad \text{(Eq. 3)}$$

- *Flow Control Using Multiple Orifices (see Figure2):*

$$a_t = \frac{2A(h_{max})}{3600CT(2g[h_{max} - h_{centroid\ of\ orifices}])^{0.5}} \qquad \text{(Eq. 4)}$$

With terms as described above except:

a_t = total area of orifices

h_{max} = maximum height from lowest orifice to the maximum water surface (ft)

$h_{centroid\ of\ orifices}$ = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 2).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

C = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

C = 0.80 when the material is thicker than the orifice diameter

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

Average annual costs for installation and maintenance (2 year useful life) are:

- Basin less than 50,000 ft³: Range, $0.24 - $1.58/ft³. Average, $0.73 per ft³. $400 - $2,400, $1,200 average per drainage acre.
- Basin size greater than 50,000 ft³: Range, $0.12 – $0.48/ft³. Average, $0.36 per ft³. $200 - $800, $600 average per drainage acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at appropriate locations.
- Remove standing water from basin within 72 hours after accumulation.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

References

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March 1992.

Draft-Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA. April 1990.

Guidelines for the Design and Construction of Small Embankment Dams, Division of Safety of Dams, California Department of Water Resources, March 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

McLean, J., 2000. Mosquitoes in Constructed Wetlands: A Management Bugaboo? In T.R. Schueler and H.K. Holland [eds.], The Practice of Watershed Protection. pp. 29-33. Center for Watershed Protection, Ellicott City, MD, 2000.

Metzger, M.E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. The dark site of stormwater runoff management: disease vectors associated with structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

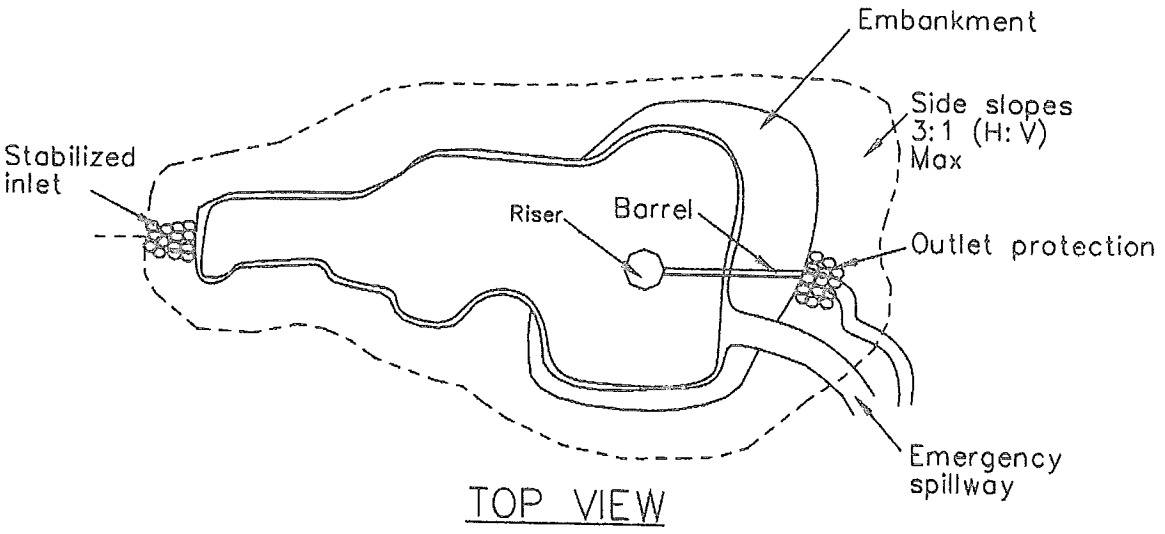
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Water, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

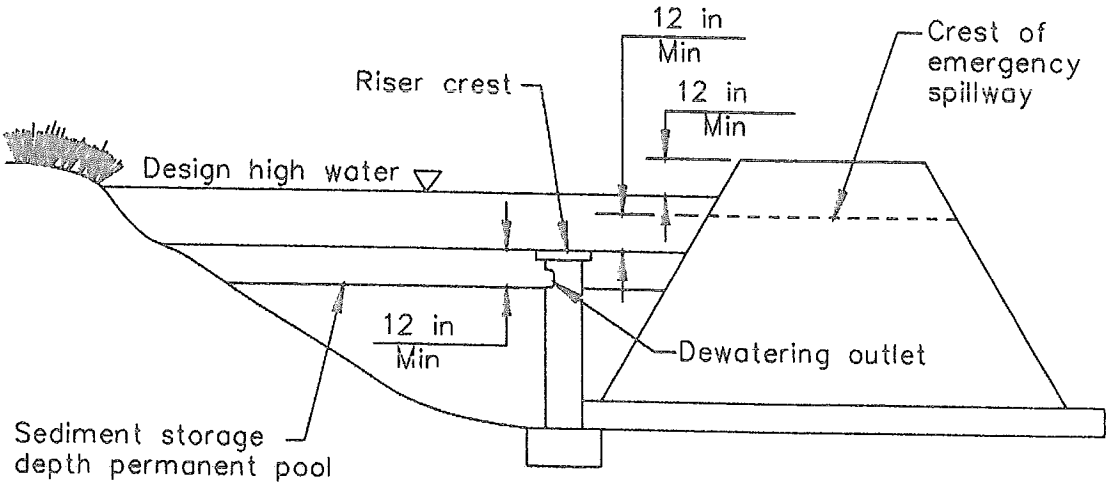
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993

Water Quality Management Plan for the Lake Tahoe Region, Volume II Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TOP VIEW



SIDE VIEW

NOTE:
This outlet provides no drainage for permanent pool.

FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
SINGLE ORIFICE DESIGN
NOT TO SCALE

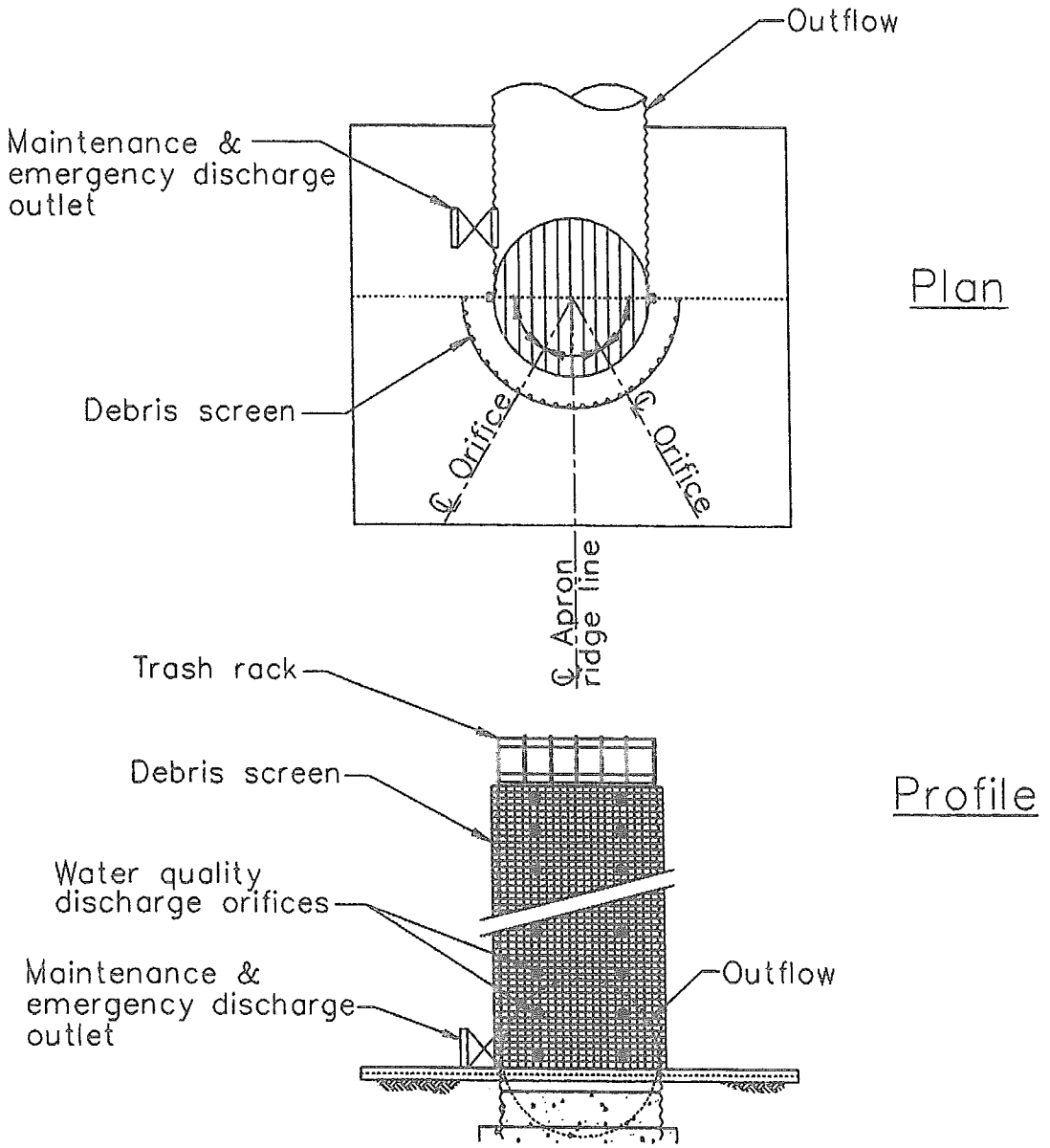
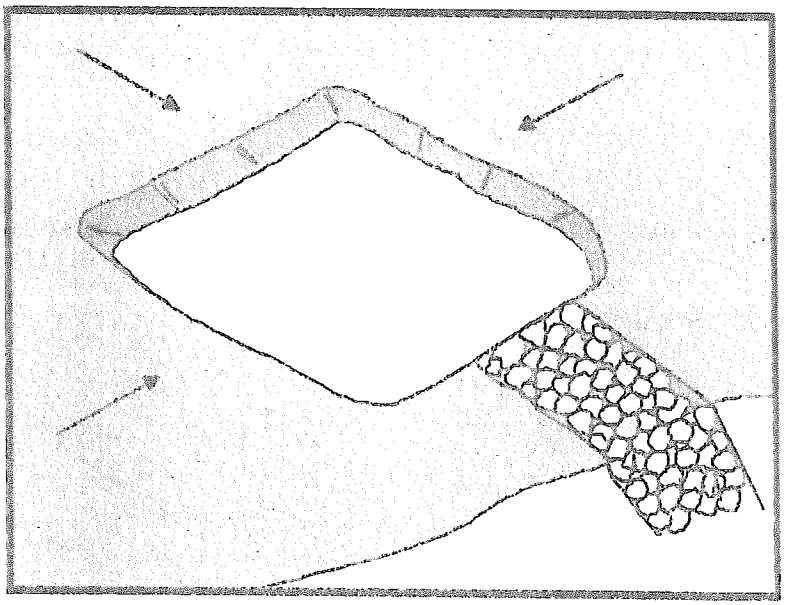


FIGURE 3: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

Sediment Trap

SE-3



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

▣ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

Draft – Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E., D.F. Messer, C.L. Beitia, C.M. Myers, and V.L. Kramer, The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

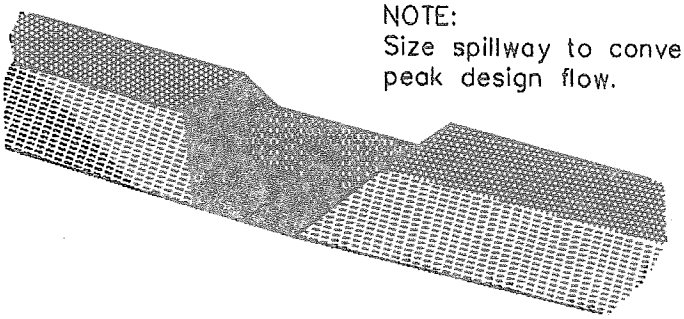
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

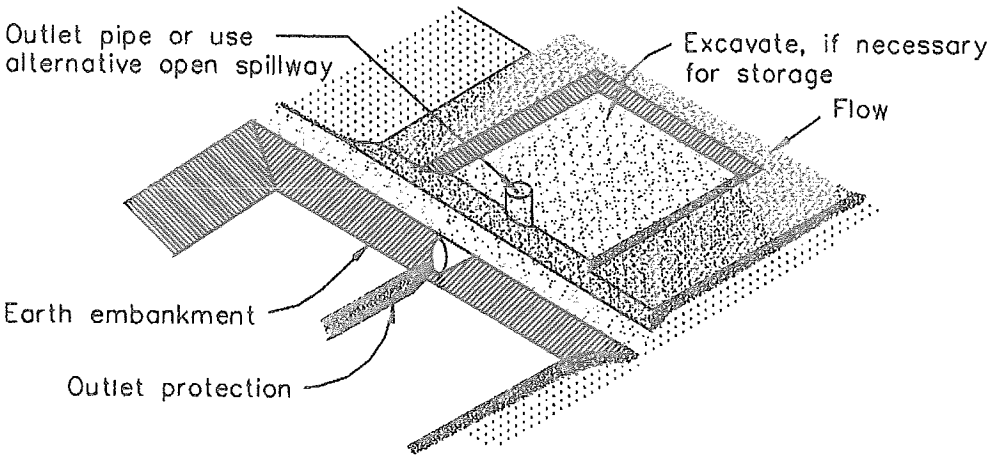
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

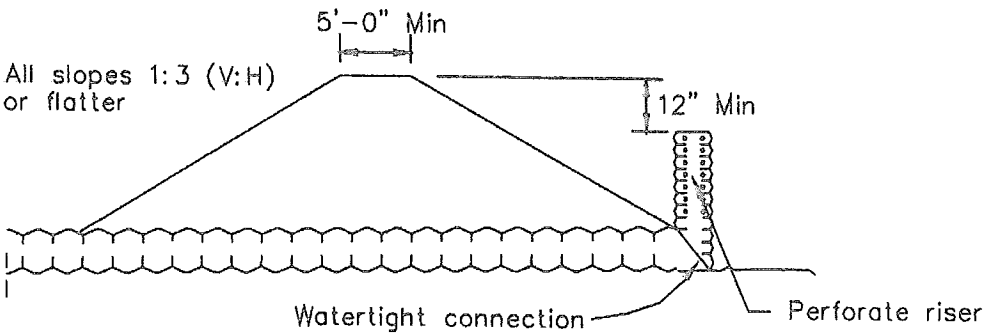
U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL OPEN SPILLWAY



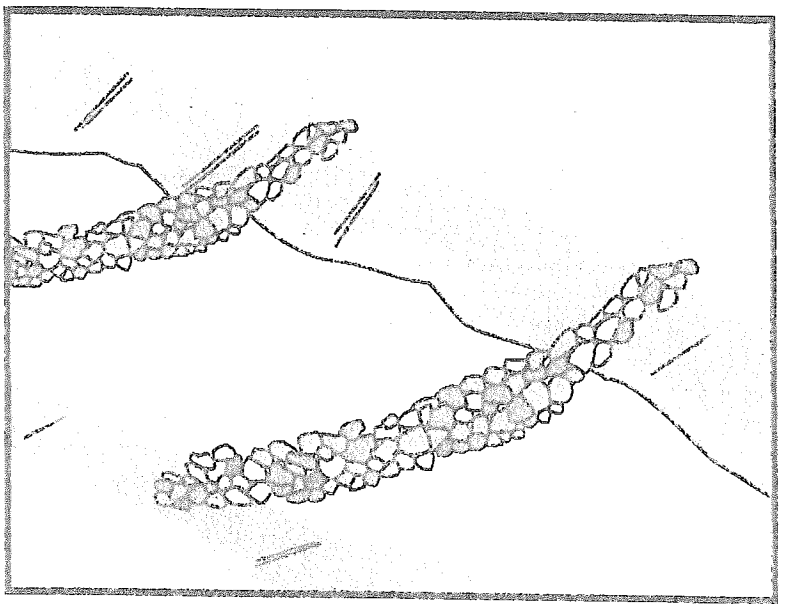


EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Check Dams

SE-4



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing the velocity of flowing water, allowing sediment to settle and reducing erosion.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

Limitations

- Not to be used in live streams or in channels with extended base flows.

- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Reduced slopes reduce the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Use of check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity must be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, there are several options:

- Don't use check dams. Consider alternative BMPs.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam. The center section of the dam should be lower than the edge sections so that the check dam will direct flows to the center of the ditch or swale.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products manufactured specifically for use as check dams are also being used, and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Straw bales can also be used for check dams and can work if correctly installed; but in practice, straw bale check dams have a high failure rate. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam must completely span the ditch

or swale to prevent washout. The rock used must be large enough to stay in place given the expected design flow through the channel.

Log check dams are usually constructed of 4 to 6 in. diameter logs. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

Gravel bag and sandbag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet.

Manufactured products should be installed in accordance with the manufacturer's instructions.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- Backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap must be cleaned following each storm event.
- High flows (typically a 2-year storm or larger) should safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams should be removed when grass has matured sufficiently to protect the ditch or swale.
- Gravel bags may be used as check dams with the following specifications:

Materials

Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms. Sandbags used for check dams should conform to SE-8, Sandbag Barrier. Fiber rolls used for check dams should conform to SE-5, Fiber Rolls. Straw bales used for check dams should conform to SE-9, Straw Bale Barrier.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Tightly abut bags and stack according to detail shown in the figure at the end of this section. Gravel bags and sandbags should not be stacked any higher than 3 ft.
- Fiber rolls and straw bales must be trenched in and firmly staked in place.

Costs

Cost consists of only installation costs if materials are readily available. If material must be imported, costs may increase. For material costs, see SE-5, SE-6, SE-8 and SE-9.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Replace missing rock, bags, bales, etc. Replace bags or bales that have degraded or have become damaged.
- If the check dam is used as a sediment capture device, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

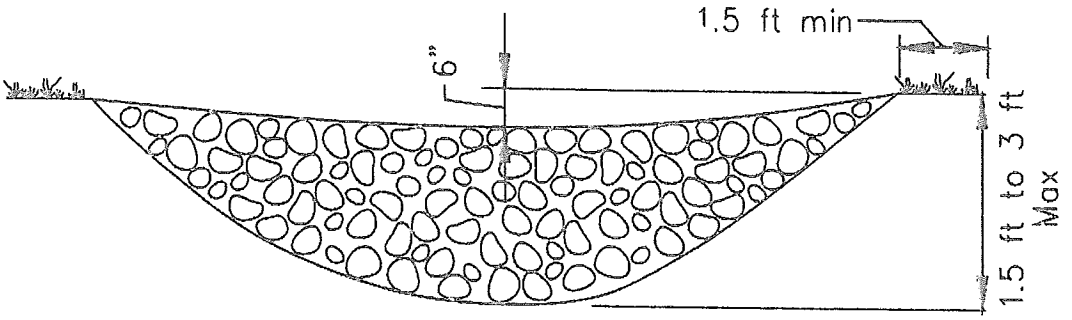
References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

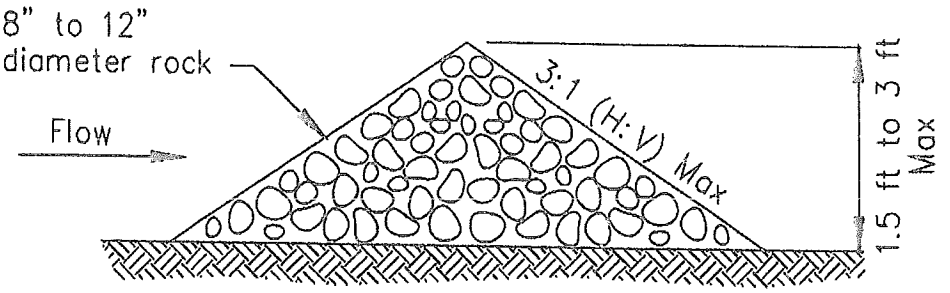
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

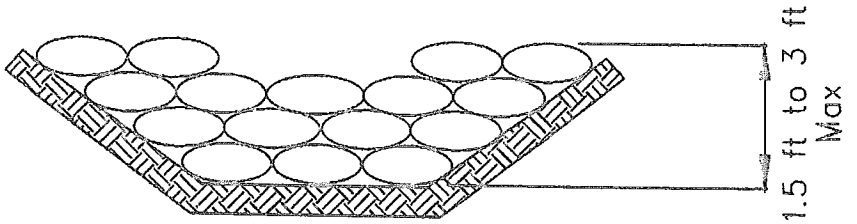


ELEVATION



TYPICAL ROCK CHECK DAM SECTION

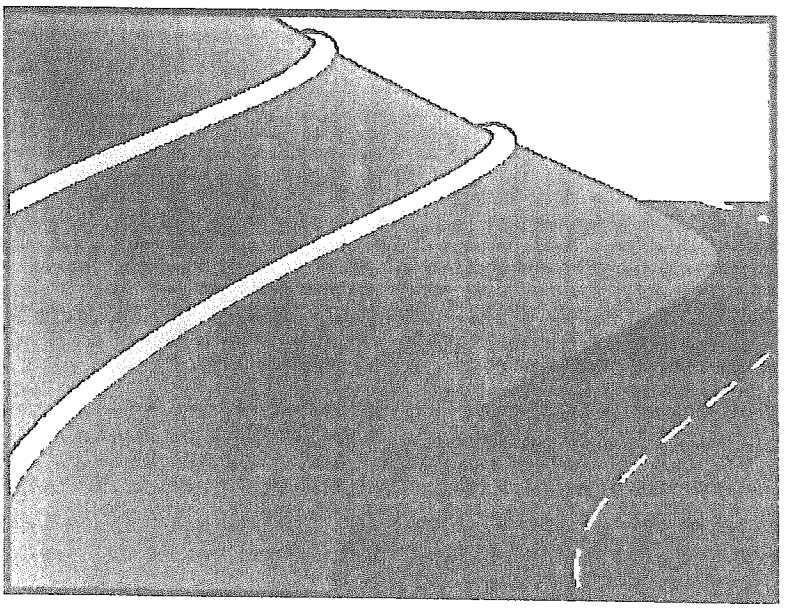
ROCK CHECK DAM
NOT TO SCALE



GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE

Fiber Rolls

SE-5



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Description and Purpose

A fiber roll consists of straw, flax, or other similar materials bound into a tight tubular roll. When fiber rolls are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- As check dams in unlined ditches
- Down-slope of exposed soil areas
- Around temporary stockpiles

Limitations

- Fiber rolls are not effective unless trenched

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

- Fiber rolls at the toe of slopes greater than 5:1 (H:V) should be a minimum of 20 in. diameter or installations achieving the same protection (i.e. stacked smaller diameter fiber rolls, etc.).
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.

Implementation

Fiber Roll Materials

- Fiber rolls should be either prefabricated rolls or rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 8 in. diameter.
- Bind roll at each end and every 4 ft along length of roll with jute-type twine.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into a 2 to 4 in. deep trench with a width equal to the diameter of the fiber roll.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

Removal

- Fiber rolls are typically left in place.

- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Costs

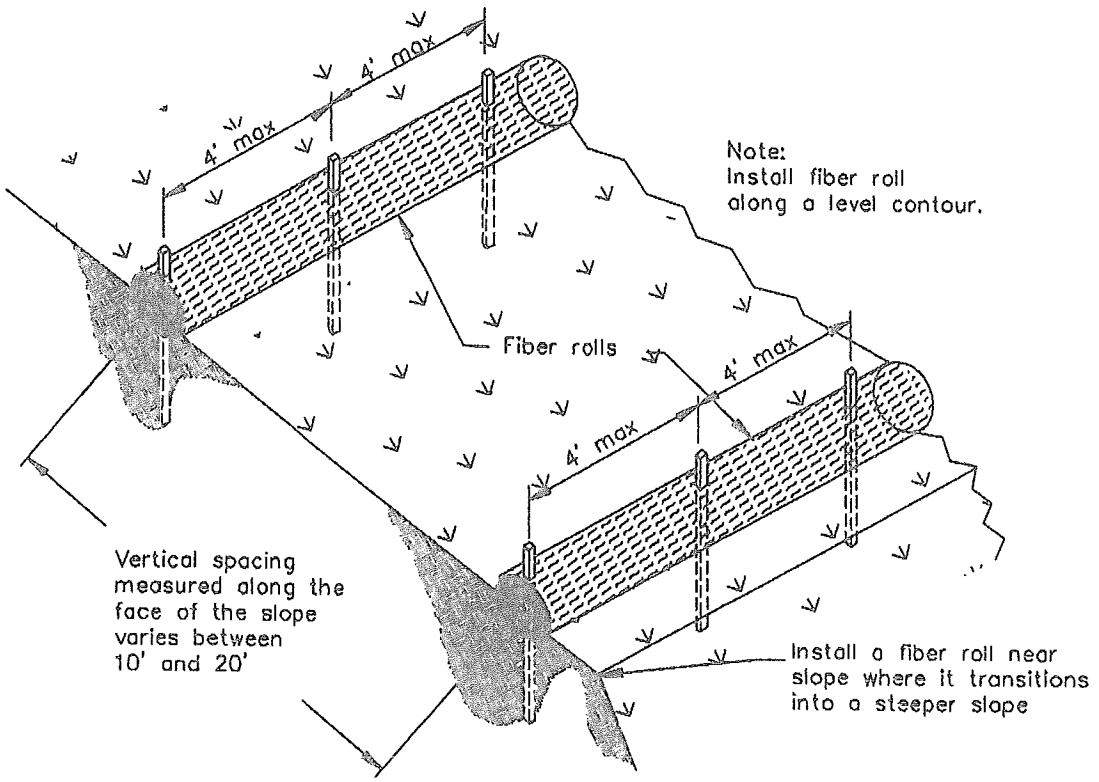
Material costs for fiber rolls range from $20 - $30 per 25 ft roll.

Inspection and Maintenance

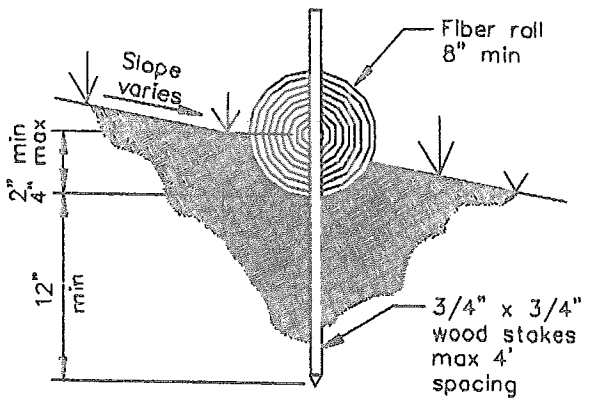
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage depth, usually one-half the distance between the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site of disposed at an appropriate location.
- If fiber rolls are used for erosion control, such as in a mini check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



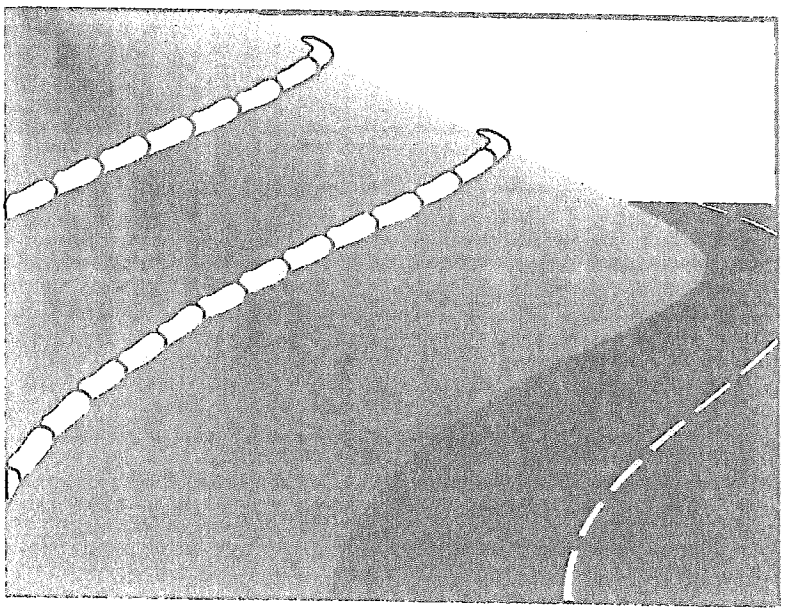
TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.

Gravel Bag Berm

SE-6



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flows, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:

- Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the filter, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Berms may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel–filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous.

Design and Layout

- Locate gravel bag berms on level contours.
  - Slopes between 20:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Gravel bags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed the slope toe.
- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.

- For installation near the toe of the slope, consider moving the gravel bag barriers away from the slope toe to facilitate cleaning. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 or flatter.
- Butt ends of bags tightly
- On multiple row, or multiple layer construction, overlapp butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- *Bag Material:* Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
- *Bag Size:* Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- *Fill Material:* Fill material should be 0.5 to 1 in. Class 2 aggregate base, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Gravel filter: Expensive, since off-site materials, hand construction, and demolition/removal are usually required. Material costs for gravel bags are average of $2.50 per empty gravel bag. Gravel costs range from $20-$35 per yd^3.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.
- Reshape or replace gravel bags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove gravel bag berms when no longer needed. Remove sediment accumulation and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

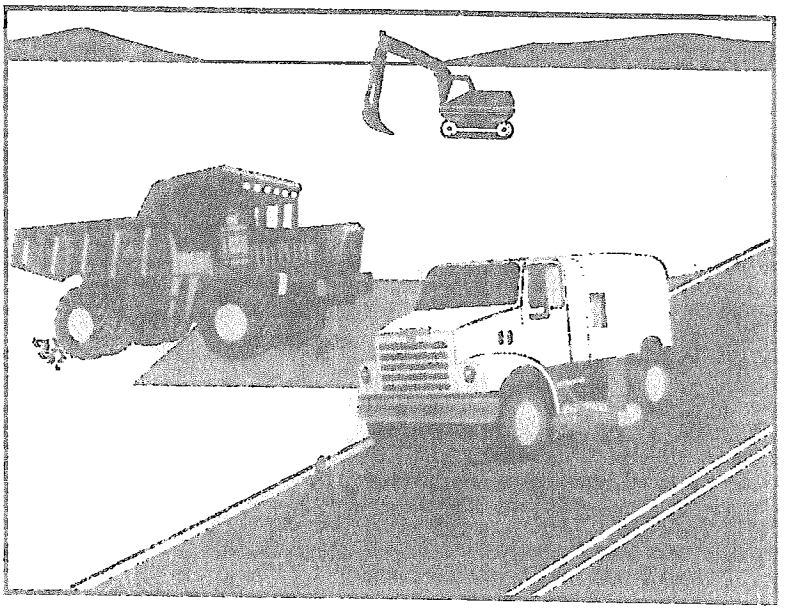
References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Street Sweeping and Vacuuming SE-7



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TR	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

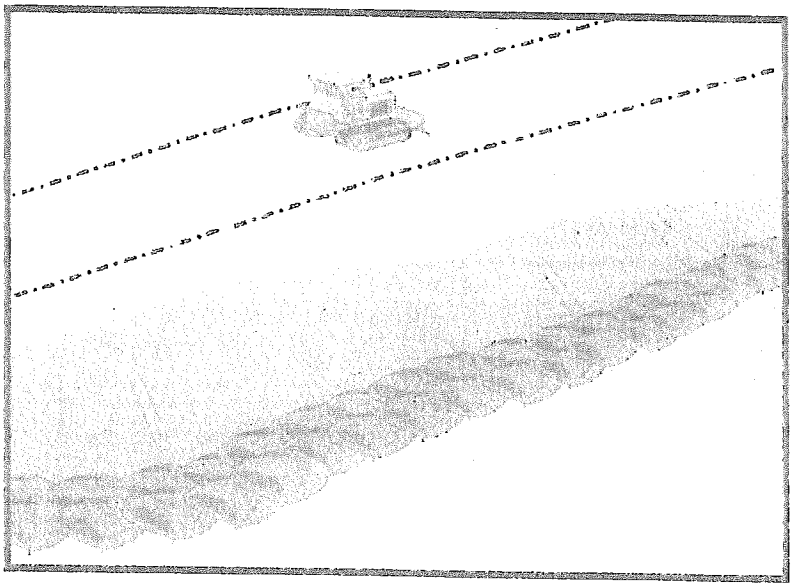
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier

SE-8



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

☒ Secondary Objective

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept sheet flows. Sandbag barriers pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-9 Straw Bale Barrier

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Barriers may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. While the sand-filled bags are porous, the fine sand tends to quickly plug with sediment, limiting the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms, or SE-9, Straw Bale Barriers. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to ground bag berms, but less porous.

Design and Layout

- Locate sandbag barriers on a level contour.
  - Slopes between 20:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Sandbags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed near the slope toe.
- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sandbags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 5 acres.

- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlapp butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 or flatter.

Materials

- *Sandbag Material:* Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap may not acceptable in some jurisdictions.
- *Sandbag Size:* Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- *Fill Material:* All sandbag fill material should be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material.

Costs

Sandbag barriers are more costly, but typically have a longer useful life than other barriers. Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag.

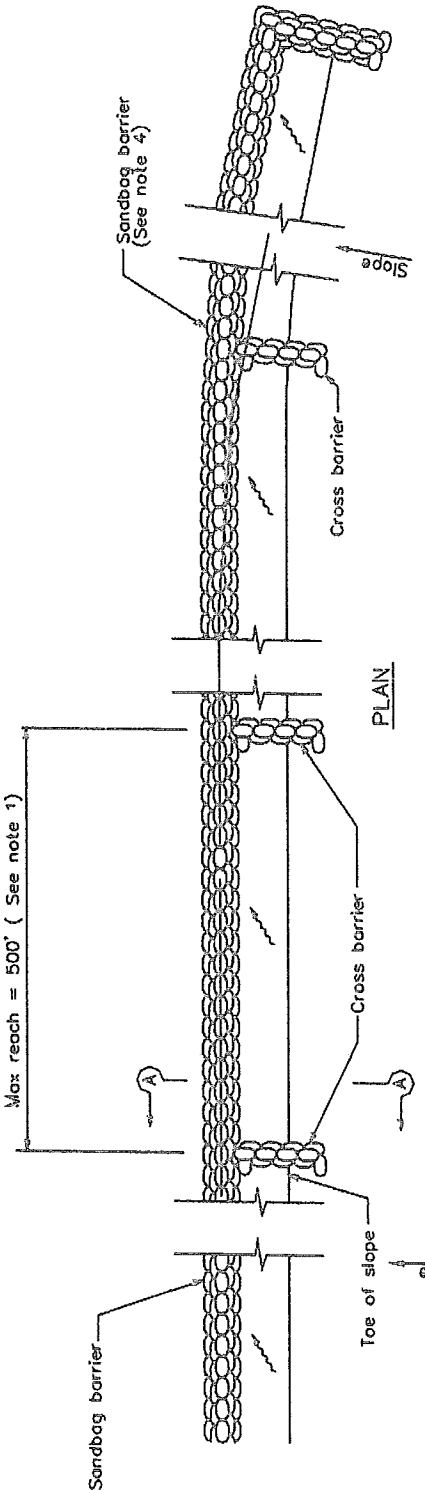
Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.

- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

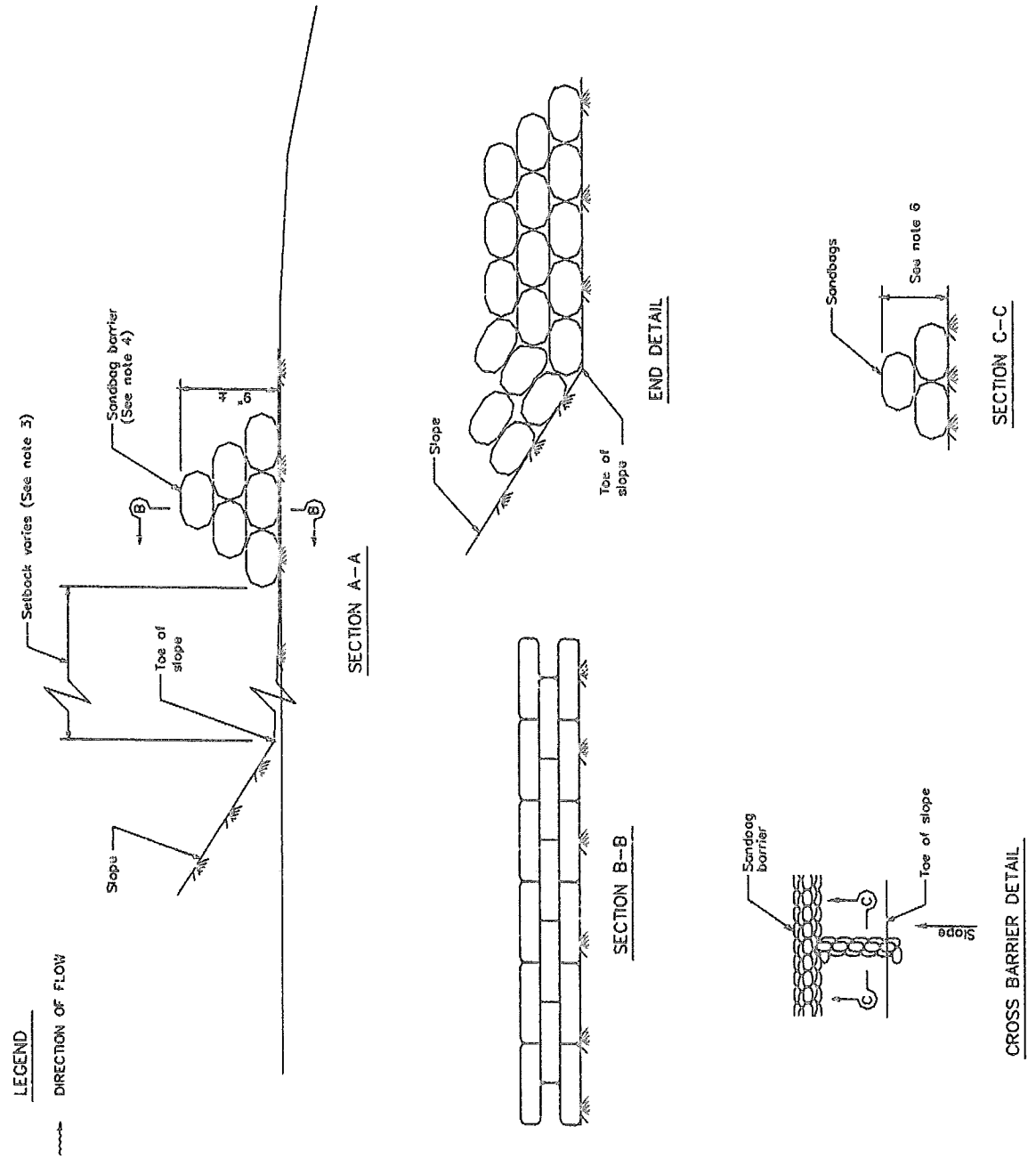
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



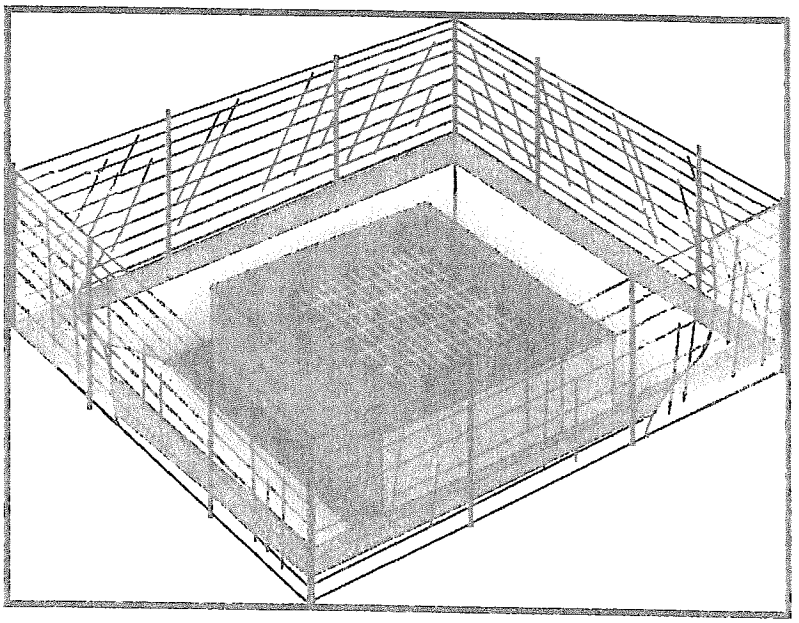
SANDBAG BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.


LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Sandbag barrier (See note 4)
Toe of slope
Slope
SECTION A-A
SECTION B-B
Slope
Toe of slope
END DETAIL
Sandbags
See note 6
SECTION C-C
Sandbag barrier
Toe of slope
Slope
CROSS BARRIER DETAIL

Storm Drain Inlet Protection SE-10



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence
SE-5 Fiber Rolls
SE-6 Gravel Bag Berm
SE-8 Sandbag Barrier
SE-9 Straw Bale Barrier

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected.

Limitations

- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- *DI Protection Type 1 - Filter Fabric Fence* - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
  5. Backfill the trench with gravel or compacted earth all the way around.
- *DI Protection Type 2 - Excavated Drop Inlet Sediment Trap* - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area.

- *DI Protection Type 3 - Gravel bag* - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.

  1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
  2. Construct on gently sloping street.
  3. Leave room upstream of barrier for water to pond and sediment to settle.
  4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
  5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- *DI Protection Type 4 – Block and Gravel Filter* - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Costs

- Average annual cost for installation and maintenance (one year useful life) is $200 per inlet.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.

- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site ore disposed at an appropriate location.

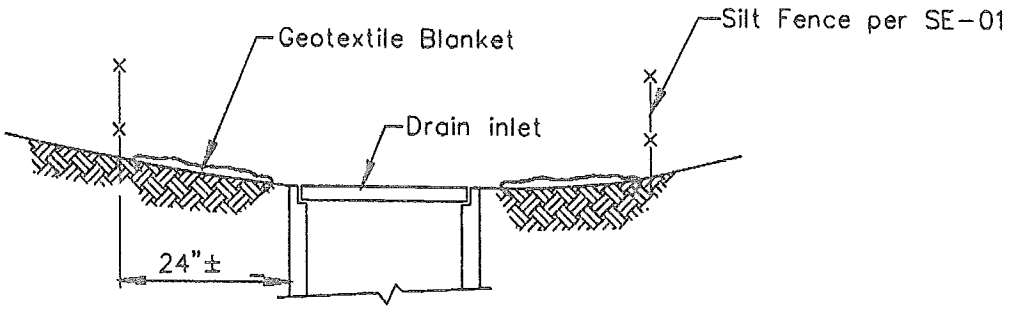
- Remove storm drain inlet protection once the drainage area is stabilized.

  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

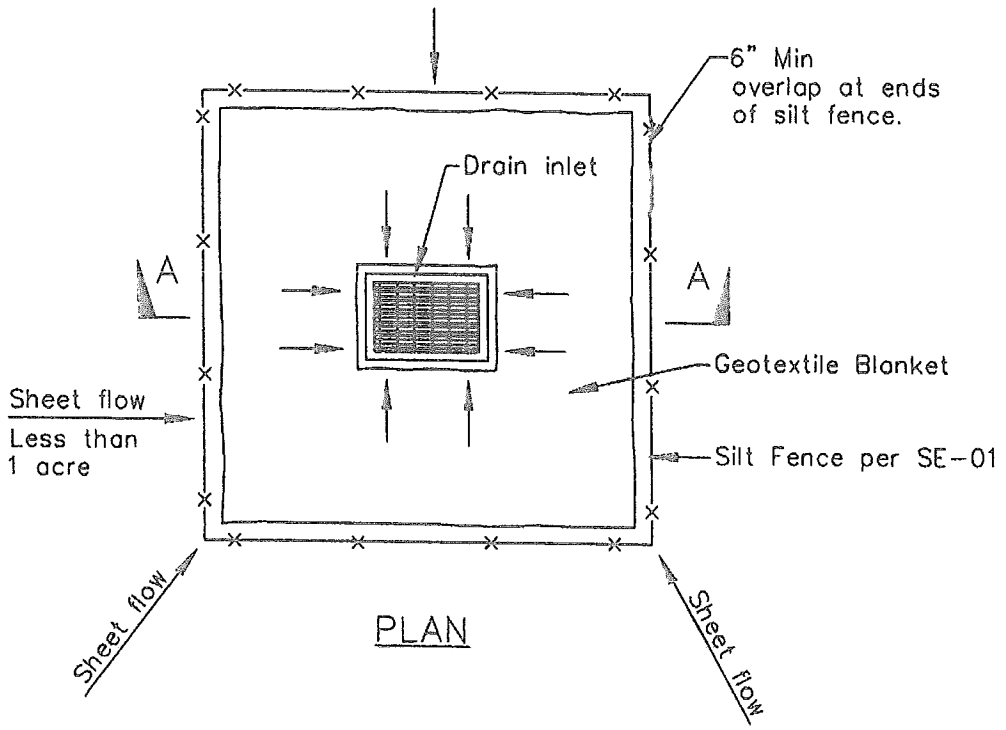
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.



SECTION A-A

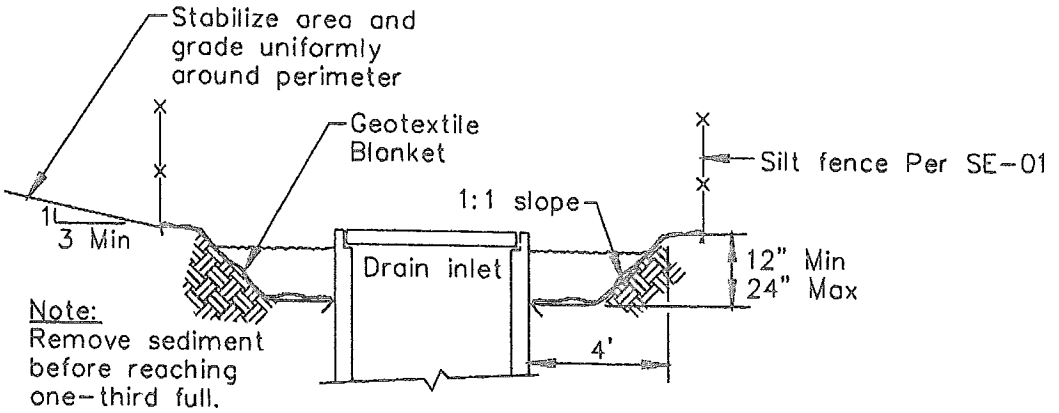


PLAN

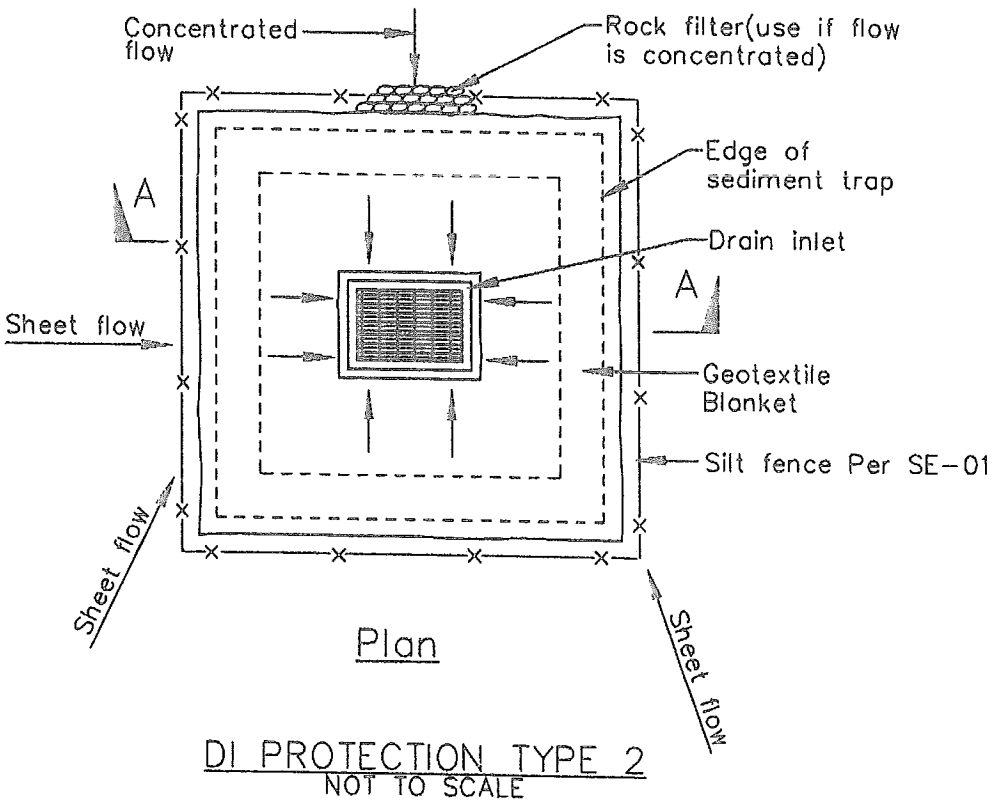
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



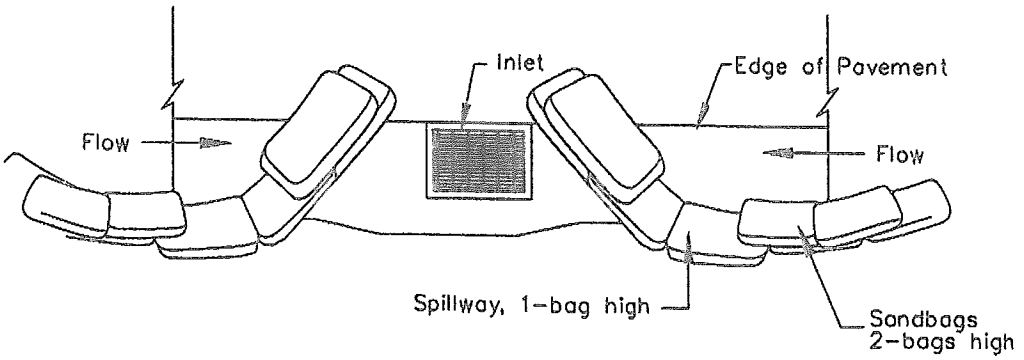
Section A-A



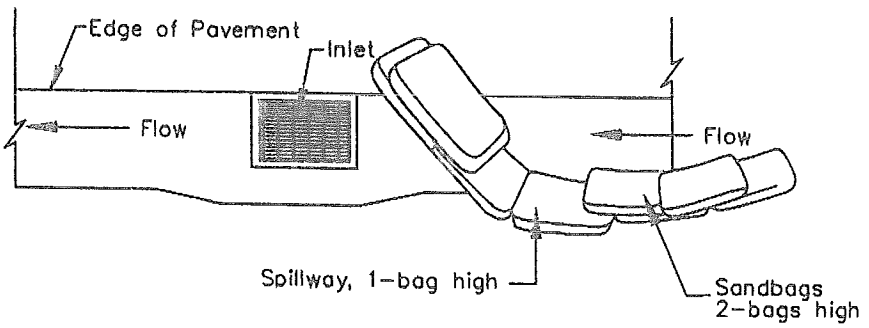
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

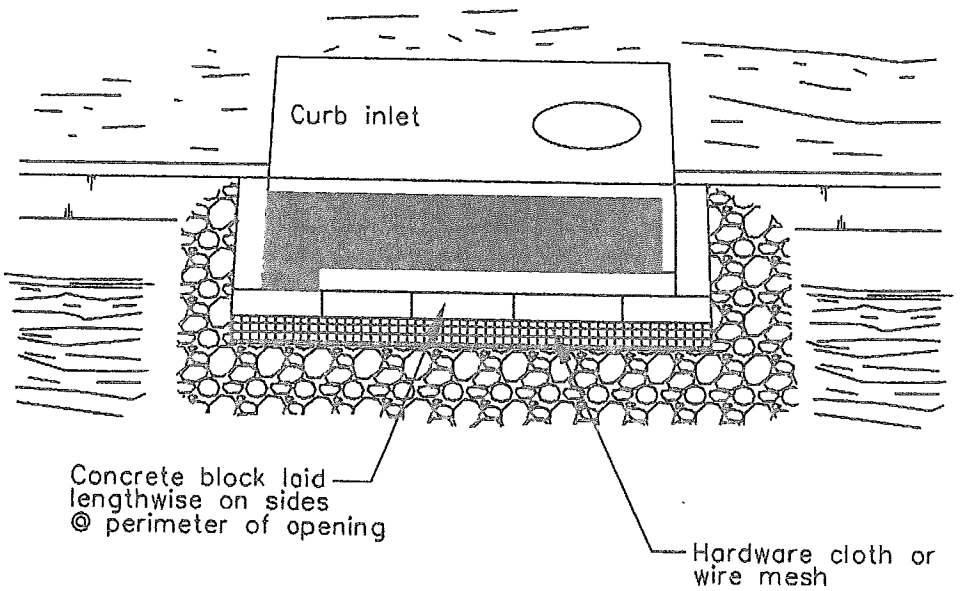


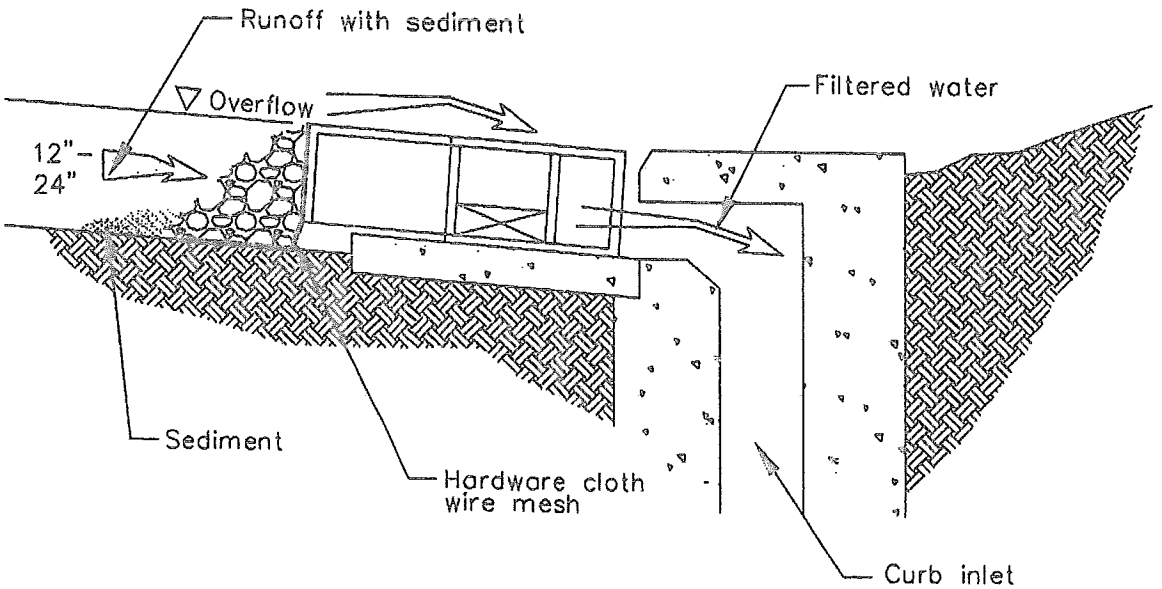
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

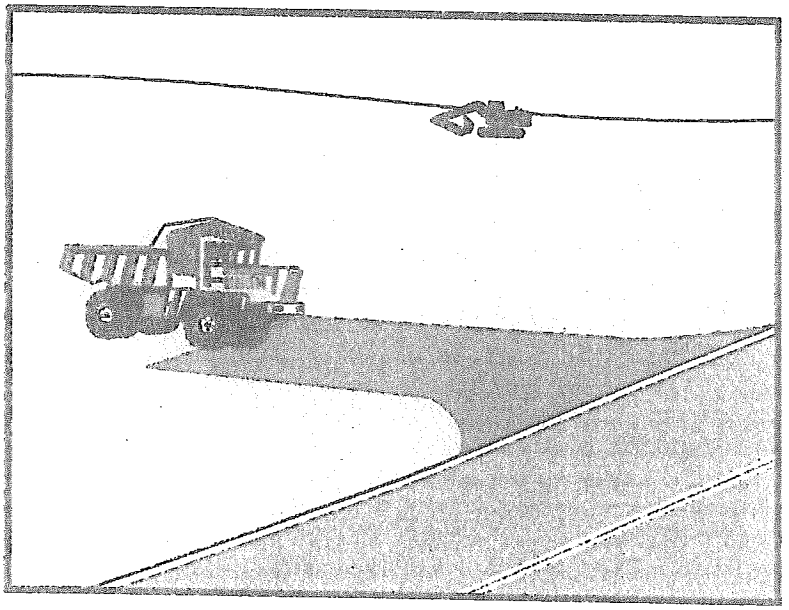
DI PROTECTION TYPE 3
NOT TO SCALE





DI PROTECTION – TYPE 4
NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Stabilized Construction Entrance/Exit TC-1

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

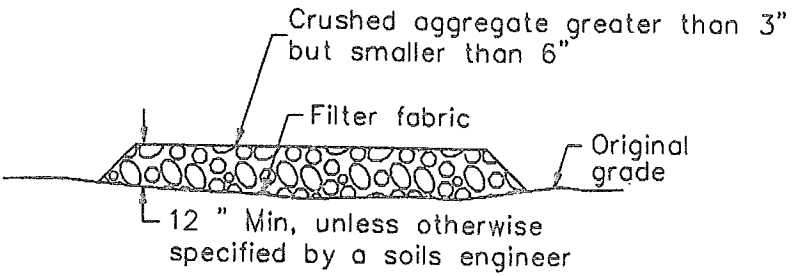
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

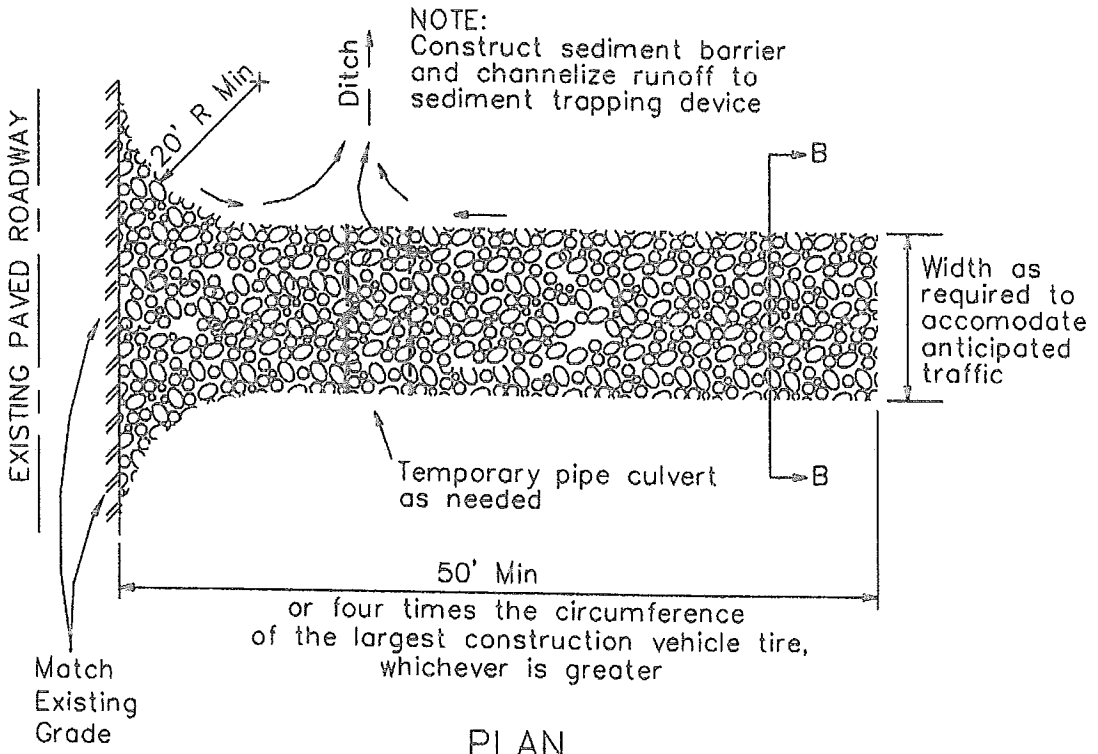
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1

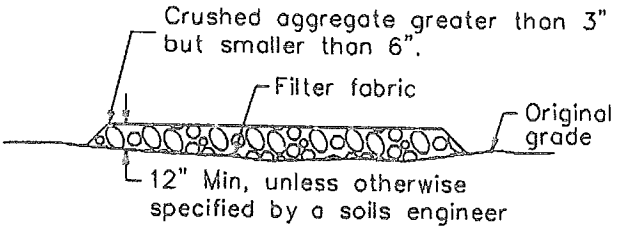


SECTION B–B
NTS

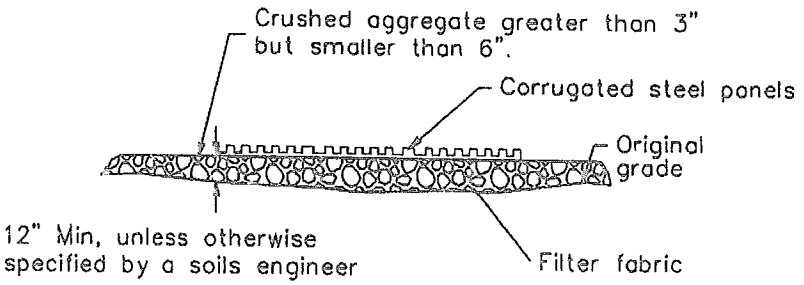


PLAN
NTS

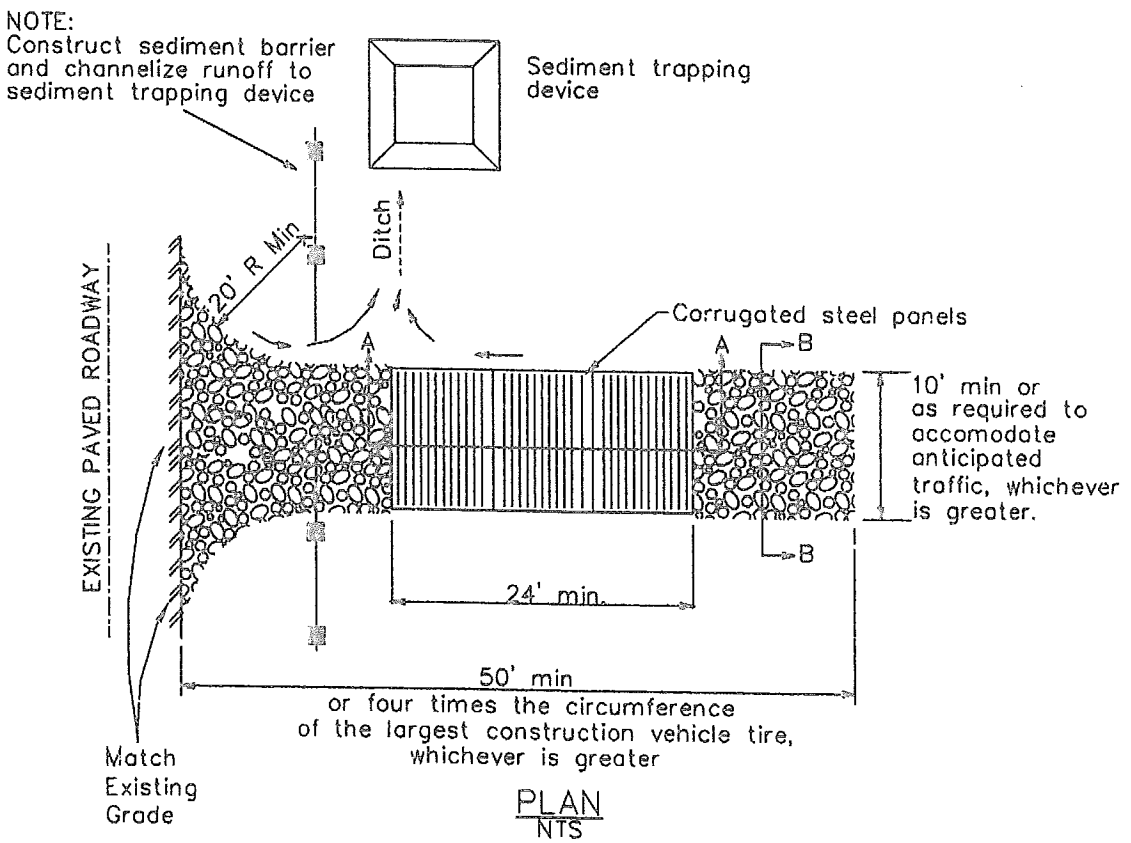
Stabilized Construction Entrance/Exit TC-1



SECTION B–B
NTS



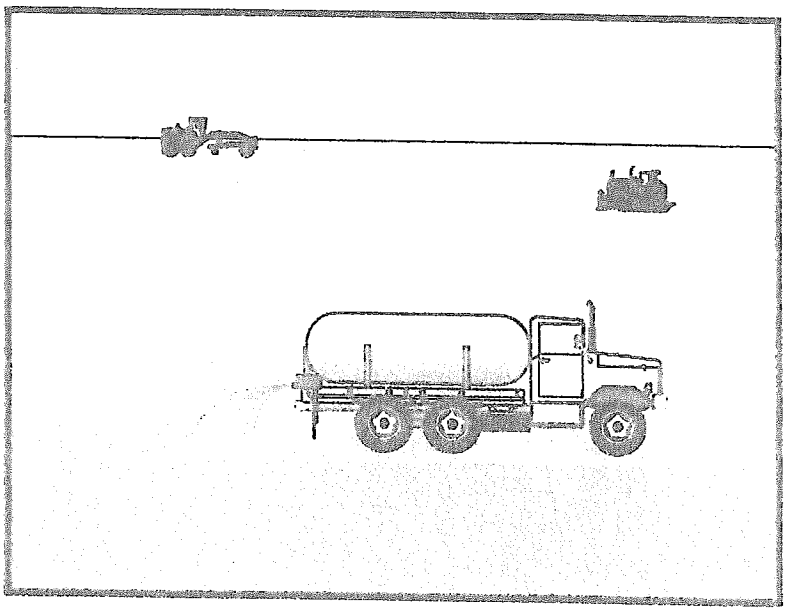
SECTION A–A
NOT TO SCALE



PLAN
NTS

Wind Erosion Control

WE-1



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

SITE CONDITION	DUST CONTROLPRACTICES								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/Equipmen Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X		X		X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/ Excavation			X	X		X			X
Truck Traffic on Unpaved Roads			X	X	X		X	X	
Mud/Dirt Carry Out					X		X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize inactive construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

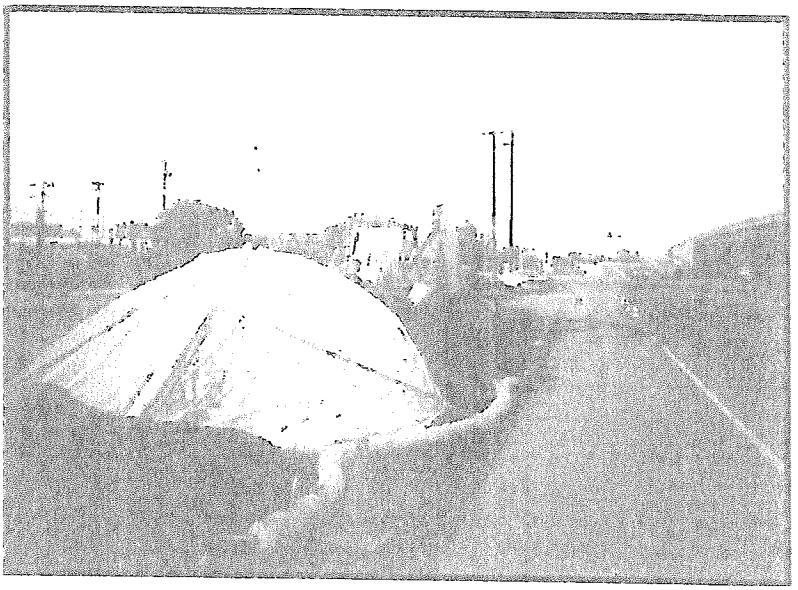
California Air Pollution Control Laws, California Air Resources Board, 1992.

Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stockpile Management WM-3



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix"

- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate

- During the rainy season, treated wood should be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected further as follows:

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Costs

All of the above are low cost measures.

Inspection and Maintenance

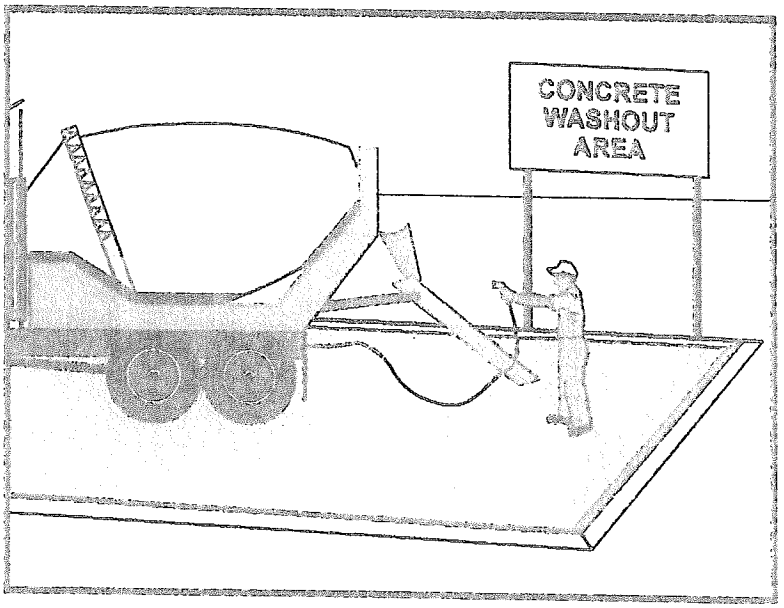
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation

- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Concrete Waste Management WM-8



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employee and subcontractors.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result form demolition activities
- Slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition
- Concrete trucks and other concrete-coated equipment are washed onsite
- Mortar-mixing stations exist
- See also NS-8, Vehicle and Equipment Cleaning

Limitations

- Offsite washout of concrete wastes may not always be possible.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Perform washout of concrete trucks offsite or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Slurry residue should be vacuumed and disposed in a temporary pit (as described in OnSite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

- Washout of concrete trucks should be performed in designated areas only.

- Only concrete from mixer truck chutes should be washed into concrete wash out.

- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.

- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.

- Temporary Concrete Washout Facility (Type Above Grade)

  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and

minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.

- Straw bales, wood stakes, and sandbag materials should conform to the provisions in SE-9, Straw Bale Barrier.

- Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- Temporary Concrete Washout Facility (Type Below Grade)

  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.

  - Lath and flagging should be commercial type.

  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.

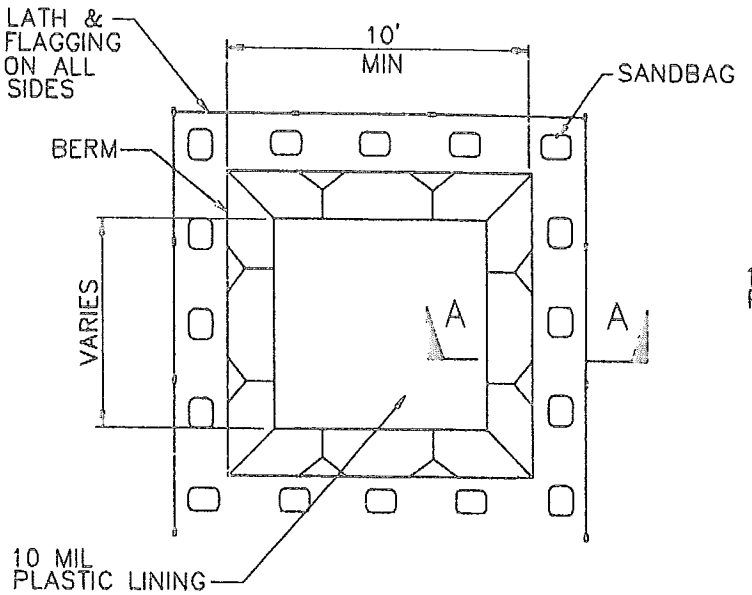
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

References

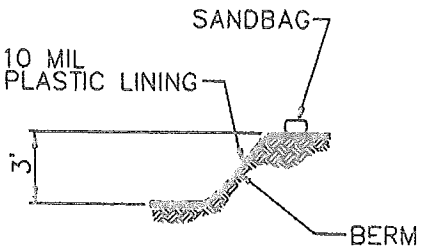
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

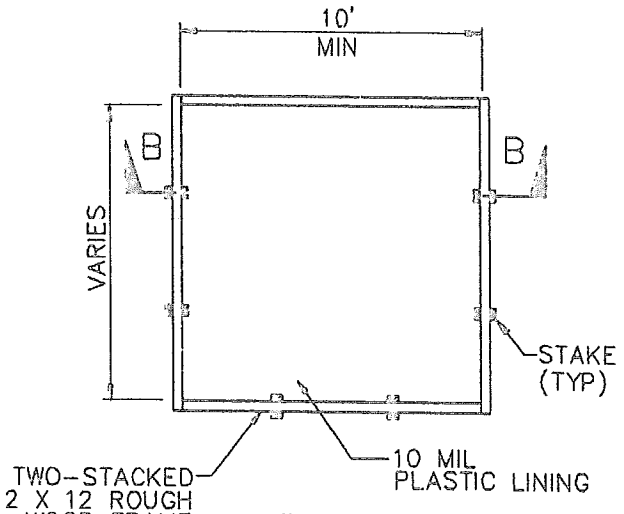
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



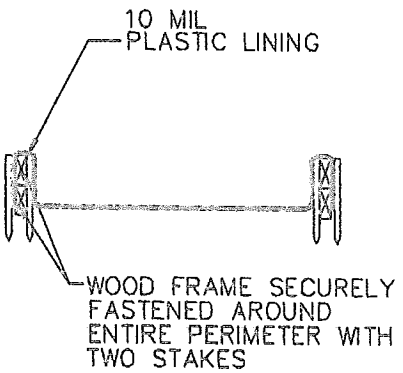
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"

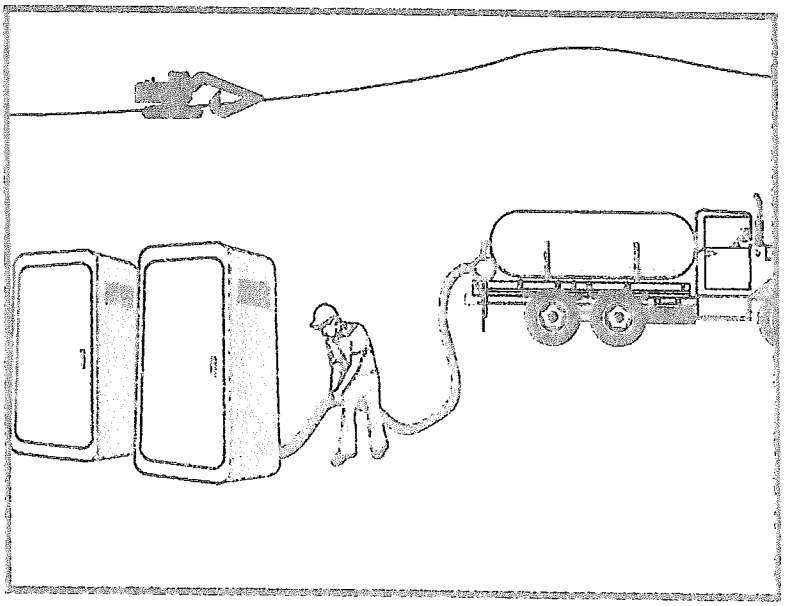


SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.
- Wastewater should not be discharged or buried within the project site.

- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.

Education

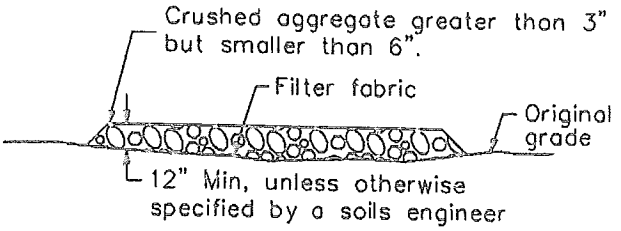
- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

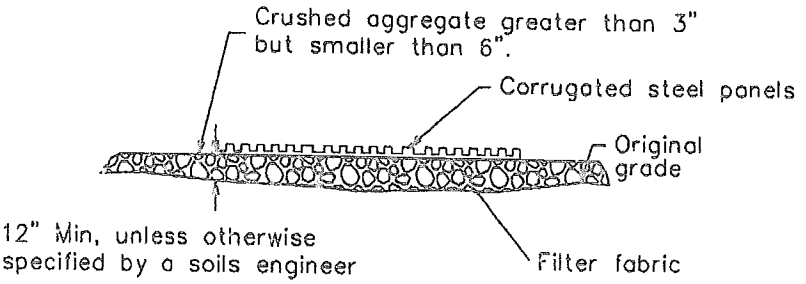
All of the above are low cost measures.

Inspection and Maintenance

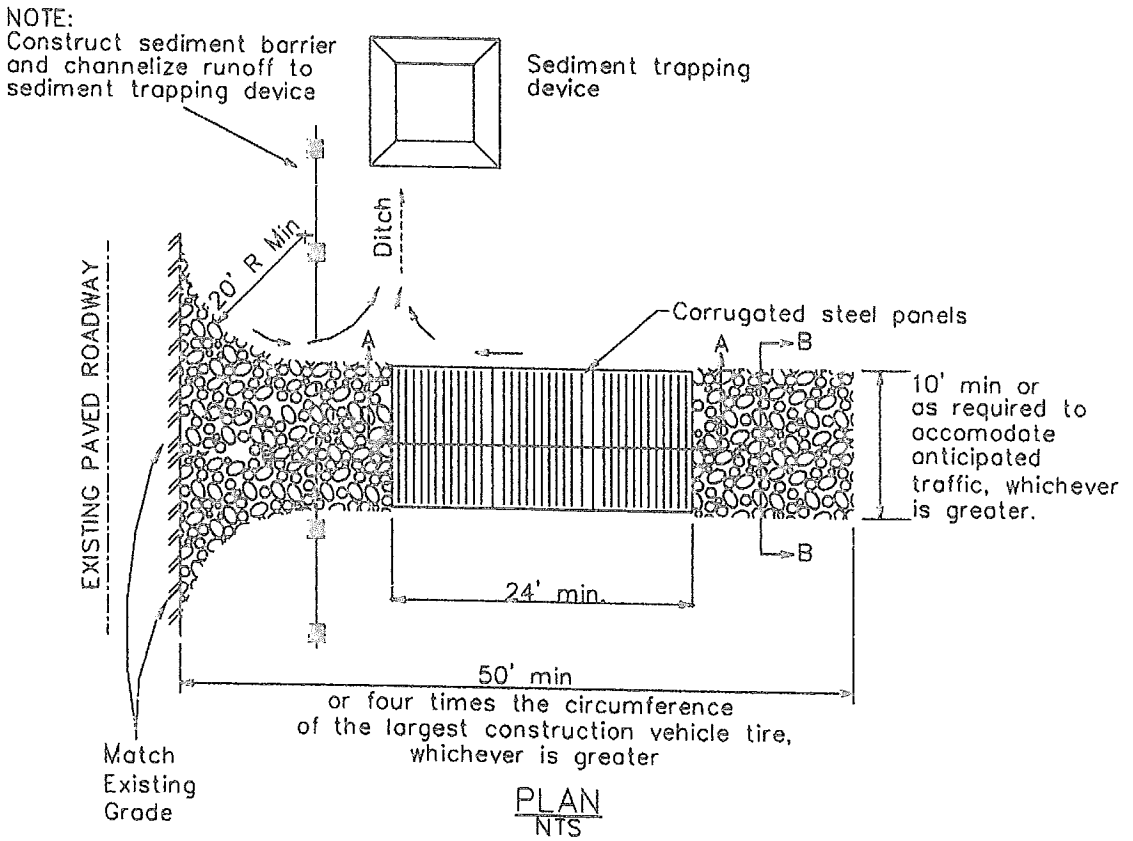
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.



SECTION B–B
NTS



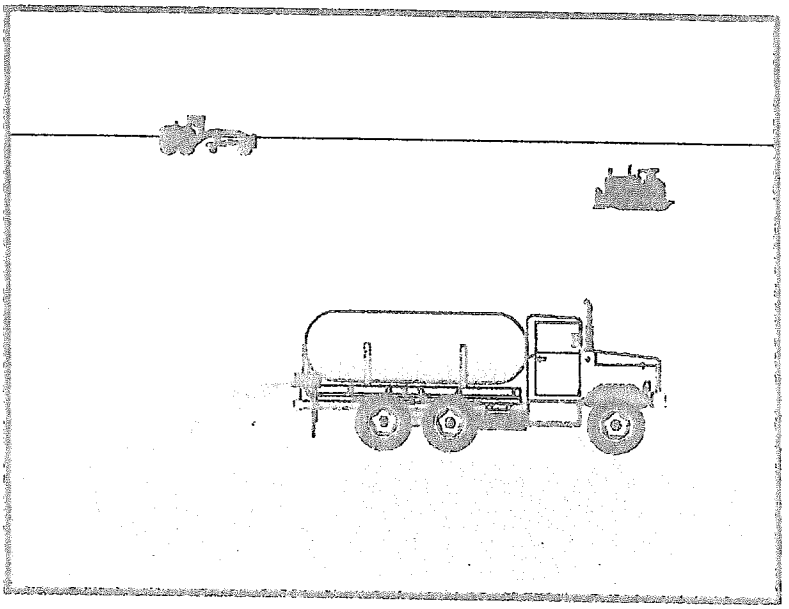
SECTION A–A
NOT TO SCALE



PLAN
NTS

Wind Erosion Control

WE-1



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

SITE CONDITION	DUST CONTROL PRACTICES								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X		X		X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/ Excavation			X	X		X			X
Truck Traffic on Unpaved Roads			X	X	X		X	X	
Mud/Dirt Carry Out					X		X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize inactive construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

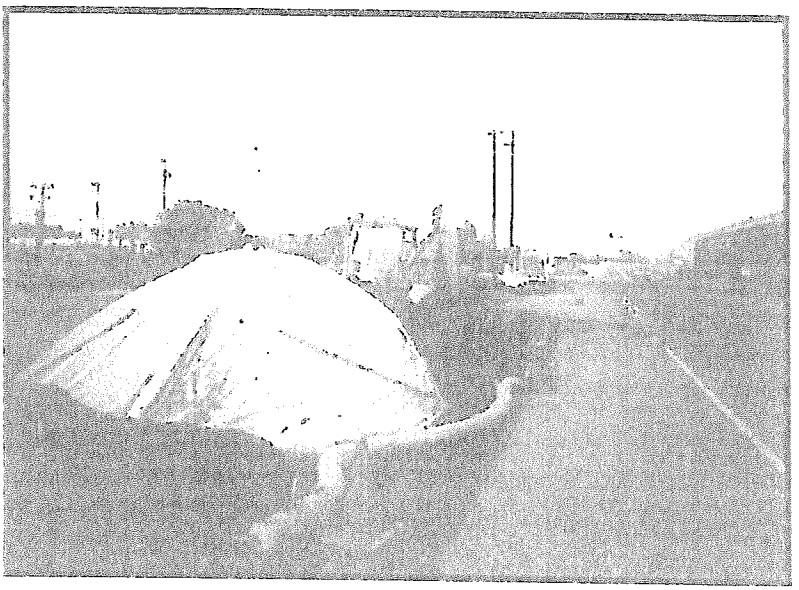
Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stockpile Management

WM-3



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ Primary Objective

☒ Secondary Objective

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix"

- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate

- During the rainy season, treated wood should be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected further as follows:

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation

- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Perform washout of concrete trucks offsite or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and expose the aggregate.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Slurry residue should be vacuumed and disposed in a temporary pit (as described in OnSite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

- Washout of concrete trucks should be performed in designated areas only.

- Only concrete from mixer truck chutes should be washed into concrete wash out.

- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.

- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.

- Temporary Concrete Washout Facility (Type Above Grade)

  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and

minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.

- Straw bales, wood stakes, and sandbag materials should conform to the provisions in SE-9, Straw Bale Barrier.

- Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- Temporary Concrete Washout Facility (Type Below Grade)

  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.

  - Lath and flagging should be commercial type.

  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.

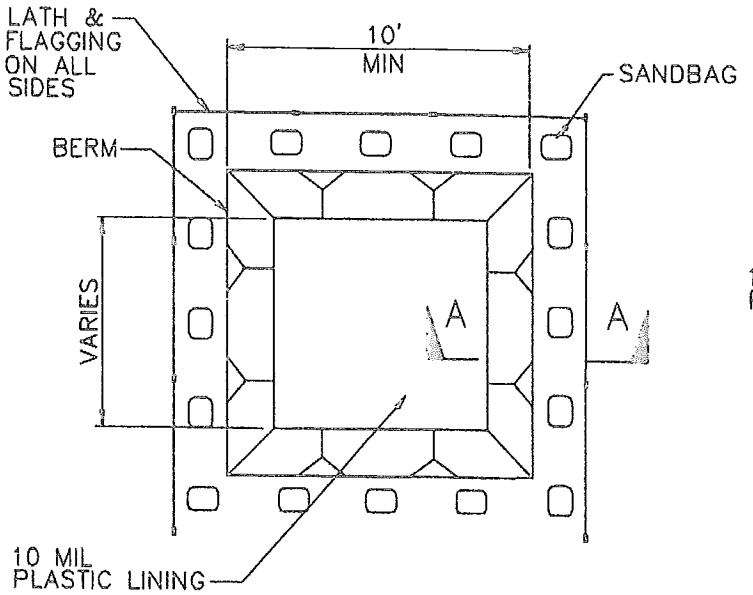
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

References

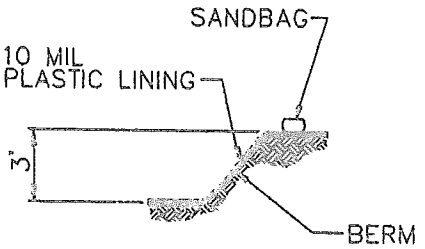
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

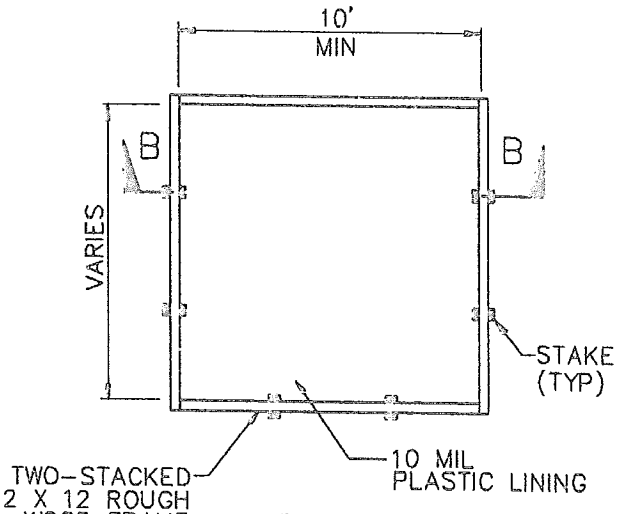
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



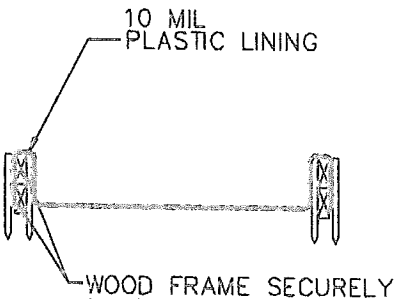
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



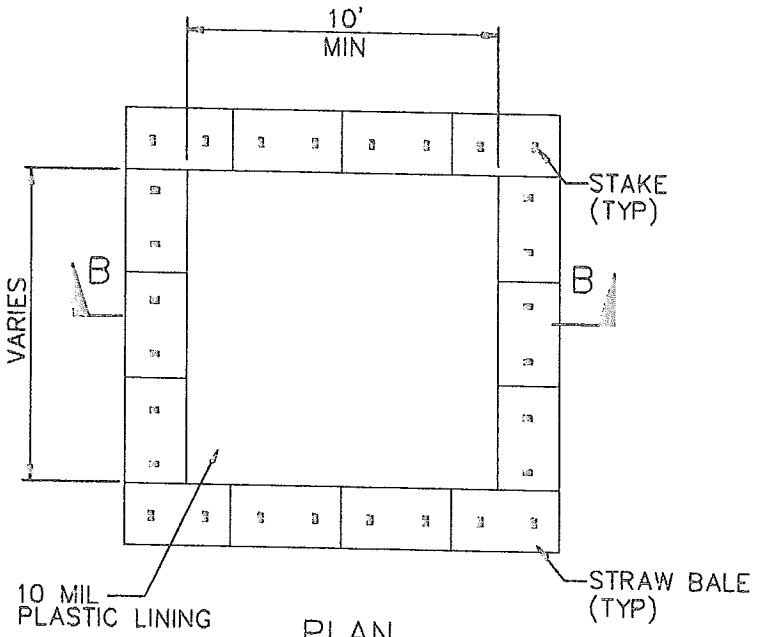
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



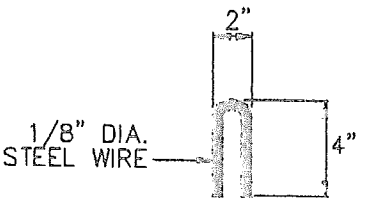
SECTION B–B
NOT TO SCALE

NOTES

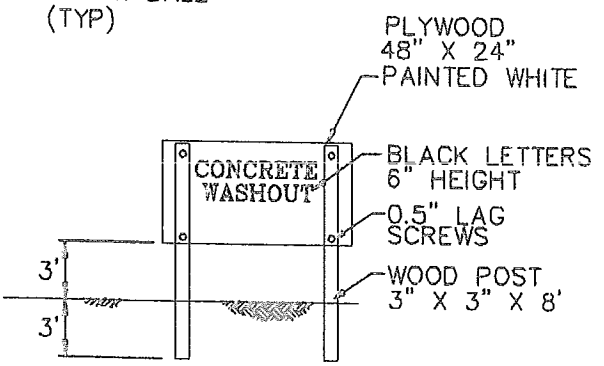
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



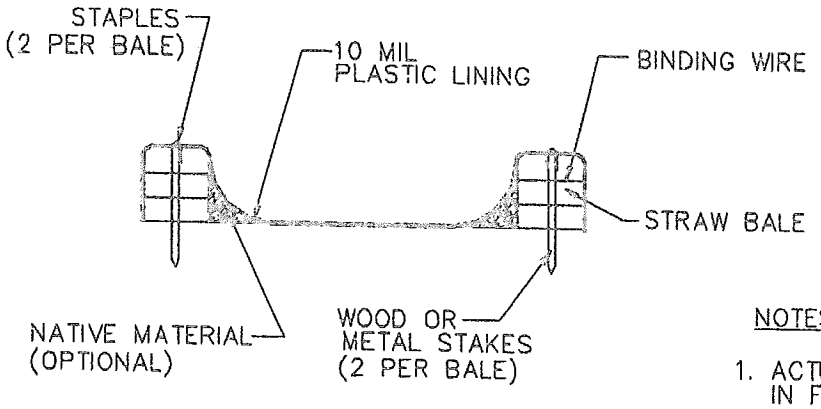
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)

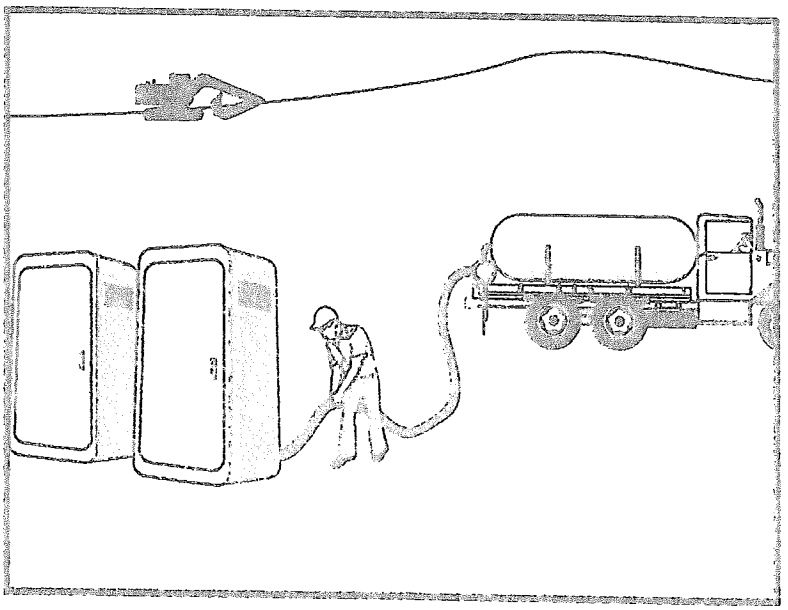


SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.

Sanitary/Septic Waste Management WM-9



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ Primary Objective

☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.
- Wastewater should not be discharged or buried within the project site.

WM-9 Sanitary/Septic Waste Management

- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

APPENDIX C

MATERIAL SAFETY DATA SHEETS

Emergency Phone Numbers

Fire, Police, Ambulance	911
Owner:	
General Contractor	Office: Site
	Mobile #
Subcontractors	
Sub #1)	Office:
Sub #2	
Sub #3	
Sub #4	
City or County Contact	
State Ecology Dept.	

Storm water Monitoring Form

PROJECT:	CONTRACTOR:
RECEIVING WATER:	MONITOR PERFORMED BY:

Monitoring date:_____ Time:_____
Current weather conditions:_____
Previous 24-hour weather conditions:_____

SAMPLING POINT	TURBIDITY (NTU)
Up-Stream	
Adjacent	
Downstream	
Comments:_____	

Sampler's Signature:_____ _____
signature print name

Erosion and Sediment Control Inspection Form
Erosion Prevention

Inspector(s): Lee Watkins Date: 7-23-08

Site Name and Location: The Sanctuary - Huntsville

Current Weather Conditions: clear-Hot Last 24 Hours: Rain

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Construction Access Trackout? Street Clean?		X	Vehicle Tracking inadequate Street to be swept (Cul de sac bulb)
Soil Stabilization Signs of Erosion: Gullies? Slope Failures? Rills?	X Lower	X High	No signs of Rills, gullies or erosion on lower part Signs of erosion prominent on higher Parts
Slope Protection Plastic Condition? Grass Growing? Hydroseed Condition? Matting?		X	Seed Exposed soils or provide other stabilization along road
Perimeter Control Clearing Limits Marked? Silt Fences? Swales?	X		Silt fence looks good.
Conveyances Stable Ditches? Check Dams Intact? Sand Bags? Slope Drains?		X	check dam at large culvert missing & is needed. Check dam at gate good.
TESC Management Revisions Required? Threatened & Endangered species	X		
Water Management Infiltration System? Clean and Dirty Water Separated? Offsite Water Bypassing?		X	Need Detention Pond
Outlet Protection Stabilized?		X	OUTLET RIP RAP at Tank road intersection missing no erosion detected Outlet protection at big culvert OK Outlet at gate good

Comments: Additional Boulders around inlets would be a good idea for safety reasons

Erosion and Sediment Control Inspection Form
Erosion Prevention

Inspector(s): Lee Watkins Date: 8-7-08

Site Name and Location: The Sanctuary - Huntsville

Current Weather Conditions: clear-warm Last 24 Hours: clear / Light showers

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Construction Access Trackout? Street Clean?		X	Vehicle tracking pad missing Street requires sweeping
Soil Stabilization Signs of Erosion: Gullies? Slope Failures? Rills?		X	Vegitation growth is apparent but still lacking Tim Charwood stated that in areas of less than 50% cover, he will seed in two weeks
Slope Protection Plastic Condition? Grass Growing? Hydroseed Condition? Matting?		X	See above comments
Perimeter Control Clearing Limits Marked? Silt Fences? Swales?	X		Silt Fence is still doing well
Conveyances Stable Ditches? Check Dams Intact? Sand Bags? Slope Drains?	X		System overall looks really good Still need check dam at large culvert & at a couple of smaller culverts
TESC Management Revisions Required?	X		None noticed
Water Management Infiltration System? Clean and Dirty Water Separated Offsite Water Bypassing?	X		Detention basin identified need trench to direct more water though
Outlet Protection Stabilized?		X	outlet protection at smaller culverts still missing Notified Thom Summers of need.

Erosion and Sediment Control Inspection Form

Sediment Control

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Storm water Detention And Monitoring	X		Need 1 additional trench to detention Pond. Tim Charlwood said they will install trench
BMP Maintenance	X		Installed BMPs appear functional
Inlet Protection		X	still lacking sufficient inlet protection Notified Tim & Thom.
Dust Control	X		Did not witness water trucks onsite. Thom Summers assured that they are using water Trucks Dust appears controlled at construction areas.
Spill Prevention	X		None observed.
Condition of Discharge Water	X		Not Flowing. But no signs of excessive Sediment deposits.

Comments:

Site construction will cease for winter in 3-4 weeks Contractor will seed prior to leaving site for winter

Vehicle tracking pad to be built near large culvert to allow water district access to tank without driving over pad. Road between vehicle tracking pad & wildsea complete except asphalt. Consists of crushed concrete (no soils)

Erosion and Sediment Control Inspection Form
Erosion Prevention

Inspector(s): Lee Watkins Date: 8-20-08

Site Name and Location: The Sanctuary - Huntsville

Current Weather Conditions: Sunny 84° Last 24 Hours: Clear Warm

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Construction Access Trackout? Street Clean?		X	Vehicle tracking pad in place though culde sac needs cleaning.
Soil Stabilization Signs of Erosion: Gullies? Slope Failures? Rills?		X	growth still lacking seeding not complete yet.
Slope Protection Plastic Condition? Grass Growing? Hydroseed Condition? Matting?		X	See above
Perimeter Control Clearing Limits Marked? Silt Fences? Swales?	X		Silt Fence looks good
Conveyances Stable Ditches? Check Dams Intact? Sand Bags? Slope Drains?	X		Still need check dam at big culvert New curtain drains look great & will help considerably
TESC Management Revisions Required?	X		None noted-
Water Management Infiltration System? Clean and Dirty Water Separated Offsite Water Bypassing?		X	need ditch to pond Contractor informed that they needed special equip & will build ditch this week
Outlet Protection Stabilized?		X	Still needs outlet protection However culvert construction in progress

Erosion and Sediment Control Inspection Form

Sediment Control

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Storm water Detention And Monitoring	X		See above re trash to pond
BMP Maintenance	X		Everything appears to be working well
Inlet Protection		X	still lacking but const. of culverts is ongoing still
Dust Control		X	Site appears very dusty no water truck seen / Contractor says they water regularly & have had no complaints to date
Spill Prevention	X		None noted
Condition of Discharge Water	X		Not Flowing, but no signs of excessive sedimentation

Comments:

Recommend Geotech inspect slopes for stability

Erosion and Sediment Control Inspection Form
Erosion Prevention

Inspector(s): Lee Watkins Date: 9-3-08

Site Name and Location: The Sanctuary - Huntsville

Current Weather Conditions: 68° Clear Last 24 Hours: Cool Clear

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Construction Access Trackout? Street Clean?	//	X	Sweep C/L/ de soc Vehicle Trakin pad is beginning to settle & will need to be corrected soon.
Soil Stabilization Signs of Erosion: Gullies? Slope Failures? Rills?		X	Still no seeding. No additional gullies noted
Slope Protection Plastic Condition? Grass Growing? Hydroseed Condition? Matting?		X	See above
Perimeter Control Clearing Limits Marked? Silt Fences? Swales?	X		Silt fence doing well
Conveyances Stable Ditches? Check Dams Intact? Sand Bags? Slope Drains?	X		looks good.
TESC Management Revisions Required?	X		None notes
Water Management Infiltration System? Clean and Dirty Water Separated? Offsite Water Bypassing?	X		Ditch installed, should line ditch with Rock though.
Outlet Protection Stabilized?		X	Sweard outlets still need additional protection

Erosion and Sediment Control Inspection Form

Sediment Control

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Storm water Detention And Monitoring	X		Greatly improved appears to be functioning
BMP Maintenance	X		Bmp's installed appear effective & in good shape
Inlet Protection		X	New inlet boxes should be adjusted to grade & have waddles or sandbags placed or other inlet protection
Dust Control	X		None seen, but not problems noted.
Spill Prevention	X		None seen
Condition of Discharge Water	X		should be greatly improved.

Comments:

Erosion and Sediment Control Inspection Form
Erosion Prevention

Inspector(s): LEE WATKINS Date: 9-19-08

Site Name and Location: The Sanctuary - Huntsville

Current Weather Conditions: Clear Last 24 Hours: Clear

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Construction Access Trackout? Street Clean?	X		Vehicle tracking pad recently re-established
Soil Stabilization Signs of Erosion: Gullies? Slope Failures? Rills?	X		Entire site is either protected by gravel or has seeded top soil placed on top. No signs of rills or gullies
Slope Protection Plastic Condition? Grass Growing? Hydroseed Condition? Matting?	X		See above
Perimeter Control Clearing Limits Marked? Silt Fences? Swales?	X		Silt fence in good shape Swales well defined
Conveyances Stable Ditches? Check Dams Intact? Sand Bags? Slope Drains?	X		looks good.
TESC Management Revisions Required?	X		None noted
Water Management Infiltration System? Clean and Dirty Water Separated? Offsite Water Bypassing?	X		ditch lined with rock & appears functional
Outlet Protection Stabilized?	X		outlet rip rap appears adequate & in place should re-devaluate in spring.

Erosion and Sediment Control Inspection Form

Sediment Control

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Storm water Detention And Monitoring	X		appears to function well Spring will confirm this
BMP Maintenance	X		appear effective & in good shape
Inlet Protection		X	a couple of catch basins do not have inlet protection though the ditches are lined with rock & should provide some protection
Dust Control	X		N/A over winter since Site will be closed.
Spill Prevention	X		None noted
Condition of Discharge Water	X		Based on visual inspection of waterways.

Erosion and Sediment Control Inspection Form

Sediment Control

BMP Designation	O.K	Not O.K.	BMP Condition, Corrective Action, General Notes
Storm water Detention And Monitoring			
BMP Maintenance			
Inlet Protection			
Dust Control			
Spill Prevention			
Condition of Discharge Water			