

TRUCKEE MEADOWS
CONSTRUCTION SITE BEST MANAGEMENT PRACTICES
HANDBOOK

February 2015 Update

Prepared For:

City of Reno

City of Sparks

Washoe County

Prepared By:

Farr West Engineering

Table of Contents

List of Tables.....	iv
List of Appendices.....	iv
Acknowledgements.....	v
List of Acronyms.....	vi

Section 1: Introduction1-1

1.1	Historical Background	1-1
1.2	What's New with the 2015 Update to the BMP Handbook?	1-2
1.3	What's in the new 2015 General Construction Permit?	1-2
1.4	Purpose of Handbook.....	1-3
1.5	Program Area	1-3
1.6	Overview of Handbook Organization	1-3
1.7	Updates and Revisions to the Construction Site BMP Handbook.....	1-4
1.8	Disclaimer	1-4
1.9	Comments	1-5
1.10	Distribution.....	1-5

Section 2: Storm Water Quality Management2-1

2.1	Environmental Impacts of Runoff from Construction Sites	2-1
2.2	Local Ordinances and Codes	2-3
2.3	The Watershed MapServer and the Truckee River Information Gateway	2-3
2.4	Best Management Practices (BMPs)	2-4
2.5	Principles of Erosion and Sediment Control	2-4
2.6	NPDES Permit Regulations	2-6
2.7	Nevada's General Permit for Construction Activity	2-6
2.8	Projects Requiring Coverage Under the General Permit	2-7
2.9	Permissible Non-Storm Water Discharges	2-7
2.10	References	2-8

Section 3: The Truckee Meadows Construction Site Discharge Program.....3-1

3.1	Local Program Requirements	3-1
3.2	Legal Authority	3-1
3.3	Performance Standards	3-3
3.4	Local Policies and Procedures.....	3-4
3.4.1	Plan Review	3-5
3.4.2	Inspection and Enforcement	3-6
3.4.3	Public Reporting	3-7
3.4.4	Public Resources	3-7

Table of Contents (cont'd)

Section 4:	Storm Water Pollution Prevention Plans	4-1
4.1	Who Must Prepare a SWPPP	4-1
4.2	SWPPP Components	4-1
4.3	Regional Program SWPPP	4-2
4.4	Pre-Construction Site Assessment	4-3
4.5	Detailed Site Map	4-3
4.6	Consistency with Other Regulations, Permits and Plans	4-4
4.7	303(d) Listed Pollutants of Concern and TMDLs	4-5
4.8	Selecting Construction Site BMPs	4-6
4.9	Inspection and Maintenance	4-7
4.10	Potential Enforcement Actions	4-8
4.11	Records Retention	4-8
4.12	References and Websites	4-9
Section 5:	Best Management Practices	5-1
5.1	Approved Construction Site BMPs for the Truckee Meadows	5-1
5.2	SWPPP Site Map Symbols	5-3
5.3	Straw Bale Barriers	5-8
5.4	Sizing Criteria for Sediment Retention Basins	5-8
5.5	References and Additional Resource Information	5-9
5.5.1	Websites	5-10
Section 6:	Planning Best Management Practices	6-1
Site Design	PL-1	6-2
Scheduling	PL-2	6-4
Phased Construction	PL-3	6-6
Phased Construction	PL-3	6-7
Native Material Reuse	PL-4	6-9
Employee Training	PL-5	6-11
Section 7:	Runoff Control Best Management Practices	7-1
Permanent Diversions	RC-1	7-2
7.1		7-3
Permanent Diversions	RC-1	7-4
Temporary Diversion Berms	RC-2	7-5
Temporary Diversion Berms	RC-2	7-6
Temporary Diversion Berms	RC-2	7-7
Temporary Diversion Berms	RC-2	7-8
Check Dams	RC-3	7-9
Check Dams	RC-3	7-10
Check Dams	RC-3	7-11
Check Dams	RC-3	7-12

Table of Contents (cont'd)

	Temporary Slope Drains	RC-4	7-13
	Temporary Slope Drains	RC-4	7-15
Section 8:	Erosion Control Best Management Practices		8-1
	Preserving Existing Vegetation	EC-1	8-2
	Slope Terracing and Tracking	EC-2	8-4
	Mulching	EC-3	8-6
	Soil Binders	EC-4	8-9
	Wind Erosion and Dust Control	EC-5	8-11
	Rolled Erosion Control Products	EC-6	8-14
Section 9:	Sediment Control Best Management Practices		9-1
	Fiber Rolls	SC-1	9-3
	Brush and Rock Filters	SC-2	9-6
	Sand & Gravel Bag Barriers	SC-3	9-8
	Gravel Filter Berm	SC-4	9-11
	Silt Fences	SC-5	9-13
	Temporary Sediment Traps	SC-6	9-17
	Sediment Retention Basins	SC-7	9-20
	Construction Site Entrances & Exits	SC-8	9-26
	Construction Exit Tire Wash	SC-9	9-31
	Stabilized Construction Roadway	SC-10	9-34
	Synthetic Sediment Control Rolls	SC-11	9-36
Section 10:	Drainageway Protection Best Management Practices		10-1
	Temporary Stream Crossing	DP-1	10-2
	Storm Drain Outlet Protection	DP-2	10-8
	Storm Drain Inlet Protection	DP-3	10-11
	Catch Basin Filters	DP-4	10-18
Section 11:	General Site and Materials Best Management Practices		11-1
	Water Conservation Practices	GM-1	11-2
	Stockpile Management	GM-2	11-4
	Solid & Demolition Waste Management	GM-3	11-6
	Dewatering Operations	GM-4	11-8
	Street & Surface Cleaning	GM-5	11-14
	Spill Prevention & Control	GM-6	11-16
	Vehicle & Equipment Cleaning	GM-7	11-19
	Vehicle & Equipment Maintenance & Fueling	GM-8	11-21
	Handling & Disposal of Concrete & Cement	GM-9	11-24
	Material Delivery, Handling, Storage & Use	GM-10	11-26
	Paints & Liquid Materials	GM-11	11-28

Table of Contents (cont'd)

Pavement Construction Management GM-12.....	11-30
Liquid Waste Management GM-13.....	11-32
Sanitary/Septic Waste Management GM-14.....	11-34
Landscaping Management GM-15.....	11-36
Contaminated Soil & Water Management GM-16	11-38
Hazardous Waste Management GM-17.....	11-40
Illicit Discharges & Connections Detection & Reporting GM-18.....	11-42
Drilling & Pile Driving Operations GM-19	11-44
Material & Equipment Use Over Water GM-20.....	11-46
Structure Demolition/Removal Over or Adjacent to Water GM-21	11-48
Temporary Batch Plants GM-22.....	11-50

List of Tables

Table 2-1: Typical Construction Site Pollutants	2-2
Table 2-2: Basic Soil Types and Erosion Potentials	2-5
Table 2-3: Soil Surface Conditions at Construction Sites	2-6
Table 3-1: Existing Grading Regulations	3-2
Table 5-1: Approved Best Management Practices for Construction Sites	5-2
Table 5-2: Erosion Control Plan Symbols	5-4
Table 6-1: Planning Best Management Practices	6-1
Table 7-1: Runoff Control Best Management Practices.....	7-1
Table 8-1: Erosion Control Best Management Practices	8-1
Table 8-2: Soil Cover and Erosion Control	8-1
Table 9-1: Sediment Control Best Management Practices	9-2
Table 10-1: Drainageway Protection Best Management Practices	10-1
Table 11-1: General Site and Materials Management Best Management Practices	11-1

List of Appendices

- A 2015 General Construction Permit NVR100000
- B Notice of Termination (NOT)
- C Regional Program Storm Water Pollution Prevention Plan (SWPPP)
- D Regional Program Checklists – February 2015 Update
- E Regional Seed Mix Designs

Table of Contents (cont'd)

Acknowledgements

The 2013 Update of the Truckee Meadows Construction Site Best Management Practices (BMP) Handbook was prepared under a contract with the City of Reno on behalf of the Truckee Meadows Storm Water Permit Coordinating Committee. The 2013 committee members were:

Terri Svetich, P.E., Program Coordinator
City of Reno, Sanitary Engineering

Walter West, P.E.
Washoe County Community Services Dept.
- Engineering and Capital Projects Division

Bill Gall, P.E.
City of Reno, Community Development

Christian Kropf
Washoe County Community Services Dept.
- Engineering and Capital Projects Division

Tobey Ebens
City of Sparks, Community Services Dept.

Andy Hummel, P.E.,
City of Sparks, Community Services Dept.

Susan Ball Rothe, Legal Counsel
City of Reno, Deputy City Attorney

This BMP handbook was developed to assist the Cities and County and members of public involved in the planning, design and construction of private and public new development and redevelopment projects with the requirements set forth in the Nevada 2015 General Construction Permit (NVR100000). The Nevada Division of Environmental Protection (NDEP) issued this permit in compliance with the provisions of the Federal Clean Water Act and Chapter 445A of the Nevada Revised Statutes (NRS). The NDEP staff members responsible for developing and implementing the permit, and reviewing the Construction Site BMP Handbook were:

Clifford Lawson, P.E.
Technical Services Supervisor
NDEP, Bureau of Water Pollution Control

Steve McGoff, P.E.
Staff Engineer
NDEP, Bureau of Water Pollution Control

The following staff members at Farr West Engineering were responsible for updating this BMP handbook: Candice Elder and Brent Farr, P.E. In addition, Julie Etra, CPESC, Western Botanical Services assisted with the updates.

List of Acronyms

BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BOD	Biological Oxygen Demand
Caltrans	State of California Department of Transportation
DI	Drop inlet (storm drain catch basin)
EPA	U. S. Environmental Protection Agency
EOS	Equivalent Opening Size
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
MSDS	Material Safety Data Sheet
NDEP	Nevada Division of Environmental Protection
NDF	Nevada Division of Forestry
NDOT	Nevada Department of Transportation
NOI	Notice of Intent
NOT	Notice of Termination
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NRCS	Natural Resource Conservation Service
RSWQMP	Regional Storm Water Quality Management Program
SWPPP	Storm Water Pollution Prevention Plan
VOC	Volatile Organic Chemicals
WSCD	Washoe-Storey Conservation District

Section 5: Best Management Practices

5.1 Approved Construction Site BMPs for the Truckee Meadows

Table 5-1 presents the preferred list of Best Management Practices (BMPs) approved for use at construction sites in the Truckee Meadows. As noted previously in Section 2.6, BMPs are required to reduce or prevent erosion and to control the sediment and wastes that are generated from construction site activities. Construction site BMPs can be temporary measures that are only applied and effective during active construction, and/or permanent measures that work to control erosion and sedimentation and improve storm water quality during and after construction. Temporary and/or permanent construction site BMPs are noted on Table 5-1.

The list presented in Table 5-1 was developed based on a comprehensive review of the Construction Site BMP Manuals developed and used by the following other communities and agencies:

- The California Regional Water Quality Control Board, San Francisco Bay Region.
- The City of Boise, Idaho.
- The City of Sacramento, California.
- Maricopa County, Arizona.
- The State of California Department of Transportation (Caltrans).
- The Urban Drainage and Flood Control District, Denver, Colorado.
- The Nevada Department of Transportation.
- The USEPA National Menu of Storm Water BMPs.
<http://cfpub1.epa.gov/npdes/stormwater/menuofbmps/index.cfm>

Several relevant local documents were also reviewed:

- Erosion Control for Construction Sites, produced by the Washoe-Storey Conservation District, 1997.
- The Draft Construction Activities BMP Handbook prepared for Washoe County, the Cities of Reno and Sparks and the Nevada Department of Transportation, 1994.
- The Drainage Design Manuals currently used by the Cities and County.
- The Handbook of Best Management Practices, produced by the Nevada Division of Environmental Protection and the Nevada Division of Conservation Districts, 1994.

In addition, several independent field manuals, guidance documents and websites were also reviewed and the pertinent information was incorporated in this BMP handbook. All of the documents and websites reviewed during the development of this BMP handbook are listed in Section 5.5.

Table 5-1: Approved Best Management Practices for Construction Sites

Category	BMP#	BMP Name	Temporary	Permanent
Planning	PL-1	Site Design	T	P
	PL-2	Scheduling	T	
	PL-3	Phased Construction	T	
	PL-4	Native Material Reuse	T	P
	PL-5	Employee Training	T	P
Runoff Control	RC-1	Permanent Diversions		P
	RC-2	Temporary Diversion Dikes and Ditches	T	
	RC-3	Check Dams	T	
	RC-4	Temporary Slope Drains	T	
Erosion and Sediment Control	EC-1	Preserving Existing Vegetation	T	P
	EC-2	Slope Terracing and Tracking	T	P
	EC-3	Mulching	T	P
	EC-4	Soil Binders	T	P
	EC-5	Wind Erosion and Dust Control	T	P
	EC-6	Rolled Erosion Control Products	T	P
	EC-7	Riprap*	T	P
	EC-8	Revegetation	T	P
	SC-1	Fiber Rolls	T	P
	SC-2	Brush and Rock Filters	T	P
	SC-3	Sand Bag Barriers	T	
	SC-4	Gravel Filter Berm	T	
	SC-5	Silt Fences	T	
	SC-6	Temporary Sediment Traps	T	
	SC-7	Sediment Retention Basins	T	P
	SC-8	Construction Site Entrances and Exits	T	
	SC-9	Construction Exit Tire Wash	T	
	SC-10	Stabilized Construction Roadway	T	
	SC-11	Synthetic Sediment Control Rolls	T	
	SC-12	Compost Filter Berms and Socks	T	P
Drainageway Protection	DP-1	Temporary Stream Crossing	T	
	DP-2	Storm Drain Outlet Protection		P
	DP-3	Storm Drain Inlet Protection	T	
	DP-4	Catch Basin Inlet Filters	T	

* Riprap is not allowed for use as an erosion or sediment control measure on disturbed slopes within the City of Sparks' residential area construction sites.

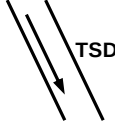
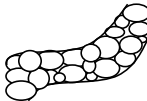
Table 5-1: Approved Best Management Practices for Construction Sites

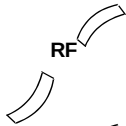
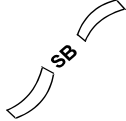
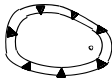
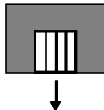
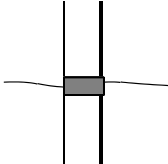
Category	BMP#	BMP Name	Temporary	Permanent
General Site and Materials Management	GM-1	Water Conservation Practices	T	P
	GM-2	Stockpile Management	T	
	GM-3	Solid and Demolition Waste Management	T	
	GM-4	Dewatering Operations	T	
	GM-5	Street Sweeping	T	
	GM-6	Spill Prevention and Control	T	
	GM-7	Vehicle and Equipment Cleaning	T	
	GM-8	Vehicle and Equipment Maintenance and Fueling	T	
	GM-9	Handling and Disposal of Concrete and Cement	T	
	GM-10	Material Delivery, Handling, Storage and Use	T	
	GM-11	Paints and Liquid Materials	T	
	GM-12	Pavement Construction Management	T	
	GM-13	Liquid Waste Management	T	
	GM-14	Sanitary/Septic Waste Management	T	
	GM-15	Landscaping and Revegetation Management	T	P
	GM-16	Contaminated Soil and Water Management	T	
	GM-17	Hazardous Waste Management	T	
	GM-18	Illicit Discharges and Connections – Detection and Reporting	T	
	GM-19	Drilling and Pile Driving Operations	T	
	GM-20	Material and Equipment Use Over Water	T	
	GM-21	Structure Demolition/Removal Over or Adjacent to Water	T	P
	GM-22	Temporary Batch Plants	T	

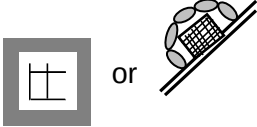
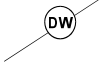
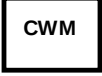
5.2 SWPPP Site Map Symbols

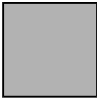
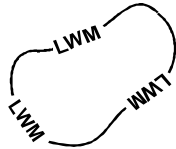
Table 5-2 presents the alphanumeric codes (BMP#, Table 5-1) and map symbols that should be consistently used on SWPPP site maps other construction plans that depict erosion, sediment and waste control BMPs. Use of these simple codes and/or symbols is intended to provide a universally convenient method for depicting BMPs on site plans and other construction plans.

**Table 5-2: SWPPP
Site Map Symbols**

<u>BMP NAME</u>	<u>BMP NUMBER</u>	<u>MAP SYMBOL</u>
Temporary Diversion Dikes and Ditches	RC-2	
Check Dams	RC-3	
Temporary Slope Drains	RC-4	
Preserving Existing Vegetation	EC-1	
Slope Terracing and Tracking	EC-2	
Mulching	EC-3	
Soil Binders	EC-4	
Wind Erosion and Dust Control	EC-5	
Rolled Erosion Control Products	EC-6	
Riprap	EC-7	

<u>BMP NAME</u>	<u>BMP NUMBER</u>	<u>MAP SYMBOL</u>
Revegetation	EC-8	
Fiber Rolls	SC-1	
Brush and Rock Filters	SC-2	
Sand Bag Barriers	SC-3	
Gravel Filter Berm	SC-4	
Silt Fences	SC-5	
Temporary Sediment Traps	SC-6	
Sediment Retention Basins	SC-7	
Construction Site Entrances and Exits	SC-8	
Construction Exit Tire Wash	SC-9	
Stabilized Construction Roadway	SC-10	
Temporary Stream Crossing	DP-1	

<u>BMP NAME</u>	<u>BMP NUMBER</u>	<u>MAP SYMBOL</u>
Storm Drain Outlet Protection	DP-2	
Storm Drain Inlet Protection	DP-3	
Stockpile Management	GM-2	
Solid and Demolition Waste Management	GM-3	
Dewatering Operations	GM-4	
Street Sweeping	GM-5	
Spill Prevention and Control	GM-6	
Vehicle and Equipment Cleaning	GM-7	
Vehicle and Equipment Maintenance and Fueling	GM-8	
Handling and Disposal of Concrete and Cement	GM-9	
Material Delivery, Handling, Storage and Use	GM-10	

<u>BMP NAME</u>	<u>BMP NUMBER</u>	<u>MAP SYMBOL</u>
Paints and Liquid Materials	GM-11	
Pavement Construction Management	GM-12	
Liquid Waste Management	GM-13	
Sanitary/Septic Waste Management	GM-14	
Contaminated Soil and Water Management	GM-16	
Hazardous Waste Management	GM-17	
Illicit Discharges and Connections Detection and Reporting	GM-18	
Drilling and Pile Driving Operations	GM-19	
Material and Equipment Use Over Water	GM-20	
Structure Demolition Over Water	GM-21	
Temporary Batch Plants	GM-22	

5.3 Straw Bale Barriers

Based on literature reviews and the concerns of the District Health Department, straw bale barriers shall not be used for sediment control at construction sites in the Truckee Meadows. Use of straw bale barriers was one of the most common and familiar methods historically used to retain sediment on construction sites, despite the fact that they are relatively ineffective for the following reasons:

- Improper installation and application of straw bale barriers can result in accelerated erosion and sediment transport.
- Straw bale barriers are also maintenance intensive.
- Straw bales shall never be installed in a channel or drainage that conveys concentrated flows or used for storm drain inlet protection. When used in channels and drainages, runoff is often diverted around straw bales creating additional erosion.
- Field manuals and BMP handbooks used by other communities typically indicate that straw bale barriers may only be used as temporary sediment control measures for small runoff events and they can only be used for short periods of time (three months or less). However, straw bales are often misused and remain onsite for extended periods of time, falling apart and becoming an additional pollutant.
- Although “weed free straw” is typically specified, they can also inadvertently introduce noxious weeds to a site if they have not been certified by the Nevada department of Agriculture. In addition, the Washoe County District Health Department has requested that straw bales not be used in the Truckee Meadows because the straw provides a nutrient medium for mosquito breeding. Other communities, such as Sacramento County, have removed straw bale barriers from their list of preferred BMPs and are actively discouraging their continued use.

If straw bales are to be used to temporarily contain concrete washout or to filter muddy water removed from a sediment basin, they must be removed from the site and properly disposed of as soon as their intended function is complete (e.g. the concrete washout is full or dewatering procedures are complete).

5.4 Sizing Criteria for Sediment Retention Basins

Per section 4.2 of NDEP’s 2015 General Construction Permit, If sediment basins are installed the operator shall comply with the following design and maintenance requirements:

- 4.2.1.1 Provide storage for either the calculated volume of runoff from a 2-year, 24-hour storm event for each disturbed acre drained, or 3600 cubic feet per acre drained;
- 4.2.1.2 When discharging from the sediment basin, utilize outlet structures that withdraw water from the surface in order to minimize the discharge of pollutants, unless infeasible. If it is determined to be infeasible, support documentation shall be provided in the SWPPP.

- 4.2.1.3 Prevent erosion of (1) the sediment basin using stabilization controls (e.g., rip-rap or erosion control blankets), and (2) the inlet and outlet using erosion controls and velocity dissipation devices;
- 4.2.1.4 Sediment basins shall be situated outside of surface waters and any natural buffers established under Part 3.5.1; and
- 4.2.1.5 Basins shall be maintained in effective operating condition and removal of accumulated sediment shall be conducted when design capacity has been reduced by 50%.

The drainage policy for new developments in the Cities of Reno and Sparks and Washoe County is to require permanent minimum detention storage for the 5-year, 24-hour storm (for drainage areas less than 20 acres). Permanent local major and regional detention facilities are required to follow the existing design criteria outlined in the Cities and County's drainage design manuals. In addition, the current Truckee Meadows MS4 permit states that flood management projects must also assess the impacts on the water quality of receiving water bodies and evaluate existing structural flood control devices (such as detention and retention basins) to determine if it is feasible to retrofitting the devices to provide additional storm water pollutant removal capability. Sizing, design, construction, inspection and maintenance criteria for permanent sedimentation basins is presented in the current version of the Truckee Meadows Structural Controls Design & LID Manual.

5.5 References and Additional Resource Information

The references listed below provide additional resource information about Federal, State and local programs and regulations, studies of the effectiveness of BMPs, manufactures of erosion and sediment control BMPs, and general information about storm water quality management.

Bay Area Stormwater Management Agencies Association, undated. *Start at the Source – Residential Site Planning & Design Guidance Manual for Stormwater Quality Protection*.

California Regional Water Quality Control Board, San Francisco Bay Area Region, 1999. *Erosion and Sediment Control Field Manual*, 3rd Edition, July 1999.

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

Camp, Dresser & McKee, Larry Walker & Associates, Uribe and Associates and Resource Planning Associates, 1993. *California Storm Water Best Management Practices Handbooks – Construction Handbook*, prepared for the Stormwater Quality Task Force.

Camp, Dresser & McKee, Inc. 1993. *Drainage Design Manual for Maricopa, Arizona, Volume III, Erosion Control*. Prepared for the Flood Control District of Maricopa County.

City of Boise, 2002. *Construction Site Control, Responsible Person Training Curriculum*. Boise Planning & Development Services.

City of Boise, 2002. *Erosion & Sediment Control Field Manual, First Edition, March 2002*. Boise Planning & Development Services.

City of Reno, 1992. *Public Works Design Manual*. Department of Public Works, Engineering Division.

City of Sacramento, 1994. *Administrative and Technical Procedures for Grading and Erosion and Sediment Control*. Prepared by the City of Sacramento Department of Utilities, Stormwater Management Program, January 1994.

City of Sparks. 1998. *Hydrologic Criteria and Drainage Design Manual, Draft*.

Denver, Colorado, City and County of, 2000. *Stormwater Quality Control Plans – An Information Guide*, Wastewater Management Division, Department of Public Works, Rev. 5, January 11, 2000.

Fifield, Jerald S., Ph.D., CPESC, 2001. *Designing for Effective Sediment and Erosion Control on Construction Sites*. Forester Press, Santa Barbara, California.

Fifield, Jerald S., Ph.D., CPESC, 2001. *Field Manual on Sediment and Erosion Control, Best Management Practices for Contractors and Inspectors*. Forester Press, Santa Barbara, California.

International Erosion Control Association, 2001. *Workbook: How to Select, Install and Inspect Construction Site Erosion and Sediment Control BMPs for NPDES Storm Water Permit Compliance*.

Kennedy/Jenks Consultants, 1994. *Construction Activities Best Management Practice Handbook*, prepared for Washoe County Department of Comprehensive Planning, City of Reno Community Development Department, City of Sparks Department of Public Works, and Nevada Department of Transportation.

Maricopa County Flood Control District, Arizona, 1993. *Drainage Design Manual for Maricopa County, Volume III, Erosion Control*.

State of Nevada, 1994. *Handbook of Best Management Practices*. Prepared by the Nevada Division of Environmental Protection and the Nevada Division of Conservation Districts.

Urban Drainage and Flood Control District, 1999. *Urban Storm Drainage – Criteria Manual, Vol. 3 – Best Management Practices*, Denver, Colorado, September 1999.

Washoe County. 1996. *Hydrologic Criteria and Drainage Design Manual, Draft*.

Washoe-Storey Conservation District, 1997. *Erosion Control for Construction Sites*.

5.5.1 Websites

Association of General Contractors, Environmental Services
http://www.agc.org/environmental_info/index.asp

Caltrans, Division of Construction <http://www.dot.ca.gov/hq/construc/stormwater.html>

Center for Watershed Protection, Erosion and Sediment Control
http://www.cwp.org/esc_practices.htm

Earth911, provides information on local recycling centers for hazardous wastes and other construction materials and wastes, <http://www.earth911.org/>

Erosion Control Technology Council <http://www.ectc.org/>

International Erosion Control Association <http://www.ieca.org/>

Nevada Division of Environmental Protection, Bureau of Water Pollution Control, Storm Water Resource Information for Construction Activities <http://ndep.nv.gov/bwpc/storm03.htm>

The Stormwater Managers Resource Center (click on Facts Sheets then ESC)
<http://www.stormwatercenter.net/>

The Truckee Meadows Storm Water Quality Management Program www.TMstormwater.com

U.S. Environmental Protection Agency, 2002. National Pollution Discharge Elimination System Construction Site Storm Water Runoff Control
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm/

Section 6: Planning Best Management Practices

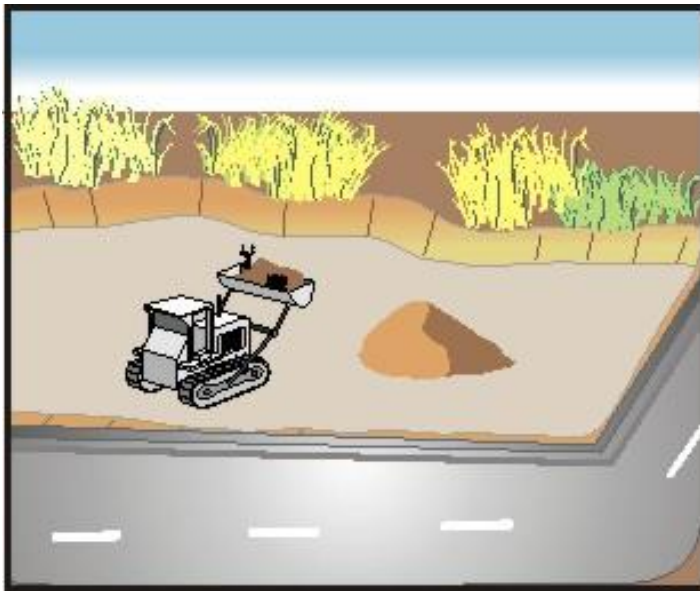
This section presents the planning concepts that can be incorporated into construction sites to provide temporary and permanent erosion and sediment controls as well as long-term water quality benefits. Detailed information about site design concepts such as low impact development (LID) and structural controls are provided in the Truckee Meadows Structural Controls Design and LID Manual.

Table 6-1: Planning Best Management Practices

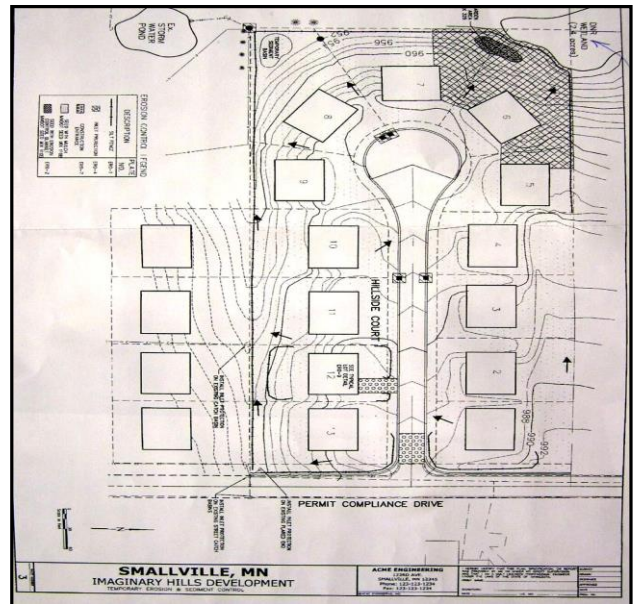
BMP#	BMP Name	Temporary	Permanent
PL-1	Site Design	T	P
PL-2	Scheduling	T	
PL-3	Phased Construction	T	
PL-4	Native Material Salvage, Storage, and Reuse	T	P
PL-5	Employee Training	T	P

Site Design

PL-1



Graphic produced by Kennedy/Jenks Consultants



Purpose: To plan and implement design features that help to minimize the need for erosion and sediment control BMPs and also reduce offsite storm water discharges. Some of these design features can also be used to reduce the rate, volume and pollutant loading of storm water runoff during construction, as well as provide permanent post-construction treatment control.

Applications:

- All construction projects. Examples include vegetated swales installed and established prior to the commencement of major construction activities and use of existing topographic features, natural vegetated buffers and existing structures that prevent, reduce or filter storm water run-on or runoff. Also consider alternative grading techniques such as Landform Grading or Contour Grading.

Limitations:

- Site constraints may limit the ability to use existing vegetation as a filter strip.
- Grass lined swales are difficult to establish in the Truckee Meadows unless they have a permanent irrigation system or are supported hydrology (shallow depth to groundwater or active channel).

Standards and Specifications:

- Limit the amount of continuously connected disturbed soil areas.

- Where possible, preserve existing vegetation and areas with permeable soils that can be used for infiltration of storm water during and after construction is complete.
- Where possible, provide active construction areas with base grade elevations below the elevation of the surrounding area. An active construction area located below the grade of surrounding pavement or sidewalks may be considered to have effective perimeter controls since the entire work area would effectively function as a detention basin during storm events. An example is provided in the graphic above where below grade construction activities and existing curb and gutter result in effective perimeter control.
- Provide additional perimeter control using vegetated swales and filter strips in conjunction with other sediment control BMPs such as fiber rolls, silt fences, gravel berms, and berms constructed of salvaged native material. Vegetated swales and filter strips can also provide permanent post construction structural treatment controls and can consist of preserved or enhanced existing vegetation.
- Limit flow velocities and trap sediments using vegetated swales. If these features are located downstream of the site and are constructed prior to the majority of other construction activities, they can also provide permanent post construction structural controls.
- Refer to the latest version of the Truckee Meadows Structural Controls Design & LID Manual for the design standards of vegetated swales, buffer strips and other structural controls and LID practices.

Inspection and Maintenance:

- Inspect site design features weekly during construction activities that are intended to block or filter storm water runoff to ensure they are adequate to prevent sediment transport offsite. If they are not, install additional BMPs.

Scheduling

PL-2

JANUARY				
MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
		1	2	3
			NTP MOBILIZATION	
		8	9	10
		Land clearing		Grading
6	7		15	16
Install erosion & sediment control measures		14		
12	13		22	23

Graphics used with permission of Caltrans

Purpose: To encourage the sequencing of construction activities and minimize the exposure of un-stabilized soils to erosion by wind, rain, and runoff.

Applications:

- All locations that include grading or earthwork.

Limitations:

- Certain activities such as permanent revegetation (seeding) are constrained by climate and should be conducted within seeding windows.

Standards and Specifications:

- Incorporate erosion and sediment control measures into the construction schedule.
- Include significant long-term operations or activities in the schedule that may have planned non-storm water discharges.
- Minimize earthwork during the local wet season (October 1st to April 1st).
- Install temporary sediment collection devices and stabilize disturbed soil areas before the wet season begins.
- Schedule work to minimize the extent of site disturbance at any one time.
- Establish final grade quickly and stabilize disturbed soils as soon as practicable (**Note: the NDEP 2015 General Construction Permit requires the application of stabilization measures no more than 14 days after construction activity has temporarily or permanently ceased.**)

Scheduling

PL-2

- The construction schedule (and the SWPPP) shall include the dates the following applicable BMPs will be installed:
 - Temporary soil stabilization BMPs
 - Temporary sediment control BMPs
 - Tracking control BMPs
 - Wind erosion control BMPs
 - Non-storm water BMPs
 - Waste management and material pollution control BMPs
- Use a calendar or flow chart to plan the construction and BMP implementation schedule.
- Outline the starting and completion dates of each item in a timetable (i.e. site clearing, grading, excavation, installation of utilities, etc.)
- Inventory and evaluate the existing site terrain and vegetation.
- Monitor weather forecasts for rainfall.
- Sequence trenching activities by closing open portions before new trenches are developed.
- Install erosion controls as work progresses.

Inspection and Maintenance:

- Verify that work is on schedule according to the project plan.
- Revise the schedule well in advance to prevent problems and to maintain control when changes to the schedule are unavoidable,
- Communicate significant schedule changes to city/county staff to assist with inspection efforts.

Phased Construction

PL-3



Source: USEPA

Purpose: To reduce on-site erosion and sediment transport off-site by sequencing land disturbance and erosion and sediment control measures.

Applications:

- Locations where water quality might be impacted by erosion from earthwork.

Limitations:

- Weather and other unforeseen conditions that may affect construction phasing.

Standards and Specifications:

- Construction phasing schedules shall include at a minimum the following:
 - A schedule for the installation of erosion and sediment controls.
 - A schedule that is compatible with the general construction schedule.

Phased Construction

PL-3

The following is an example of construction site sequencing:

- | | |
|---|--|
| 1. Signage | Install construction notice signs for site work, dust control, etc. |
| 2. Construction Access | Install stabilized construction entrances/exits (SC-8) before earth disturbing construction activities begin. |
| 3. Sediment traps and basins | Design and construct sediment traps and basins (SC-6 and SC-7) prior to stripping and grading. |
| 4. Runoff control | Install diversion channels and dikes (RC-2) before the onset of grading activities. |
| 5. Sediment Control | Install sediment control BMPs (SC-1 through 5) along downhill border of site. |
| 6. Erosion control | Stabilize disturbed soils as soon as possible. |
| 7. Land clearing and grading | Clear and grade the site after sediment and runoff control measures have been installed, inspected, and approved. |
| 8. Maintenance | Conduct frequent inspections and remove accumulated sediments from the BMPs. |
| 9. Surface stabilization | Apply immediately to any disturbed areas to control dust and erosion. |
| 10. Building construction | Properly store and contain materials. |
| 11. Maintenance | Conduct frequent inspections and remove accumulated sediments from the BMPs. |
| 12. Revegetate or Landscape and final stabilization | Stabilize the area and remove all temporary sediment control and construction wastes. Biodegradable controls may remain. |

Inspection and Maintenance:

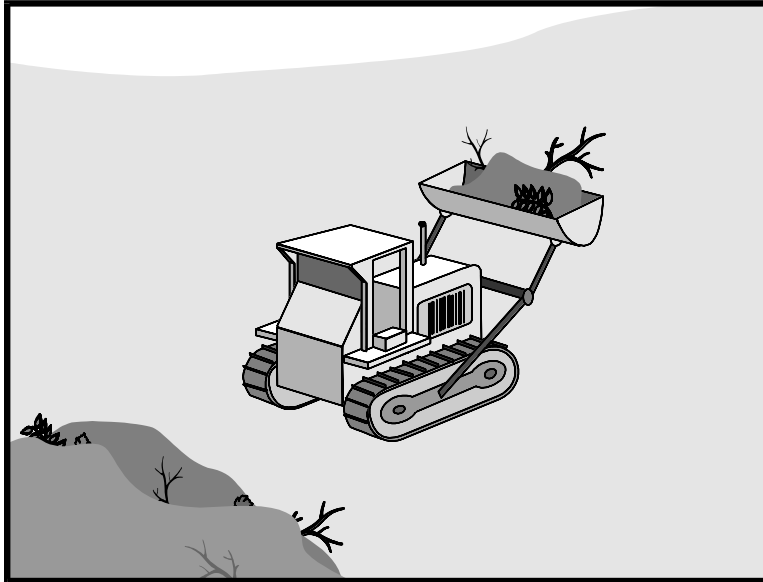
- Verify frequently that work is on schedule according to the project plan.

- Revise the plan before construction activities are implemented when changes to the project schedule are unavoidable.

Communicate significant schedule changes to city/county staff to assist with inspection efforts.

Native Material Reuse

PL-4



Graphics used with permission of Caltrans (with modifications)

Purpose: To encourage the salvaging, stockpiling and reapplication of native materials for reuse during revegetation activities. Reuse of native materials can be a critical factor to the success of revegetation and erosion control., only if native topsoil is not contaminated with noxious weed seeds.

Applications:

- Sites where revegetation is desirable.
- Particularly applicable on cut and fill slopes, floodplains, wetlands, streambanks, and sensitive habitat areas.
- Proper native material management can result in successful revegetation, enhanced productivity, reduced erosion, and permanent stabilization.

Limitations:

- Requires advanced planning prior to grading and earthwork activities.
- Stockpiles may constrict the area available for construction activity.
- May be limited area for storage; may require storage off site.
- Stockpile runoff can negatively impact water quality if improperly contained.
- Can become a source of undesirable weeds if not revegetated or properly stabilized using mulch and binders (tackifier).

Standards and Specifications:

- Conduct a site analysis including vegetation survey and soil analysis as part of pre-project site assessment to identify the location, depth, quality, and amount of material suitable for salvaging. At a minimum salvage material to a depth of six (6) inches.
- Excavate material carefully, avoid large rocks, and stockpile material where it will not be contaminated by demolition or construction activities. Screen to remove large rocks, and process organic matter when necessary to establish a representative native growth medium.
- If there is sufficient turf in good condition on site, it can be machine cut and stockpiled for reuse.
- Where suitable, strip groundcover and salvageable vegetation such as willows, roses, cactus species, and Joshua trees for reuse after construction. Carefully removed and store with specific protocol for each species.
- Soil stockpiles must be protected with temporary stabilization measures such as mulch or temporary revegetation. DO NOT USE PLASTIC SHEETING.
- Temporary stabilization must be established no later than 21 days after stockpiles are created.
- Perimeters controls such as sandbag barriers or fiber rolls must be installed as soon as practicable and must be in place prior to the onset of precipitation.

Consider the following elements when developing a topsoil management plan:

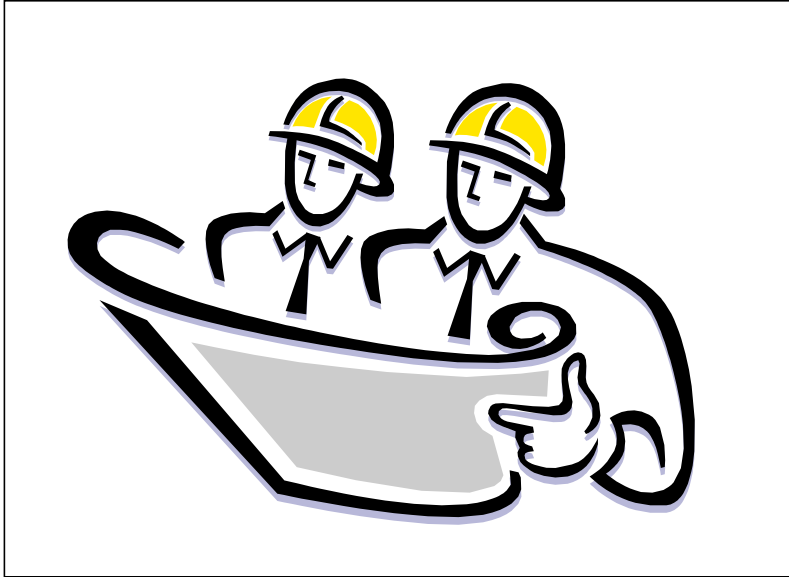
- The amount and quality of existing native material. Do not reuse if the area is contaminated with noxious weeds.
- The area where material will be reused and the required depth of application.
- Methodology for salvaging material.
- Stockpile location, duration of storage and protection against erosion and sediment transport.
- Availability and suitability of amendments to supplement revegetation.

Inspection and Maintenance:

- Inspect surface cover and perimeter controls weekly.
- Replace or repair or augment temporary stabilization measures as needed.
- Replace or repair perimeter controls as needed.

Employee Training

PL-5



Purpose: Ensure that contractors, subcontractors and government review and inspection staff are able to identify activities that may potentially impact storm water quality, identify possible solutions, and implement appropriate BMPs.

Applications:

- All construction intending to include grading or earthwork.

Limitations:

- None.

Standards and Specifications:

- Incorporate storm water quality management training with existing construction related training programs.
- Provide refresher courses or training classes on a regular basis.
- Include standard operating procedures and training in spill prevention and response.
- Train personnel in the proper use, storage, and disposal of pesticides and other construction related chemicals.
- Inform off-site contractors of on-site procedures.
- Conduct “tailgate” training sessions at project sites prior to the start of construction activities. Include discussion of Noxious and Invasive weeds.

Employee Training PL-5

Consider the following elements when developing a formal training course:

- Environmental concerns about runoff from construction sites.
 - The Clean Water Act and the NPDES program.
 - NDEP's 2015 General Permit and local policies and procedures.
 - Principles of erosion and sediment control.
 - Best Management Practices and appropriate applications.
 - Proper design and installation procedures.
 - Inspection, maintenance, and reporting requirement.
 - Weed identification.

Section 7: Runoff Control Best Management Practices

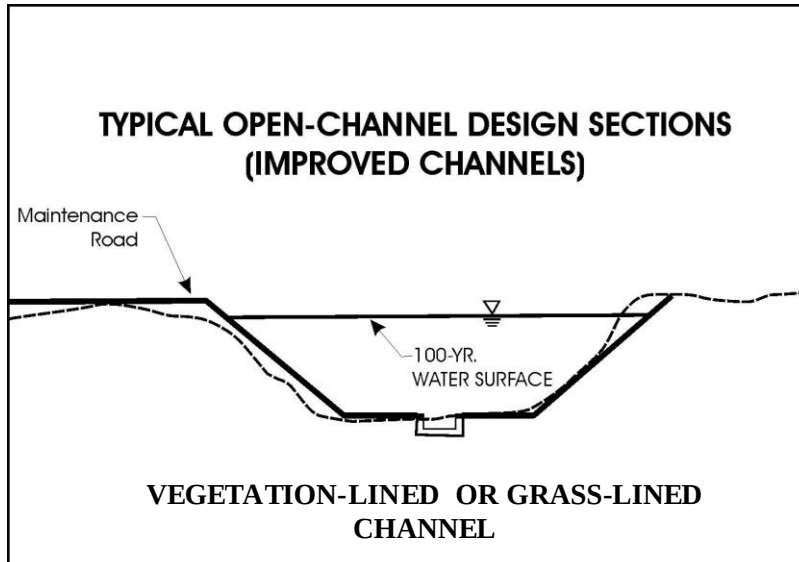
This section presents the temporary and permanent facilities that can be constructed to intercept, divert, and convey concentrated flows away from disturbed soil areas. These facilities can be constructed onsite or upstream of the site. Runoff control BMPs can be used alone or in combination with erosion control measures to direct run-on around or through the project in a non-erodible fashion.

Table 7-1: Runoff Control Best Management Practices

BMP#	BMP Name	Temporary	Permanent
RC-1	Permanent Diversions		P
RC-2	Temporary Diversion Berms and Ditches	T	
RC-3	Check Dams	T	
RC-4	Temporary Slope Drains	T	

Permanent Diversions

RC-1



Graphic produced by Kennedy/Jenks Consultants

Purpose: To design permanent facilities to collect storm water runoff and/or stream flow and convey it away from disturbed ground to an appropriate outlet or downstream drainage channel.

Applications:

- To decrease the likelihood of runoff from upstream watersheds that could result in property damage or erosion.
- To protect upland slopes by reducing slope lengths and minimizing erosion and soil loss.
- To reduce runoff velocities and increase stability by reducing channel slope and adding channel liners.

Limitations:

- Watershed and/or contributing drainage area modeling and engineering design are generally required.
- Constructed channels must be stabilized so that they are not subject to the same erosion potential as the disturbed areas they are meant to protect.
- May require additional measures to ensure channel stability and function.

Permanent Diversions RC-1

7.1

Standards and Specifications:

Open Channels for Storm Water and Diverted Stream Flows

- Permanent open channels must be designed by a professional registered engineer in the State of Nevada according to the criteria outlined in the drainage design manual of the appropriate jurisdiction.
 - Reno – Public Works Design Manual, 2010.
 - Sparks and Washoe County – Hydrologic Criteria and Drainage Design Manual, latest edition.
- Refer to the drainage design manual of the appropriate jurisdiction regarding velocity limitations, channel liners, channel drops and energy dissipation structures.
- If intended to also function as a permanent post-construction structural treatment control BMP (e.g. a vegetated swale), design per the criteria presented in the current version of the Truckee Meadows Structural Controls Design Manual.
- Where feasible, establish and install vegetated swales prior to the swale receiving run-off (with established vegetation) down slope of proposed construction sites prior to the commencement of major earth disturbing activities.

Paved Flumes

- Divert storm water runoff down the face of slopes without causing erosion problems on or below the slope.
- Outfall protection must be provided to prevent damage from high velocity flows.
- Maximum slope of the flume structure shall not exceed 1.5 H:1V.
- Install cutoff walls at upstream and downstream ends and along the length of the flume to prevent undermining.
- Place anchor lugs shall along the length of the flume to prevent movement.
- Install expansion joints and transverse joints along the length of flumes.
- Outlets must be protected using the appropriate energy-dissipating structures.

Outlet Protection

Permanent Diversions

RC-1

- Structurally lined aprons or other energy dissipating devices placed at the outlets of pipes to decrease the velocity of storm water flows.
- No bends shall be present in the horizontal alignment.
- Invert elevations shall be equal at the receiving channel and at the downstream end of the apron.
- No overfall shall occur at the end of the apron.
- Side slope of the receiving channel shall not be steeper than 2H:1V.
- Riprap, grouted riprap, concrete, or gabion baskets shall be used to line the apron.
- Where velocities warrant, filter cloth or rolled erosion control products such as coconut netting shall be placed between the channel and the riprap to prevent soil movement.
- Additional specifications are provided on the Storm Drain Outlet Protection (DP-2) fact sheet.

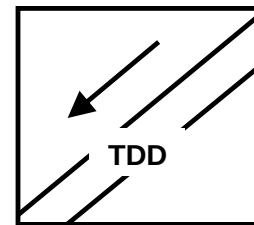
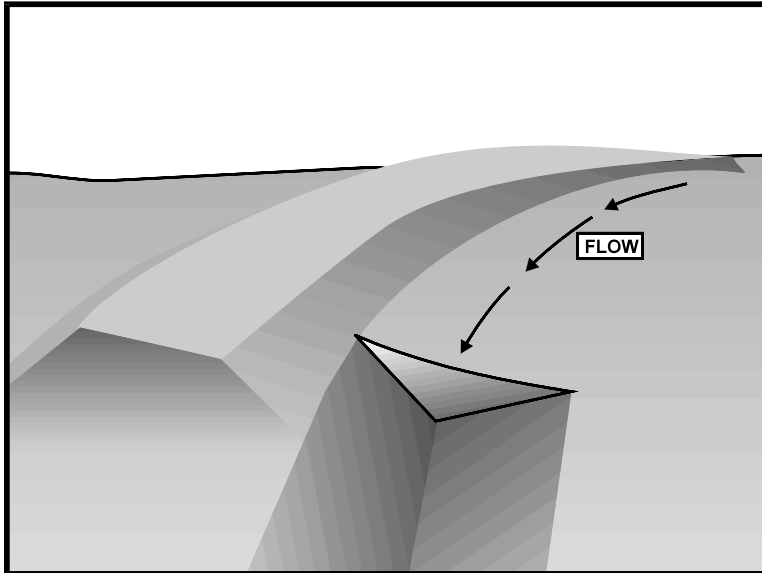
Inspection and Maintenance:

- Inspect channels and outfalls a minimum of once a week and after every rainfall until the area is stabilized.
- Inspect competency of riprap or channel lining after runoff events.
- Keep channels clear of sediment.
- Reseed areas if vegetative cover is not established.

Temporary Diversion Berms

RC-2

Dikes & Ditches



Map Symbol

Graphics used with permission of Caltrans

Purpose: To prevent erosion by capturing and diverting runoff away from above unprotected slopes. Also used along the perimeter of construction sites to prevent runoff from leaving the site. Use temporary diversion berms and dikes, ditches and swales to convey runoff to sediment trapping devices, stabilized outlets or level spreaders, where appropriate.

Applications:

- Used on upslope of disturbed areas.
- Located at the perimeter of construction sites.
- Intercept runoff from paved surfaces.
- Direct runoff to sediment trapping devices or stabilized outlets.

Limitations:

Temporary Diversion Berms and Dikes

- Do not remove or trap sediments.
- Surrounding slopes shall not exceed 5 percent.
- Upstream drainage areas shall not exceed 5 acres.
- Dikes may become barriers to construction equipment.
- Concentrated runoff may damage adjacent areas.
- Diversion dikes shall not cross roadways.

Temporary Diversion Berms

RC-2

Dikes & Ditches

- Dikes must not adversely affect upstream or downstream properties.
- Berms are erodible if not correctly constructed.

Limitations:

Temporary Diversion Ditches and Swales

- Must conform to local floodplain management regulations and shall not adversely impact upstream or downstream properties.
- Not to be used as sediment trapping devices.
- Scour and erosion in newly graded swales and ditches may occur.
- Ditches and swales may require lining or check dams to prevent erosion and gully formation.
- Can be expensive if engineering design is required.
- Vegetation and ponded water in the bottom of these facilities can provide midge and mosquito habitat.

Standards and Specifications:

- Firmly compact dikes, berms, ditches and swales to minimize erosion and prevent unequal settling.
- Drain dikes, berms, ditches and swales to protected outlets and/or sediment trapping devices.
- Provide a continuous grade to prevent water from ponding.
- Keep in place until the disturbed area is permanently stabilized.

Temporary Diversion Dikes & Berms

- Dikes & Berms shall have the following minimum dimensions: top width of 24 inches, height of 18 inches, and side slopes of 2H:1V or flatter.
- When revegetation is not possible, stabilize with filter cloth if necessary to reduce erosion potential.

Temporary Diversion Ditches and Swales

- No bushes, trees, shrubs, straw bales or silt fences shall be located within ditches or swales.
- Stabilization with liners and/or check dams is required when channel grades exceed 2 percent or velocities are in excess of 6 feet/second.

Temporary Diversion Berms

RC-2

Dikes & Ditches

Level Spreaders

- Provides an outlet from a temporary runoff diversion and consist of a lowered section in the sidewall of a temporary dike or swale.
- Spreads storm water runoff over the ground as even shallow flow instead of through channels.
- Only to be used for runoff that is relatively free of sediment.
- Construct of 2 to 4 inch washed gravel at zero grade.
- Design length based on drainage area and design flow.

Drainage Area (acres)	Minimum Spreader Length (feet)
1	10
2	10
3	15
4	18
5	20

- Height of spreader based on depth of design flow.
- Lip of spreader shall be a gravel berm a minimum of 6 inches high.
- Width of spreader shall be 6 feet minimum.
- Slope of the undisturbed outlet must not exceed 6 percent.
- Construct level spreaders on natural soil and not on fill material or easily erodible soils.
- Grade of runoff diverter entering the spreader shall be less than one percent for at least 20 feet upstream of the spreader
- Do not allow heavy equipment or traffic onto the level spreader.
- Regrade the spreader if ponding or erosion channels begin to develop.

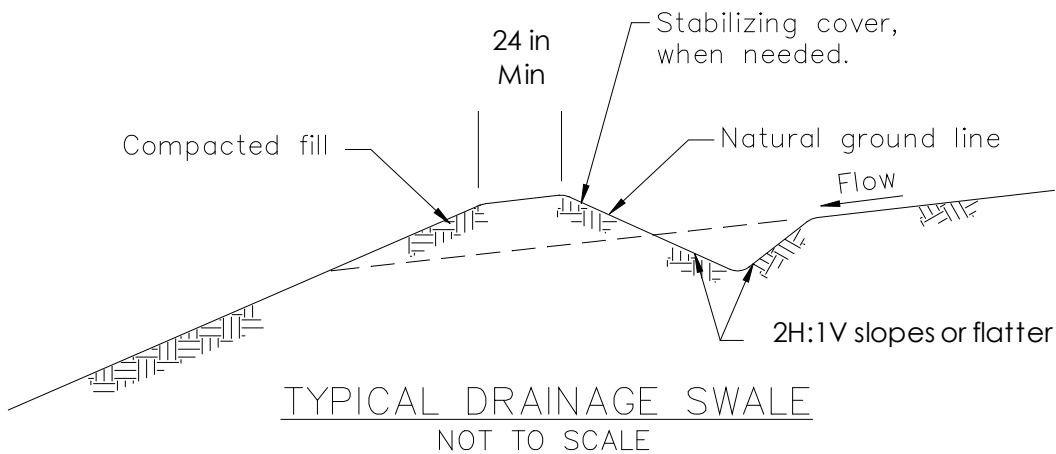
Inspection and Maintenance:

- Inspect every week and after rainfall events for debris buildup or damage to dikes, ditches, swales and liners.
- Remove accumulated sediment and debris and repair embankments and repair linings as needed.
- From May to October, do not allow water to pond behind dikes or in ditches or swales for more than 48 hours.

Temporary Diversion Berms

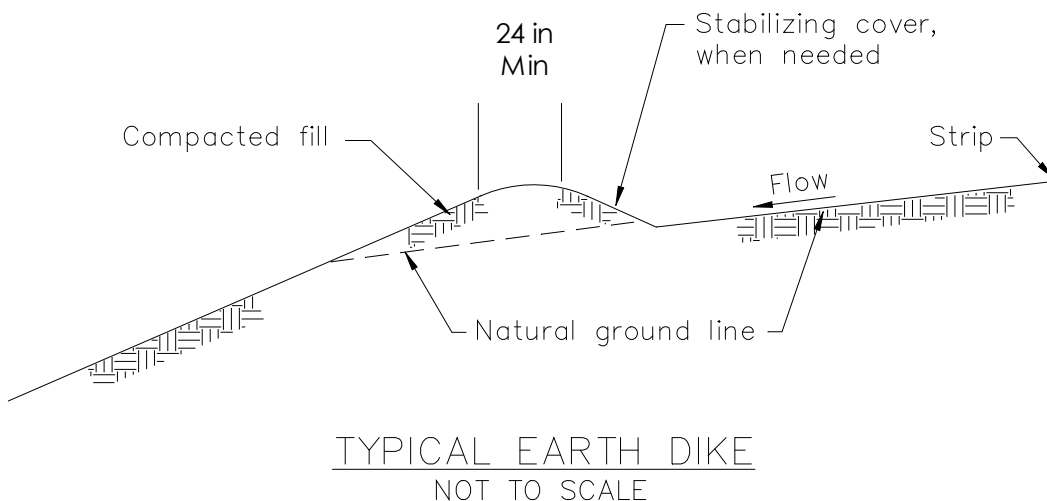
RC-2

Dikes & Ditches



NOTES:

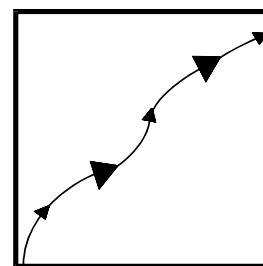
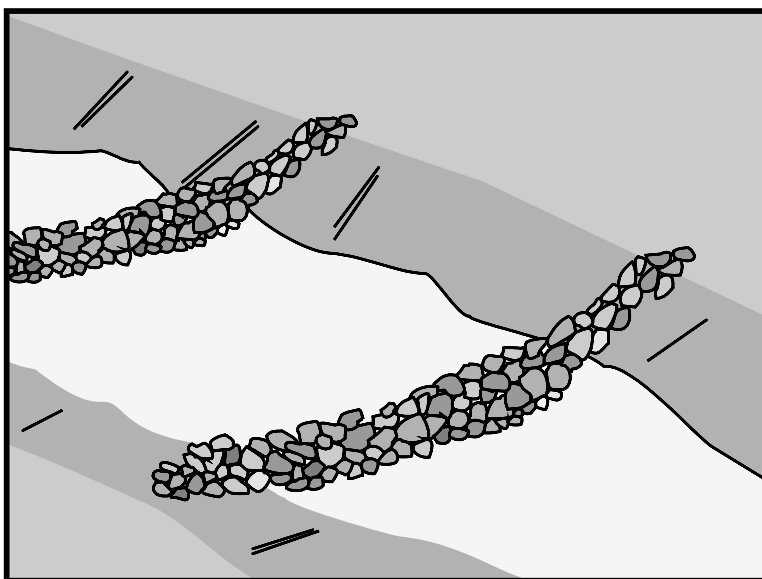
1. Stabilize inlet, outlets and slopes.



Graphic used with permission of Caltrans.

Check Dams

RC-3



Map Symbol

Graphics used with permission of Caltrans

Purpose: To reduce erosion in channels, swales and ditches caused by high flow velocities through the installation of temporary dams constructed of rocks or gravel bags. Check dams reduce flow velocity and channel scour and encourage sediment deposition. Fiber rolls can also be used in low flow and low gradient drainage swales (< 1 cfs and $< 3H:1V$), provided they are securely anchored in place.

Applications:

- Used in small open channels draining 10 acres or less.
- Used in steep channels when runoff velocities exceed 3 feet/second.
- Used when establishing grass linings in channels or drainage ditches.

Limitations:

- Do not use in live streams.
- Do not use in channels draining areas greater than 10 acres.
- Do not construct a check dam with silt fencing or straw bales.
- Check dams shall not be used as primary sediment-trapping devices.
- Extensive maintenance may be required following high flow events.
- Check dams typically trap sediment, which can be re-suspended during subsequent storm events and during check dam removal.

Standards and Specifications:

- Place check dams at a distance and height to allow small pools to temporarily form behind them.
- Space the dams at regular intervals based upon soil types and slope gradients.
- Use clean rock riprap with the D_{50} ranging 3 and 6 inches in diameter.

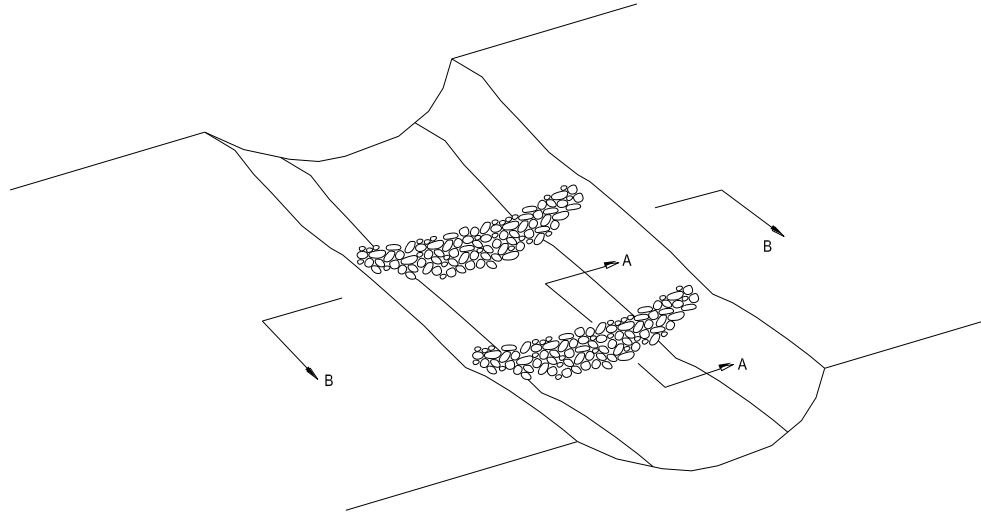
Check Dams

RC-3

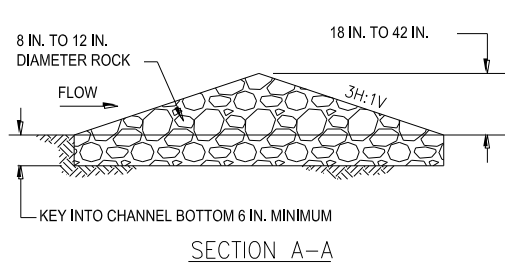
- Install the first check dam approximately 16 feet downstream of the outfall device. Steeper channel slopes and more erosive soils require shorter spacing intervals between check dams.
- Space check dams such that the downstream toe of each dam meets the backwater from the next downstream check dam.
- Design check dams to pass a 2-year, 24-hour storm without causing damage to the dam or any upstream flooding.
- The maximum height of a check dam is 4 feet from the upstream toe to the crest and the center of the dam.
- Construct the crest and the center of the dam 6 inches lower than the edges.
- Install (keyed) dam materials at least 6 inches into the sides and bottom of the channel.
- Do not dump rocks when constructing check dams. Placed rocks individually by hand or by mechanical methods.
- If gravel bags are used in the construction of check dams, follow the design criteria presented in BMP fact sheet SC-3 (do not use sand bags).
- If fiber rolls are to be used as check dams in low flow (< 1 cfs) and low gradient (< 3H:1V) drainage swales, they must be securely anchored in place (e.g. keyed-into the soil at least 1/3 the diameter of the fiber roll and staked in place) and follow the design criteria presented in BMP fact sheet SC-1.
- Check dams should be removed once vegetation has been established in a channel. However, check dams may be left in place if they are designed as permanent structures and in accordance with local drainage policies.
- From October to May, do not allow water to pond behind check dams for more than 48 hours.

Inspection and Maintenance:

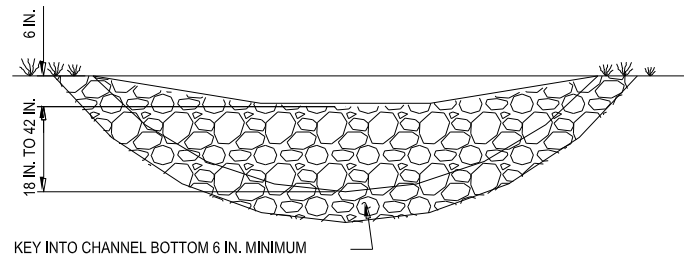
- Inspect regularly and after each runoff event for sediment buildup and signs of erosion under or around the dam.
- Replace loose material.
- Remove accumulated sediments when it reaches one third of the check dam height.
- Remove accumulated sediments prior to performing soil stabilization or permanent seeding practices.
- Remove check dam and accumulated sediments when dams are no longer needed.
- Dispose of accumulated sediments properly.



TEMPORARY CHECK DAM
(ADAPTED FROM CALTRANS)



SECTION A-A



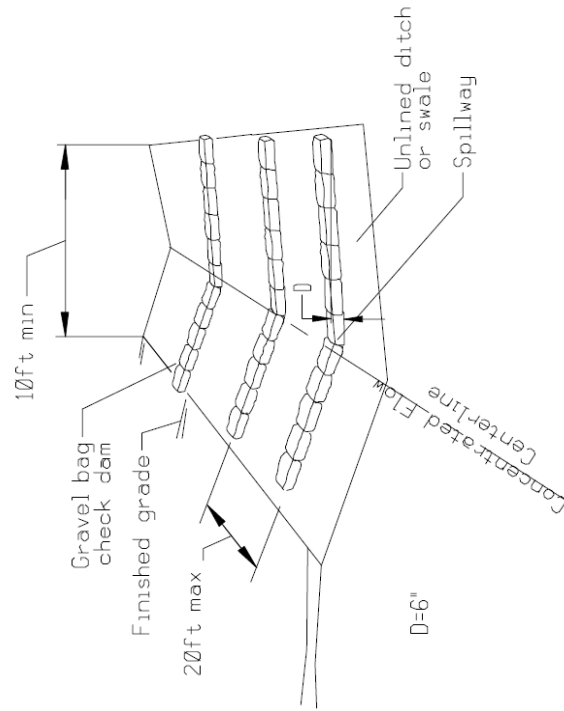
SECTION B-B

ROCK CHECK DAM
NOT TO SCALE

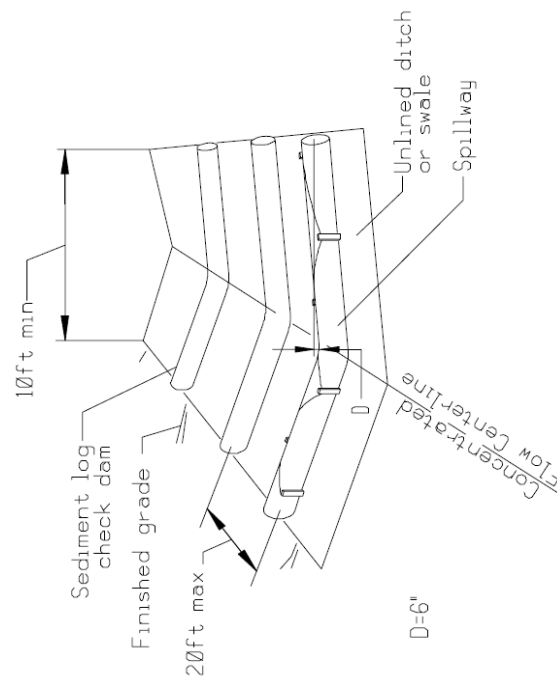
Graphics adapted from Caltrans.

Check Dams

RC-3



PERSPECTIVE
TEMPORARY CHECK DAM (TYPE II)



PERSPECTIVE
TEMPORARY CHECK DAM (TYPE I)

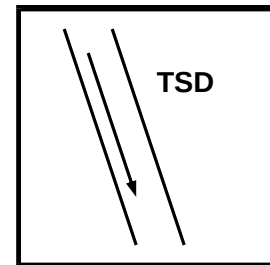
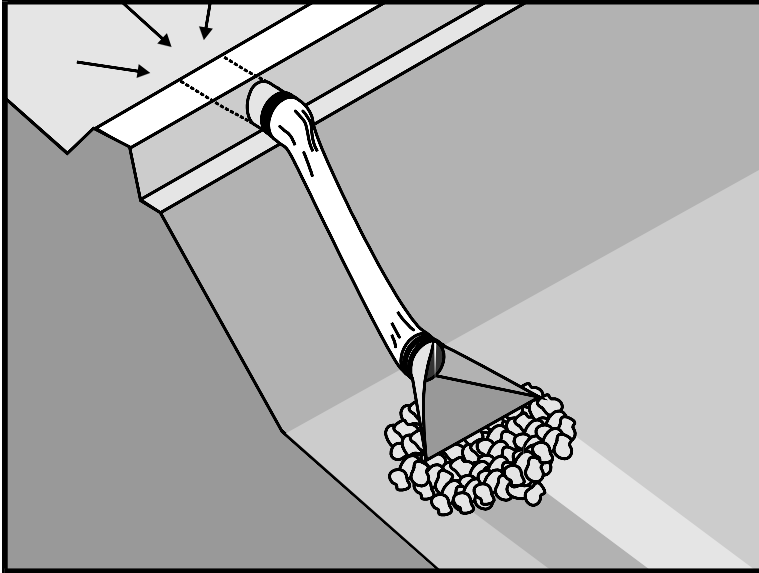
NOTES

1. Spillway depth "D" shall be maintained to prevent flanking of concentrated flow around the ends of the check dam.

Graphics adapted from Caltrans.

Temporary Slope Drains

RC-4



Map Symbol

Graphics used with permission of Caltrans

Purpose: Used as a temporary measure to convey concentrated runoff across a slope to a stabilized discharge point without allowing erosion to occur.

Applications:

- Used on construction sites where surface runoff may cause slope erosion.

Limitations:

- Clogged slope drains can cause flooding and severe erosion.
- High flows must be dissipated to avoid downstream erosion.
- Slope disturbance can occur during construction and removal of drains.

Standards and Specifications:

- Size at a minimum to convey the peak flow from the 2-year, 24-hour storm.
- Maximum drainage area per pipe is 5 acres.
- Slope drains should not be used on slopes steeper than 2H:1V.
- Compact soil around inlet, outlet and along length of pipe
- Inlet must be securely entrenched and protected with filter fabric cloth.
- Use gasketed watertight fittings.
- Pipes can be either placed on the surface or buried beneath the slope.

Temporary Slope Drains RC-4

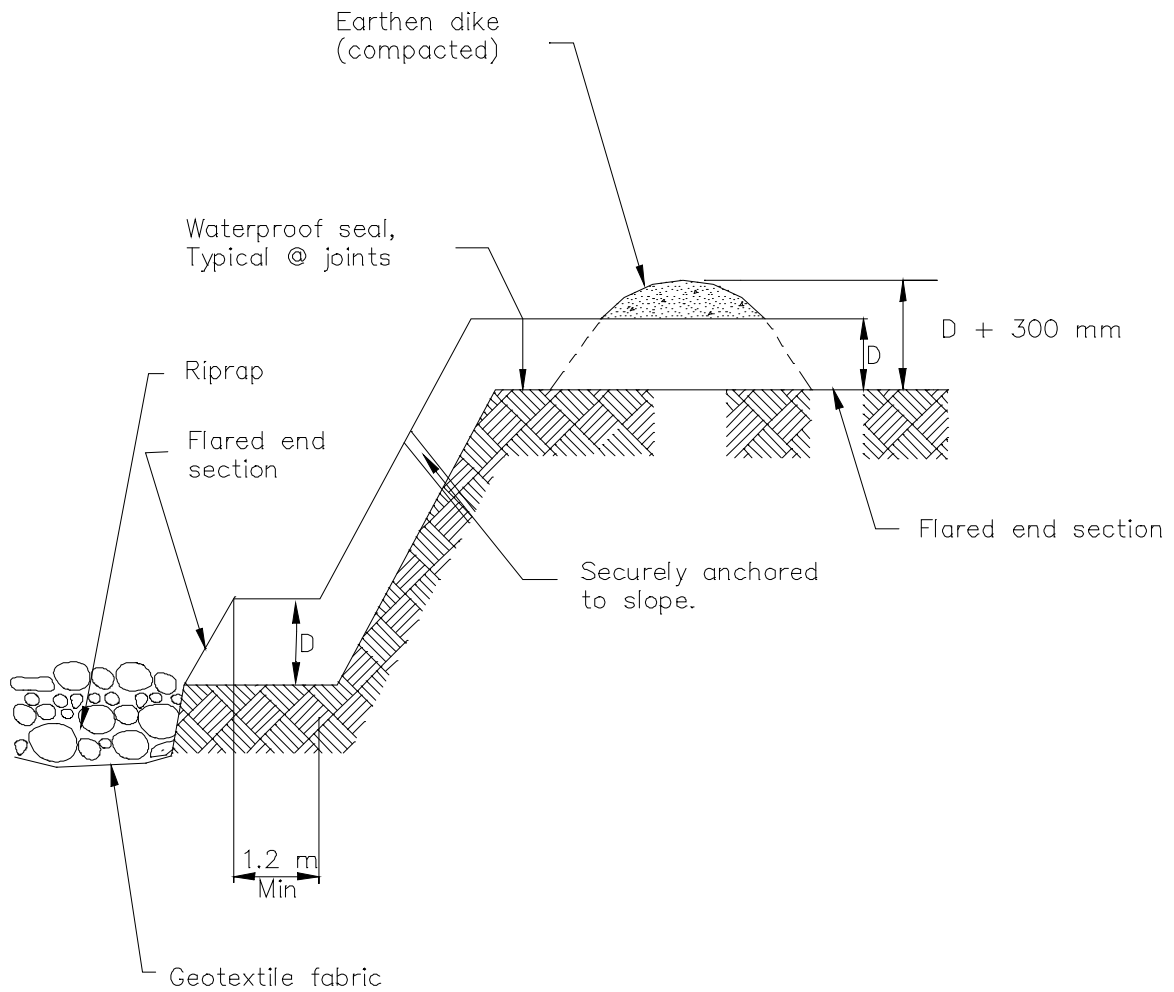
- Install pipes perpendicular to slope contours.
- Protect area around inlet with filter fabric.
- Stabilize the outlet using riprap or other materials to dissipate energy using the criteria outlined in the drainage design manual of the appropriate jurisdiction.

Inspection and Maintenance:

- Inspect weekly and after every storm event that creates runoff.
- Inspect the inlet for undercutting and the outlet for scour.
- Inspect for accumulations of sediment and debris.
- Remove accumulations of sediment and debris prior to the next forecasted storm event.
- Do not allow water to pond in inappropriate areas (e.g. active traffic lanes, material storage areas, etc.).

Temporary Slope Drains

RC-4



TYPICAL SLOPE DRAIN
NOT TO SCALE

Graphic used with permission of Caltrans.

Section 8: Erosion Control Best Management Practices

This section represents the measures that can be applied to control erosion at construction sites (as source control). Preservation of existing vegetation (EC-1) reduces the amount of erodible area and provides buffer zones between bare soil areas and waterways or the storm drain system. The other measures presented in this section are those that can be directly applied to disturbed soils to reduce erosion by wind, rain and runoff. Erosion control is typically the most effective method of controlling discharges from construction sites.

Table 8-1: Erosion Control Best Management Practices

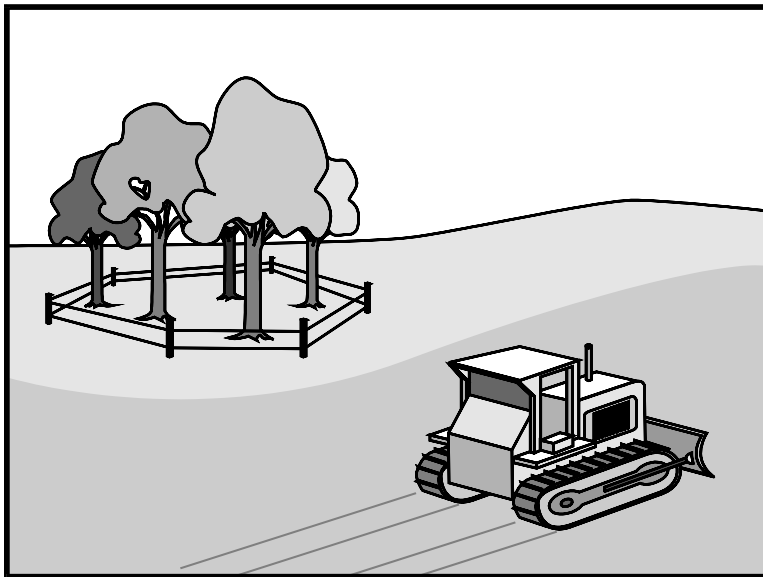
BMP#	BMP Name	Temporary	Permanent
EC-1	Preserving Existing Vegetation	T	P
EC-2	Slope Terracing and Tracking	T	P
EC-3	Mulching	T	P
EC-4	Soil Binders	T	P
EC-5	Wind Erosion and Dust Control	T	P
EC-6	Rolled Erosion Control Products	T	P
EC-7	Riprap	T	P
EC-8	Revegetation	T	P

Table 8-2: Soil Cover and Erosion Control

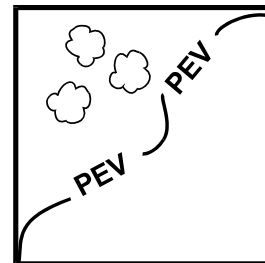
Soil Cover Condition	Erosion Reduction Potential
Certified Weed-Free Straw Mulch	
0.5 ton/acre	75%
1.0 ton/acre	87%
2.0 tons/acre	98%
Grass – Seeding and Sod	
40% cover	90%
60% cover	96%
90+% cover	99%
Trees and Bushes	
25% cover	58-60%
75% cover	64-72%
Rolled Erosion Control Products	95-99%
Reference: Fifield, 2002	

Preserving Existing Vegetation

EC-1



Graphics used with permission of Caltrans



Map Symbol

Purpose: To protect and preserve existing desirable plants and trees in and near areas that will be exposed to land-disturbing activities. Protecting and preserving landscaped and/or native vegetation can reduce the amount of erodible area and provide buffer zones that assist with infiltrating runoff and trapping sediment so that it does not discharge to waterways or the storm drain system.

Applications:

- Can be used on all types of construction sites.
- Applicable on floodplains and steep slopes, and next to wetlands, streams, rivers, lakes, and sensitive habitat areas that have existing desirable vegetation.

Limitations:

- Requires advanced planning.
- May constrict the area available for construction activity.
- High real estate values may not allow for the preservation of some natural areas.
- Improper grading may negatively impact vegetation.

Standards and Specifications:

- Install high visibility temporary fencing to protect high value existing vegetation before beginning clearing or other soil-disturbing activities.

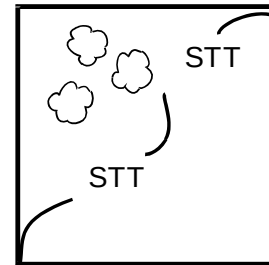
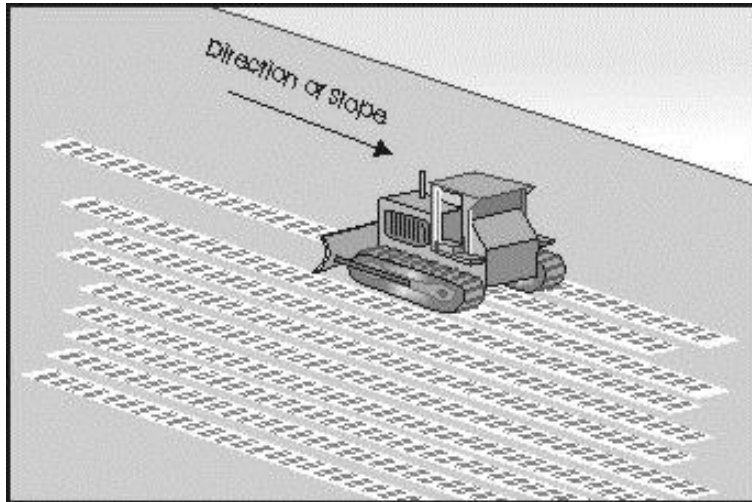
- Wherever possible, preserve desirable vegetation on steep slopes and near perennial and intermittent watercourses or swales.
- Wherever possible, preserve contiguous areas or clumps of native or landscaped vegetation, instead of individual trees and shrubs.
- Consider the location, species, size, age, and vigor of existing vegetation.
- Local agencies may have ordinances to save vegetation.
- Consider tree health, age, species, space needed, aesthetic values, and wildlife benefits when deciding which trees to preserve.
- Follow existing contours and avoid stands of trees when locating temporary roadways.
- Do not place equipment, construction materials, native materials, topsoil, or fill dirt within the limits of preserved areas.
- Maintain existing irrigation systems.
- Consider installing retaining walls to additionally protect vegetation.
- Fires are not permitted within 100 feet of the tree drip line.
- At a minimum, extend limits of fencing to the tree drip line (end of tree branches) when protecting trees. Wherever possible, extend the limits of the no-dig root protection zone outward such that it is twice as large as the outer perimeter of the branches.
- Do not cut tree roots within the tree drip line. Curve trenches around tree drip lines to avoid large root concentrations.
- Smoothly cut off the ends of damaged roots.
- Consult local arborist where appropriate.

Inspection and Maintenance:

- Repair or replace damaged vegetation immediately. Smoothly cut off the ends of damaged roots.
- Monitor the protected areas to ensure that new structures won't compromise vegetation.
- Loosen compacted soil around the tree root zone.
- Consult an arborist to determine if soil amendments or fertilizers are needed to maintain tree health.
- If advised fertilize trees in late fall or early spring.
- Cover exposed tree roots with damp soil or a wet burlap as soon as possible.

Slope Terracing and Tracking

EC-2



Graphics produced by Kennedy/Jenks Consultants

Purpose: Terracing and soil roughening or tracking of slopes reduces erosion by creating stair-steps, furrows across slope and serrations in the soil. Uneven bare soil surfaces capture raindrops, decrease the velocity of runoff, trap sediments, increase infiltration into the soil, decrease wind velocity, and aid in the establishment of vegetation.

Applications:

- Appropriate for all construction sites, particularly sites with uneven or steep topography or easily erodible soils.
- Applicable on graded areas that have smooth and hard surfaces.
- To be used in conjunction with seeding, planting, and mulching for temporary and permanent erosion control.

Limitations:

- Soil roughening may increase grading costs, cause sloughing in certain soil types, and is not needed on rocky slopes.
- Stair-step grading or terracing may not be appropriate for sandy, steep, or shallow soils.
- Effectiveness of soil roughening or tracking is limited when used alone in intense rain events.
- Terracing installed as a permanent measure to shorten slope length shall be designed based on site-specific conditions and under the direction and approval of a registered professional civil engineer.

Standards and Specifications:

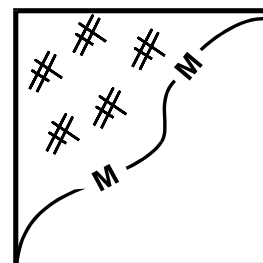
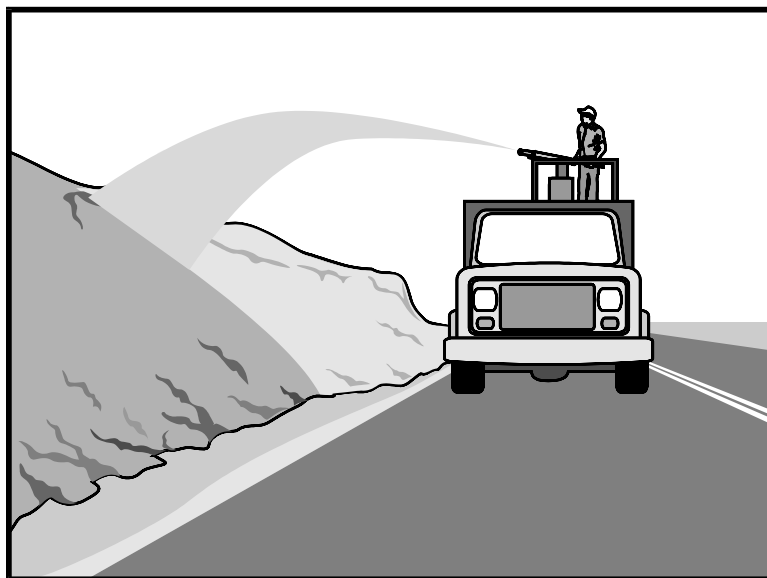
- Consider the following in grading plans:
 - The effects of grading on drainage patterns.
 - Soil type.
 - Access.
 - Type of equipment (dozer, imprinter, etc.).
 - The effects of runoff on receiving waters.
 - Starting and ending dates for movement of earth materials.
 - The percent, length, and aspect of the finished slopes.
 - How and where excess materials will be disposed.
 - Berms, diversions, and other storm water practices.
 - Site fingerprinting (clearing and grading only those areas necessary for building activities or movement of equipment).
- Roughening methods include: stair-step grading, grooving, tracking, and rough grading.
- Stair-step graded areas steeper than 3H:1V with benches.
- Mowed areas (slopes less than 3H:1V) may have small furrows left by disking, harrowing, raking, or seed-planting machinery.
- Use terraces where the slope length needs to be shortened.

Inspection and Maintenance:

- Inspect tracked, mulched, seeded and planted slopes for gullies or rills, after storm events.
- Repair immediately small-scale eroded areas to prevent them from developing into significant gullies.
- Inspect terraces annually and after significant storm events.

Mulching

EC-3



Map Symbol

Graphics used with permission of Caltrans

Purpose: To prevent erosion by protecting bare soil from rainfall and wind, reducing runoff velocity, conserving moisture, and fostering plant growth. Mulches can be composed of straw, wood chips, bark, pine needles, recycled paper, wood fibers, cotton, flax, or gravel, and they act to protect soil and enhance seed germination by reducing evaporation and insulating the soil.

Applications:

- Applicable to all bare soil surfaces where construction activities will cease for 14 days or more and will not resume within 21 days.
- Provides a temporary or permanent cover and aids in stabilization measures.
- Immediately follow temporary and permanent seeding of an area with mulching.

Limitations:

- Additional control measures may be necessary for the establishment of vegetation if the area is susceptible to erosion.
- Straw and wood chip mulch require removal before soil stabilization or permanent seeding is to take place.
- Straw and wood mulch are prone to removal by runoff and wind if not correctly anchored.

- Wood fiber hydraulic mulches may be short-lived. Recycled paper lasts longer.
- A strong potential for introducing weed-seed and unwanted plant material exists with use of pine needles and un-certified straw.

Standards and Specifications:

- The type of mulch to be applied depends on soil type, site conditions, landscape requirements, and economics.
- Roughen embankments and fill areas before applying mulch.

Straw Mulch

- Used as a temporary or permanent surface cover on disturbed areas until vegetation can be established.
- Apply at a minimum rate of 4,000 lb per acre.
- Straw mulch can be anchored by crimping, punch roller-type rollers, or track-walking, and /or with binders.
- The area must be within 150 feet of a roadway if straw blowers are to be used in the application of the mulch,
- Do not place straw in lined drainage channels, on sidewalks, or on sound walls.
- Use certified weed-free mulch.

Wood Chip Mulch and Shredded Wood

- Primarily used as a temporary ground cover around trees, shrubs, and landscaping.
- Apply by hand and distribute mulch as a layer 2-3 inches thick for landscaping and weed control.
- Apply one layer deep for revegetation applications.
- Will float or move on slopes 3:1 and steeper.

Green Material/Compost

- Don't use as mulch.

Hydraulic Mulches made from recycled paper

- Composed of a mixture of recycled newsprint, magazines, or other paper waste products.
- Mulch mixed with seeds, inoculants, and tackifier and can be applied on many sites.
- Erosion control effectiveness is limited by the short fiber length and lack of tackifier.
- Life span is generally longer than wood fiber mulches.

Hydraulic Mulches made from wood fiber

- Wood fiber mulch can also be made from lumber mill waste.
- Provides limited erosion control even with tackifier.

Hydraulic matrices (Bonded Fiber Matrix)

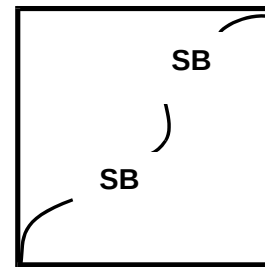
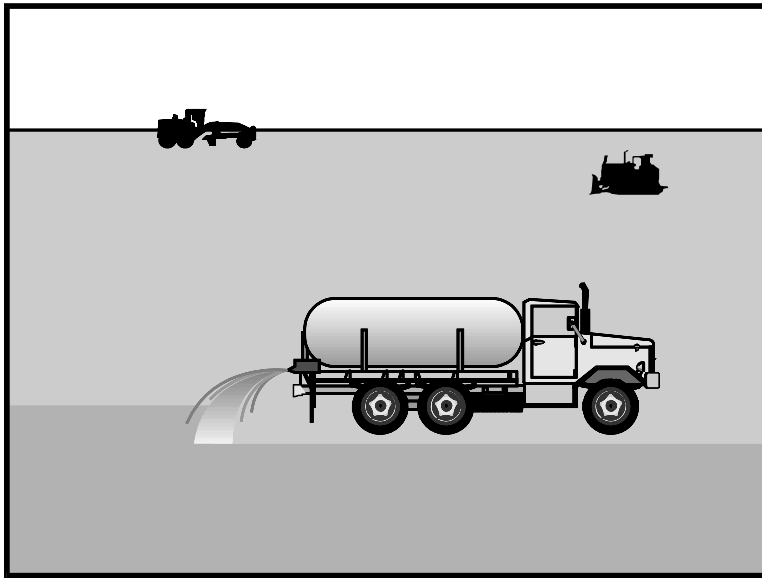
- Hydraulic slurries are a mix of wood or cellulose fiber held together by a chemical or mechanical bond.
- The mixture does not dissolve upon rewetting or contain any growth inhibitors.
- Application rates range between 3,000 lbs/acre to 4,000 lbs/acre.
- Do not apply immediately before, during, or after rainfall. Allow 24 hours of drying before application.
- Slopes must be pre-wetted prior to application.
- Excellent on highly erodible slopes.
- More expensive than other methodologies.

Inspection and Maintenance:

- Inspect for failures and loss of mulch during the wet season.
- Reapply immediately if disturbed.

Soil Binders

EC-4



Map Symbol

Graphics used with permission of Caltrans

Purpose: To provide temporary or permanent stabilization of disturbed soils.

Applications:

- Locations where other methods such as temporary or permanent seeding of vegetation are not appropriate.
- Used in combination with vegetative or perimeter practices to enhance erosion and sediment control.

Limitations:

- Synthetic stabilizers are expensive compared to plant-derived binders.
- Soil binders are short lived and may need to be reapplied.
- Some binders need at least 24 hours to become fully effective.
- Heavy rainfall may cause localized failures.
- Soil binders are made ineffective by pedestrian or construction traffic.
- Soil surfaces comprised of compacted silts and clays may be impenetrable to soil binders.
- Low temperatures may not allow soil binders to cure.
- Some soil binders do not perform well in climates with low relative humidity.
- Some chemical binders inhibit germination and plant establishment.

Standards and Specifications:

- Soil binders must be non-toxic to plants and animals, easy to apply, easy to maintain, and not stain paved surfaces.
- Do not allow overspray

Types of soil binders:

- Copolymer – Provides long-term soil stabilization (1-2 years) and is compatible with existing vegetation. However, it is relatively costly. 80 – 100 gallons/acre is the suggested application rate.
- Psyllium/Guar – Good for short-term application. They are cost effective.
- Starch can also be used.

Factors to consider when choosing a soil binder:

- Consider where the soil binder will be applied.
- Soil type and frequency of application.
- Follow the manufacturer's recommended application rates and procedures.
- Roughen embankments and fill areas prior to application of soil binders.
- Do not apply soil binders during or immediately after rainfall.
- Do not apply soil binders to frozen soils or areas with standing water or during rainy conditions or when the temperature is less than 40°F.
- Allow 24 hours for soil binders to cure.

The application of liquid agents requires:

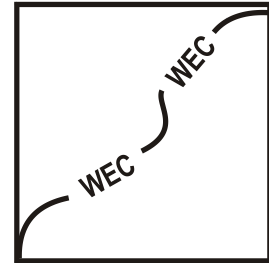
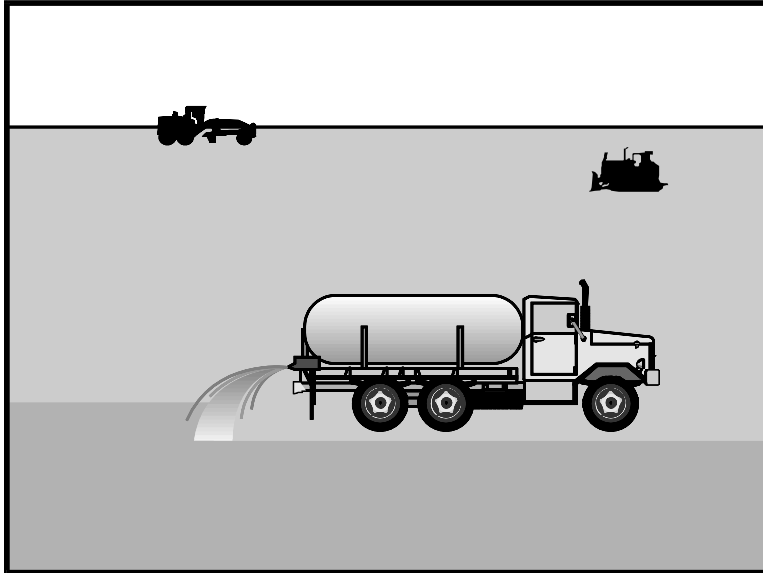
- Proper mixing.
- Re-application for extended longevity.

Inspection and Maintenance:

- Inspect regularly.
- Reapply as needed.

Wind Erosion and Dust Control

EC-5



Map Symbol

Graphics used with permission of Caltrans

Purpose: Storm water runoff, wind, erosion, and vehicle trackout from construction sites can re-disperse sediments to the air by high winds and traffic. Therefore, the purpose of dust control is to minimize these effects.

Applications:

- All construction sites having exposed soils must perform dust control measures.
- Wind erosion and dust control is important in arid and windy regions.
- Areas with soils with fine particles (silts and clay) are more prone to dust if the surface is disturbed.
- Dust control is a permanent or treatment between but must be adequate upon project completion.
- Dust control methods can help to minimize pollutants in the storm drain system, are generally inexpensive.
- Wind fence (snow fence) are applicable in arid regions where large areas of cleared land are susceptible to blowing sand and dust.

Limitations:

- During construction dust control measures are only temporary and may require reapplication.
- Incorrect usage of chemical stabilizers can have adverse effects on water quality.

- Discharges from the site can occur if excessive water is applied resulting in runoff.
- Factors such as soil type, temperature, humidity, and wind velocity will impact the effectiveness of the dust control measures.
- Wind fences do not control sediment carried in storm water runoff. Install additional sediment and erosion control measures to capture sediment in runoff (see Section 9).

Standards and Specifications:

- Follow District Health Department standards and specifications when applying dust control measures at construction sites.
 - Wind fences are barriers made of small, evenly spaced wooden slats or fabric. They are erected to reduce wind velocity and to trap blowing sand.
 - Erect wind fences perpendicular to the prevailing wind source. Multiple fences may be erected to help prevent wind erosion. Software packages are available to assist with proper design.
 - Reduce disturbance of soil crust.
 - Other techniques used to control and minimize dust include the application of coarse gravel.
 - Magnesium chloride, resins, and lignin sulfonate may be used on roads where revegetation will not occur as these products inhibit plant establishment.
- Application
 - Moistening road surfaces is an effective dust control method for traffic routes.
 - This technique is short term and requires constant reapplication especially in windy areas.
 - Apply 0.03 - 0.3 gal/yd² uniformly to pre-wet the soil surface.
 - Apply 0.125 gal/yd² every 20-30 minutes.
 - Reactivate chemicals in dry climates by rewetting with 0.1 - 0.2 gal/yd².
 - Avoid ponding.
 - Use a pressure-type distributor or a pipeline equipped with a spray system to evenly distribute water for dust control.
 - Provide a positive means to shutoff distribution equipment.
 - Provide at least one water truck or hydroseeder to apply water or dust palliative to the construction site.
 - If non-potable water is used for dust control, all tanks, pipes, and other conveyances shall be clearly marked with "NON-POTABLE WATER – DO

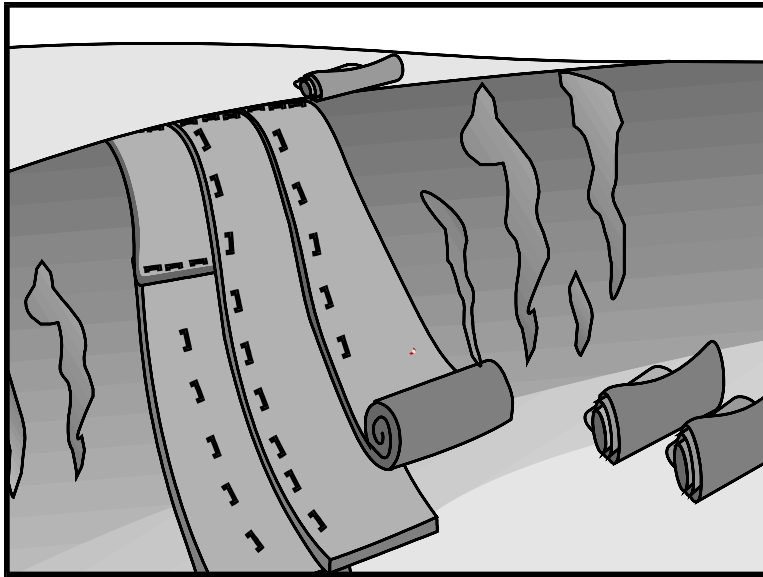
NOT DRINK". There shall be no connection between potable and non-potable water.

Inspection and Maintenance:

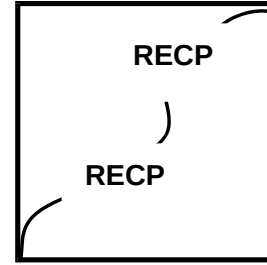
- Daily inspections shall occur for areas experiencing excessive winds, vehicle traffic, or rains. If dust is observed to be leaving the site, take corrective action.
- Inspect wind fences periodically for damage and repair as needed.

Rolled Erosion Control Products

EC-6



Graphics used with permission of Caltrans



Map Symbol

Purpose: To protect soils from wind and water and to stabilize disturbed soil areas through the installation of geotextiles, erosion control blankets, cellular confinement systems, or turf reinforcement mats.

Applications:

- Effective on steep slopes (3H:1V or greater) with high erosion potentials, slopes that are adjacent to streams or wetlands, on disturbed soils that are slow to establish vegetative cover, and on slopes where mulch must be anchored. Can also be applied in stream channels where flow velocities exceed 3.3 ft/sec.
- Biodegradable materials (straw, coconut, or a combination thereof) are preferred in arid climates.

Limitations:

- RECPs are not appropriate for sites that will be mowed or that have uneven surfaces that limit good soil contact.
- They cannot be installed where a key (anchor) trench cannot be excavated (e.g. excessive rock or vegetation)
- Erosion control blankets and geotextiles are rarely used as a temporary control measure.
- Erosion control blankets and geotextiles tend to be more expensive than other erosion control methods due labor costs and material expenses.
- Only use turf reinforcement mats (TRMs) with irrigation or where there is surface hydrology (e.g. wetlands) or groundwater adequate to support vegetation.
- Do not use plastic sheeting.

Standards and Specifications:

- Factors to consider when choosing an erosion control blanket include cost, effectiveness, longevity, dimensions, velocity, vegetation inhibition/enhancement, ease of installation, and operation and maintenance.
- Secure in place with biodegradable stakes. Steel wire staples are not as effective as wood stakes for most applications. They must be a minimum of 11 gauge.
- Overlap seams of blankets at least six (6) inches.
- Turf reinforcement mats are a three dimensional matrix of interwoven layers of polypropylene, nylon, and polyvinyl chloride netting. They allow for soil filling and retention as well as aid in the enhancement of vegetative root and stem development. They are inappropriate where hydrology is inadequate for vegetation establishment.
- Turf reinforcement mats are not biodegradable. They have high shear strengths, are resistant to ultraviolet light, and are inert to the chemicals in soils.
- Straw, coconut, straw/coconut, or Excelsior blankets are appropriate as erosion control blankets.
- Remove all rocks, and debris from the site before installing erosion control mats to allow for good soil contact.
- Generally apply seed under erosion control blankets.
- All stakes shall of adequate length for soil type and application.

Steps to install erosion control blankets on slopes:

- At the top of the slope, install a trench 6 inches deep by 6 inches wide to anchor the blanket and then backfill the trench.
- Install along flow line of slope and unroll the blanket (downslope).
- Overlap parallel rolls by at minimum six (6) inches and stake every 3 feet or as appropriate for site and blanket type.
- Keep the blankets in direct contact with the soil. Do not stretch them.

Rolled Erosion Control Products

EC-6

To anchor the blanket, install stakes (as recommended on page 8-15) or staples:

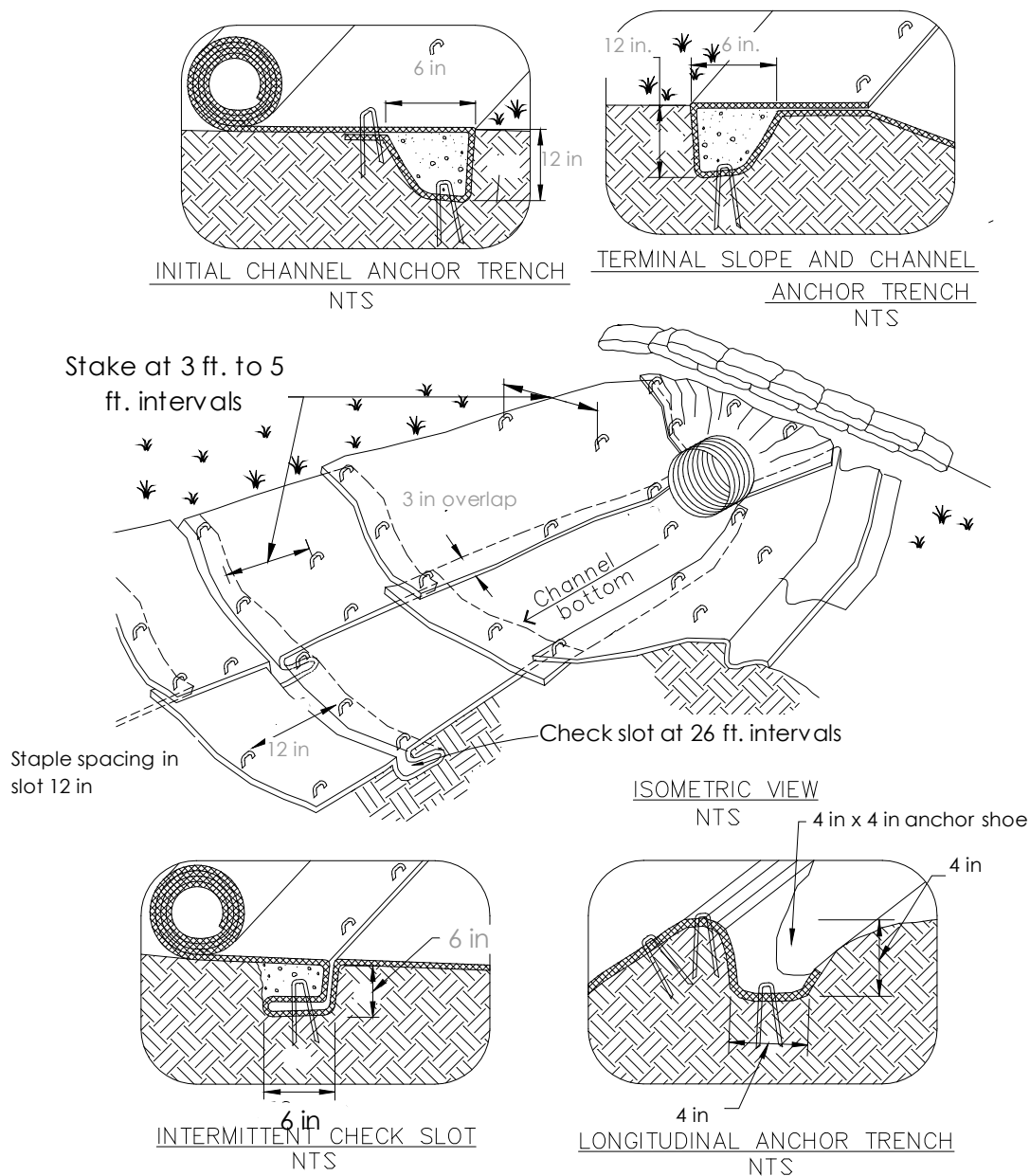
- Steep slopes (2H:1V and steeper) – minimum of 2 stakes /yd²
- Moderate slopes (2H:1V and flatter) – 1½ stakes /yd²
- Gentle slopes require a minimum of 1 stake /yd²

Steps to install erosion control blankets in channels:

- Anchor trench shall be a minimum of 12 inches deep and 6 inches wide across the channel at the top end of the project area.
- Backfill trench and compact.
- The precise installation method will vary with channel dimension, velocities, material etc. and may be parallel or perpendicular to the flow line.
- Make sure if perpendicular that installation begins at the end of the channel, and install in a shingle pattern with proper overlap up the channel with a key trench at the top of the installation.

Inspection and Maintenance:

- Inspect blankets after installation and periodically during construction activities.
- Inspect blankets and mats before and after significant storm events, for erosion and undermining.
- Repair damages and failures immediately.
- Repair the slope or channel before reinstalling blankets if washouts or degradation occur.



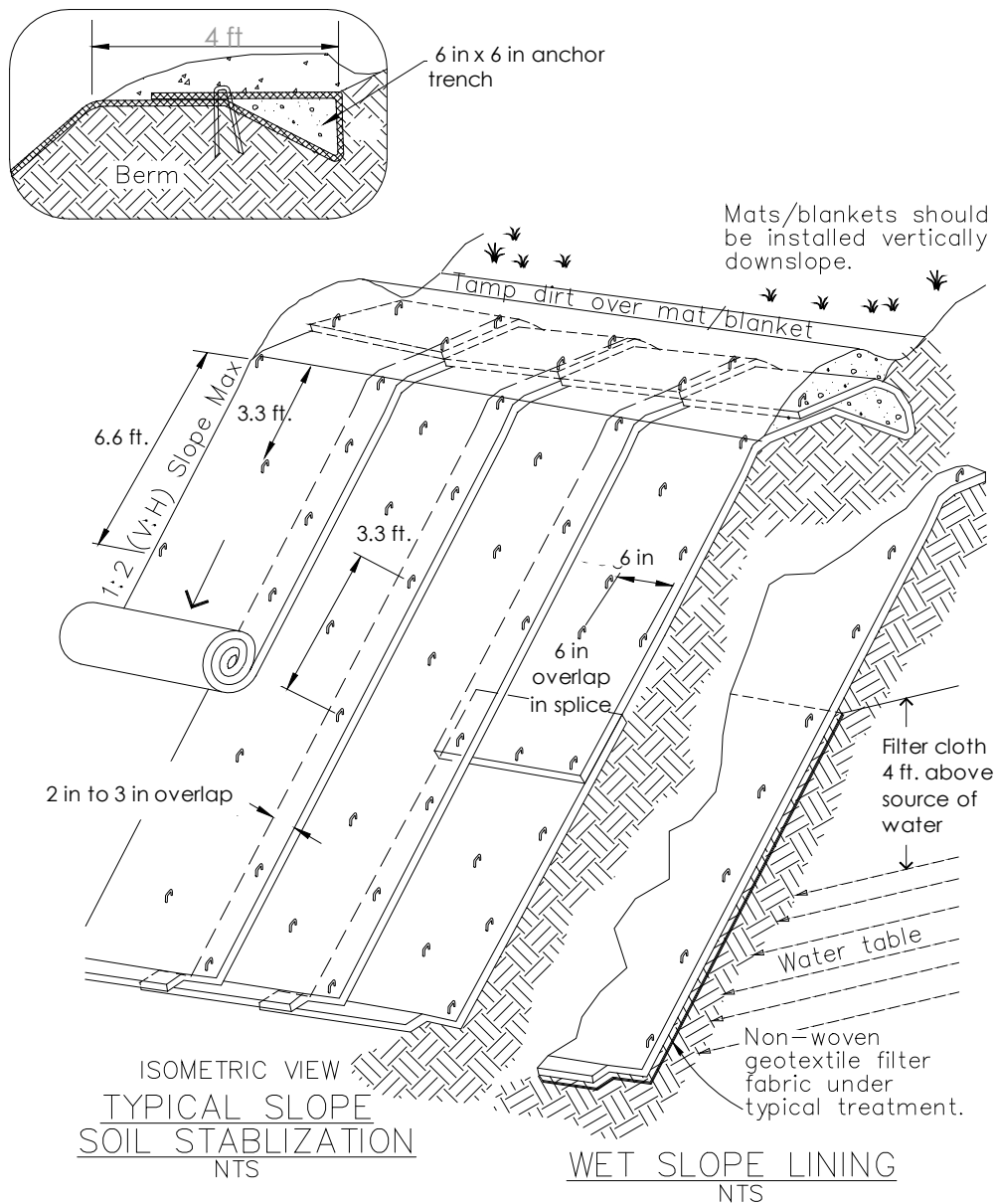
NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

Rolled Erosion Control Products

EC-6

Graphics used with permission of Caltrans.



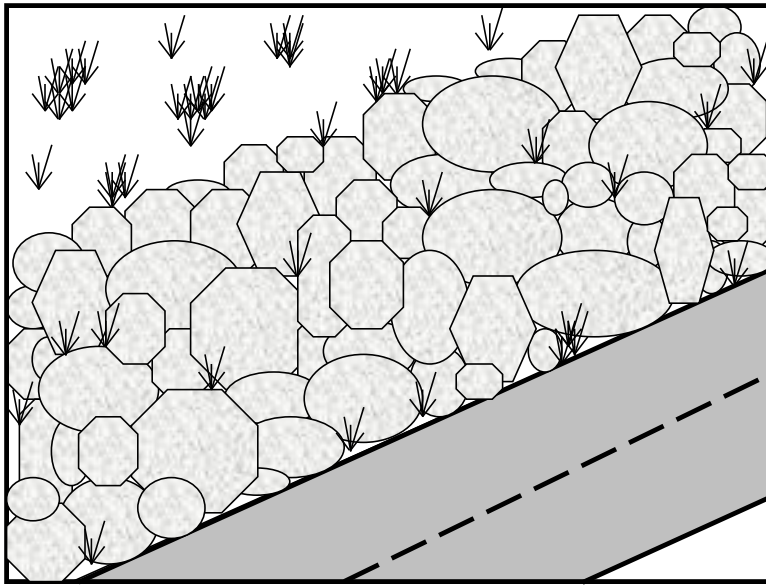
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

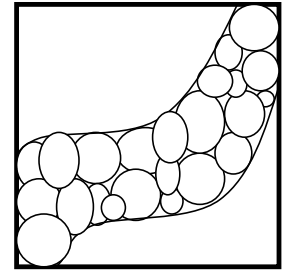
Rolled Erosion Control Products

EC-6

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Graphics produced by Kennedy/Jenks Consultants



Map Symbol

Purpose: To stabilize and protect soil from erosion.

Applications:

- Used on cut-and-fill slopes, channel side slopes, channel bottoms, inlets and outlets of culverts and slope drains, and streambanks.

Limitations:

- Riprap is not allowed for use as an erosion or sediment control on disturbed slopes within the City of Sparks.
- Implement measures to minimize erosion and excess turbidity in flowing streams during construction.

Standards and Specifications:

- Use a well-graded mixture of rock sizes depending on project objective(s) and site conditions.
- Use durable stone that won't quickly decompose from freeze/thaw cycles (i.e. granite).
- Construct riprap layers twice as deep as the maximum stone diameter.
- Consider use of filter cloth material or a layer of gravel as a filter between the riprap and the underlying soil surface in areas of high velocities.
- Extend riprap as high as the maximum flow depth in channels or streams (minimum of 4 feet) or to a height where vegetation will be satisfactory to control erosion.
- Use in conjunction with salvaged native material wherever feasible and appropriate (cut and fill slopes).
- On curves, extend riprap through the curve to five times the upstream and downstream curve endpoints.

Riprap

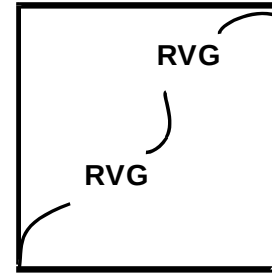
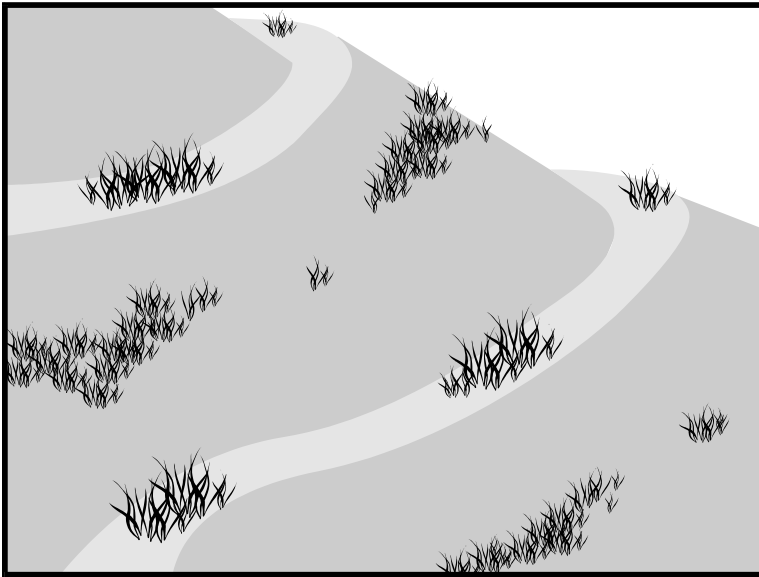
EC-7

Inspection and Maintenance:

- Inspect annually and after major storms.
- Repair and replace as needed.
- Keep channel clear of obstructions such as trees and sediment bars.

Revegetation

EC-8



Map Symbol

Graphics used with permission of Caltrans

Purpose: To permanently stabilize soils and slopes from raindrop impact and wind erosion, conserve soil moisture, decrease runoff, increase infiltration, and to provide wildlife habitat.

Applications:

- Can be applied on slopes, adjacent to waterways, along right-of-ways, as buffer strips and landscape corridors, on stream banks and in cut and fill areas.

Limitations:

- Irrigation during dry weather may be desirable for specific projects, but is generally not recommended.
- Additional erosion control methods may be required since 3-5 years is generally needed to establish adequate cover.
- Sod is almost always inappropriate for erosion control. Most species of commercially available sod require permanent irrigation.

Standards and Specifications:

- With the exception of frozen ground conditions, permanent revegetation must be seeded no later than 14 days after final grading, unless final grading takes place outside the seeding or planting window. In that case temporary erosion control is required until seeding can occur.
- Seeding in northern Nevada should take place between September 15 and February 15.

Revegetation

EC-8

- Consider climate, soils, and topography when choosing the appropriate vegetation and seed mixes for installation. Develop seed mixes based on site-specific conditions. Soil testing is recommended and should include soil biology.
- Hydroseeding is a cost effective method of applying seed mixes.
- Use a variety of seed species, including grasses, forbs, and shrubs, when the objective is to re-establish self-sustaining native and adapted species that do not require irrigation.
- All seeding rates must be based on Pure Live Seed ratios.
- In general, crested wheatgrass should not be the dominant species in the seed mix unless used in fire-prone areas in the urban interface.
- Increase revegetation success by roughening soils (EC-2) prior to seeding then applying mulch (EC-3) with a tackifier.
- Do not use fertilizers. Some soil amendments may be appropriate, especially where no topsoil is available (or for containerized plants).
- Consider use of soil inoculants in highly disturbed soils.
- Final stabilization requires that perennial vegetation cover consist of 70 percent of the native background cover, determined from a reference site or pre-project conditions.

Maintenance:

- Irrigation is discouraged, but may be desired for more rapid seed establishment. Drip irrigation is preferred for containerized plants.
- Examine seeded areas for failures. Amend, reseed, and mulch as necessary. Conduct soil testing to determine if soil inoculants or amendments are necessary.

Suggested Northern Nevada Seed for Revegetation

Botanical Name	Common Name/Variety	Comments
<i>Achillea millefolium</i>	Yarrow	Upland
<i>Achnatherum hymenoides</i>	Indian ricegrass	Upland
<i>Achnatherum speciosa</i>	Desert needlegrass	Upland
<i>Agropyron cristatum</i>	Crested wheatgrass, "Fairway", "Ephraim"	Upland
<i>Agropyron elongatum</i>	Tall wheatgrass	Wetland
<i>Agropyron X Triticum</i>	Sterile wheat hybrid, "Escort"	Upland (nurse crop)
<i>Agropyron fragile ssp. sibericum</i>	Siberian wheatgrass "P-27"	Upland
<i>Artemisia tridentata ssp vaseyana</i>	Mountain big sagebrush	Upland

Revegetation

EC-8

Botanical Name	Common Name/Variety	Comments
<i>Artemisia tridentata</i> ssp <i>tridentata</i>	Big sagebrush	Riparian
<i>Artemisia tridentata</i> ssp <i>wyomingensis</i>	Wyoming sagebrush	Upland
<i>Atriplex canescens</i>	Four-wing saltbrush	Upland (salt affected)
<i>Atriplex confertifolia</i>	Shadscale	Upland (salt affected)
<i>Atriplex lentiformis</i>	Quail bush	Upland (salt affected)
<i>Chrysothamnus nauseosus</i>	Rabbitbrush	Upland
<i>Chrysothamnus viscidiflorus</i>	Sticky rabbitbrush	Upland
<i>Cleome lutea</i>	Beeplant	Upland
<i>Distichlis stricta</i>	Inland saltgrass	Wetland (salt affected)
<i>Elymus cinereus</i>	Great Basin wildrye,	Upland
<i>Elymus elymoides</i>	Squirreltail	Upland
<i>Elymus lanceolatus</i>	Streambank or thickspike wheatgrass	Upland, Wetland
<i>Elymus trachycaulus</i>	Slender wheatgrass	Upland
<i>Ephedra viridis</i>	Mormon tea	Upland
<i>Eriogonum umbellatum</i>	Sulphur flower	Upland
<i>Eriogonum wrightii</i>	Wright's buckwheat	Upland
<i>Festuca longifolia</i>	Hard fescue	Upland
<i>Festuca ovina</i>	Sheep fesc	Upland
<i>Gaillardia aristata</i>	Indian blanket flower	Upland (irrigated)
<i>Grayia spinosa</i>	Spiny hopsage	Upland (salt affected)
<i>Gutierrezia sarothrae</i>	Snakeweed	Upland
<i>Helianthus annuus</i>	Sunflower	Upland
<i>Kochia prostrata</i>	Prostrate summer cypress	Upland
<i>Kraschenekovia lanata</i>	Winterfat	Upland
<i>Leymus triticoides</i>	Creeping wildrye,	Wetland
<i>Linum lewisii</i>	Lewis flax,	Upland
<i>Lolium multiflorum</i>	Annual ryegrass	Upland
<i>Lupinus argenteus</i>	Silverleaf lupine	Upland
<i>Penstemon palmeri</i>	Palmer penstemon	Upland
<i>Poa secunda</i>	Sandberg bluegrass	Upland
<i>Prunus andersonii</i>	Desert peach	Upland
<i>Psuedoroegneria spicata</i>	Bluebunch wheatgrass	Upland
<i>Puccinellia lemmonii</i>	Alkali grass	Wetland (salt affected)
<i>Purshia tridentata</i>	Antelope bitterbrush	Upland

Revegetation

EC-8

Botanical Name	Common Name/Variety	Comments
<i>Sarcobatus vermiculatus</i>	Greasewood	Wetland (salt affected)
<i>Sphaeralcea species</i>	Globemallow	Upland
<i>Sporobolus airoides</i>	Sand dropseed	Upland
<i>Sporobolus cryptandrus</i>	Alkali sacaton	Wetland (salt affected)

*All seeding rates must be based on Pure Live Seed

Source: Western Botanical Services, Inc.

Note: Recipes are based on site soil conditions in the Truckee Meadows are provided in Appendix E.

Section 9: Sediment Control Best Management Practices

This section presents the temporary measures that can be used to control sediment transport and reduce or eliminate sediment discharges offsite and into receiving waters.

- Linear sediment control BMPs such as Fiber Rolls (SC-1), Brush and Rock Filters (SC-2), Sand & Gravel Bag Barriers (SC-3), Gravel Filter Berms (SC-4) and Silt Fences (SC-5) do not control erosion, but can reduce erosion by reducing flow velocities and diverting flows away from erodible soils. They are intended to intercept and slow or detain storm water runoff and allow sediment to settle and be trapped.
- Temporary Sediment Traps (SC-6) and Sediment Retention Basins (SC-7) also capture and detain runoff and allow sediment to settle.
- Other sediment control BMPs such as Construction Site Entrances and Exits (SC-8), Construction Exit Tire Washes (SC-9) and Stabilized Construction Roadways (SC-10) function to minimize the amount of sediment tracked offsite by construction vehicles.

Slope length and inclination are the two most important factors controlling erosion rates. Fiber rolls and silt fences can be used to break up slope length. Fiber rolls are very flexible BMPs and can be applied along the top, face and toe of mild to steep exposed and erodible slopes to shorten slope length and spread runoff as sheet flow. Silt fences must not be placed at the top of slopes or across moderate to steep slopes with inclinations of 4H:1V or greater.

Other linear sediment control BMPs such as brush and rock filters, sand & gravel bag barriers, and gravel filter berms must be placed below the toe of slopes, and not across the face of slopes. These BMPs, as well as fiber rolls, silt fences, temporary sediment traps, and sediment retention basins must be maintained at regular intervals and the trapped sediment removed before the BMP capacity has been reduced by 50 percent or more. For example, the sediment impounded behind a silt fence must be removed and properly disposed of before it reaches ½ the height of the silt fence. The sediment removed must be placed where it won't wash into the storm drain system or waterways.

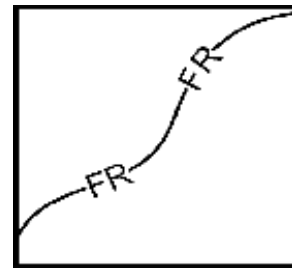
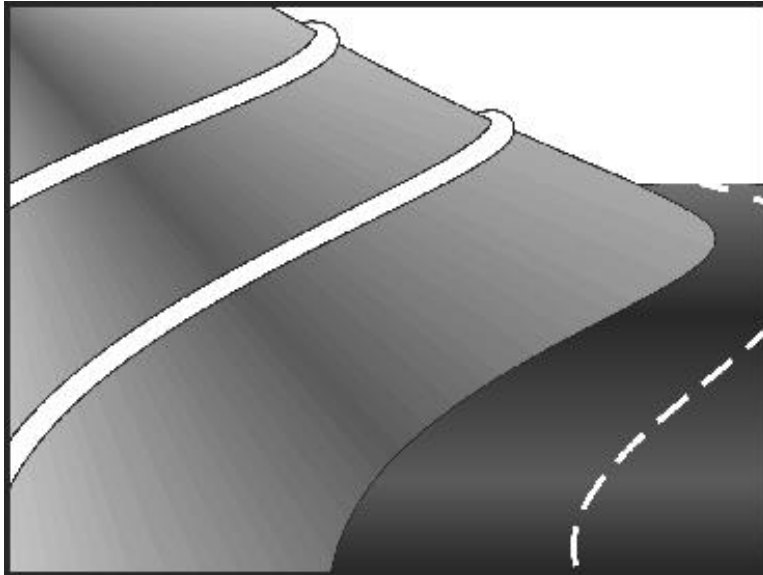
Synthetic Sediment Control Rolls (SC-11) have similar applications to fiber rolls. However, **synthetic sediment control rolls are temporary BMPs that must be removed once site stabilization is achieved.** Whereas fiber rolls and compost filter berms and socks are generally biodegradable and can be left in place to assist with permanent site erosion and sediment control.

Table 9-1: Sediment Control Best Management Practices

BMP#	BMP Name	Temporary	Permanent
SC-1	Fiber Rolls	T	P
SC-2	Brush and Rock Filters	T	
SC-3	Sand & Gravel Bag Barriers	T	
SC-4	Gravel Filter Berm	T	
SC-5	Silt Fences	T	
SC-6	Temporary Sediment Traps	T	
SC-7	Sediment Retention Basins	T	P
SC-8	Construction Site Entrances and Exits	T	
SC-9	Construction Exit Tire Wash	T	
SC-10	Stabilized Construction Roadway	T	
SC-11	Synthetic Sediment Control Rolls	T	

Fiber Rolls

SC-1



Map Symbol

Graphics used with permission of Caltrans

Purpose: Fiber rolls allow water to pass through while decreasing runoff velocity, increasing infiltration rates, and trapping sediment. Also known as sediment logs or straw wattles, they can provide temporary or permanent controls and biodegrade if made with biodegradable materials (non-plastic netting).

Applications:

- Along the top and face of slopes to reduce the slope length and to spread runoff as sheet flow.
- At grade breaks where slopes transition from shallow to steep.
- As check dams in drainage swales where flows will not exceed 1 cfs.
- Along streambanks.
- If properly anchored or weighted, to protect storm drain inlets.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along the perimeter of a project.

Limitations:

- Proper siting and installation are critical to ensure effectiveness and to prevent exacerbated erosion and/or blockage of storm drain systems.
- Not to be used where surface flows are anticipated to exceed 1 cfs.
- Fiber rolls can be transported by high flows if not properly anchored.

- Do not use fiber rolls on slopes subject to creep, slumping of landslides. (geologic instability)
- Fiber rolls are difficult to move or remove when saturated.

Standards and Specifications:

- Fiber rolls consist of straw, aspen shavings (excelsior) or coconut fiber (coir), contained in tubular nets or tubes composed of burlap fabric.
- When placed along the face of slopes, spacing between rows of fiber rolls is determined by slope inclination and slope length (see table below).

Slope Steepness	Fiber Roll Spacing
2H:1V or steeper	10 feet or less
4H:1V to 2H:1V	15 feet or less
4H:1V or flatter	20 feet or less

- On slopes create a concave trench 30 percent of roll width on contour. Place the excavated soil on the uphill side of the roll during installation.
- Remove debris and stones from the trench before installing fiber rolls.
- Lay the fiber roll into the trench and stake through the middle of the roll , stake it on both sides of the roll at the ends, and continue to stake every 4 feet (7 stake per 25 ft. roll).
- Stakes shall have a minimum dimension of ¾ inch X ¾ inch X 24 inches.
- Install stakes through the middle of the roll, averaging at most 4 feet. on center.
- If more than one fiber roll is placed in a row, overlap the end sections. Do not leave gaps between the end sections.

Inspection and Maintenance:

- Repair and/or replace torn, split, unraveling, or slumping fiber rolls.
- Inspect fiber rolls before and after storm events. Check fiber rolls daily during prolonged rainfall events.
- Re-trench and stake down fiber rolls that are undercut by rills or gullies.
- Remove accumulated sediment when it reaches three quarters (3/4) of the barrier height unless vegetation has established, properly dispose of collected sediment or move to a vegetated area or other place at the site where it will not wash into storm drains, ditches, channels, or streams.
- Fiber rolls **should not be** removed if part of the permanent erosion control and site stabilization. If non-biodegradable and are a temporary BMP, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to match the adjacent surface. Seed and mulch, or otherwise stabilize, the regarded area where the fiber rolls were removed (apply seed during fall or winter months).

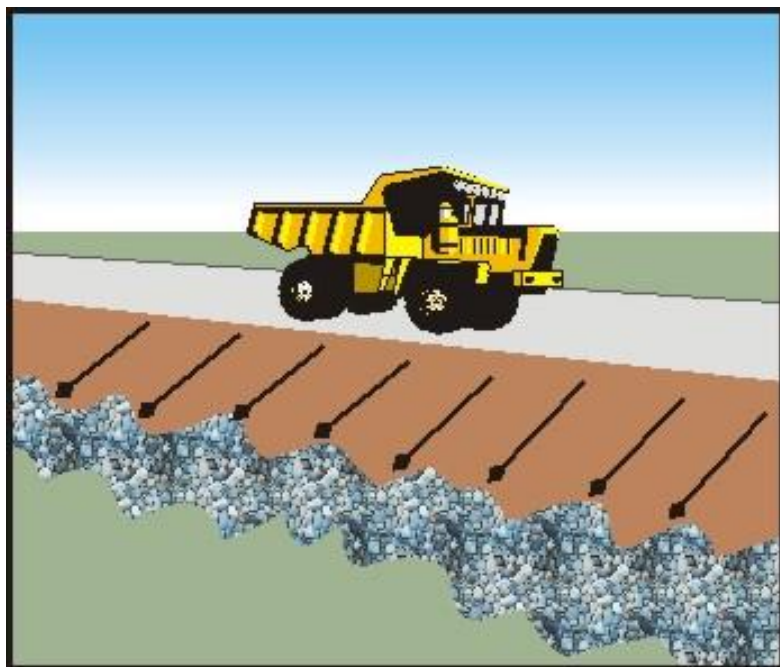
SC-1



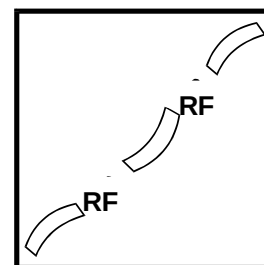
Truckee Meadows Regional Storm Water Quality Management Program
Construction Site Best Management Practices Handbook, February 2015 Update
Section 9 – Sediment Control BMPs

Brush and Rock Filters

SC-2



Graphics produced by Kennedy/Jenks Consultants



Map Symbol

Purpose: Runoff filters are used to temporarily detain and filter runoff, retain sediment on construction sites, and slowly release water as sheet flow to a stabilized or undisturbed area.

Applications:

- Along the border of disturbed areas, particularly linear projects.
- Contributing drainage areas of less than 5 acres.
- At the toe of slopes that are prone to sheet flow and rill erosion.
- Can be re graded for permanent erosion control.
- Rock filters encased in steel wire enclosures are also known as gabions.

Limitations:

- Not appropriate where drainage areas are greater than 5 acres.
- Sufficient space is needed for water to pond behind the erosion control structure.
- Rock filters are not effective for diverting runoff.
- Not appropriate for high-velocity flow areas.

Standards and Specifications:

- The maximum flow through rate for a rock berm is 60 gpm/ft².
- The minimum height of a rock berm is 18 inches from the ground surface.

Brush and Rock Filters

SC-2

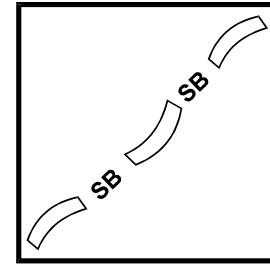
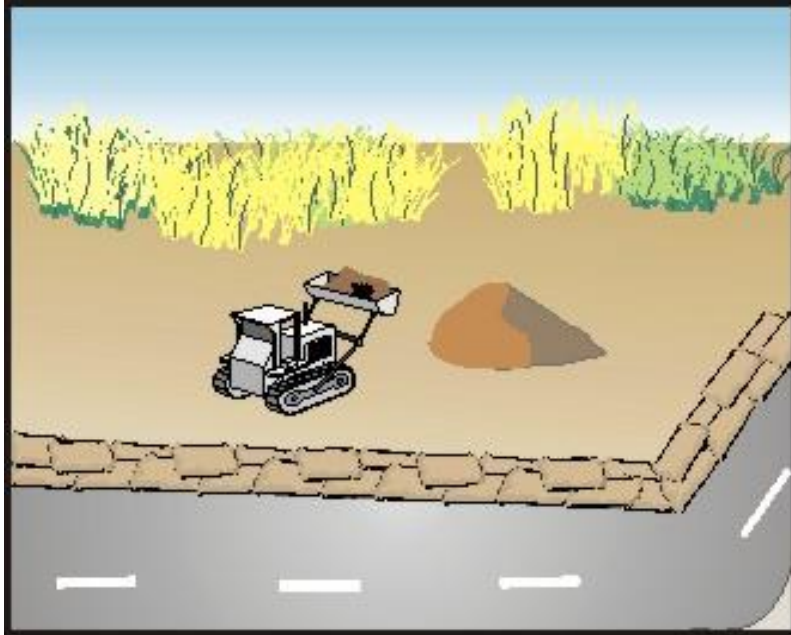
- The minimum top width of a rock berm is 2 feet.
- The maximum steepness of rock berm side slopes is 2H:1V.
- Entrench rock berms a minimum of 3-4 inches into the ground.
- Use a 3 to 5 inch diameter graded rock in the construction of rock berms.
- For gabions use a minimum of 20 gauge galvanized woven wire sheath with a maximum opening of 1 inch.
- Install brush and rock filters along level contours.

Inspection and Maintenance:

- Inspect before and after each significant storm event and weekly during the wet season.
- Replace lost or dislodged rocks, brush, or filter fabric as needed.
- Remove sediment when the depth equals one-third the berm height.
- From May through October, do not allow water to pond behind brush and rock filters for more than 48 hours.
- Re-grade filter barriers upon the completion of construction activities.

Sand & Gravel Bag Barriers

SC-3



Map Symbol

Graphics produced by Kennedy/Jenks Consultants

Purpose: To detain sediment laden runoff from disturbed areas and to allow settling of sediment prior to release to storm drains, streams or other watercourses.

Applications:

Sand Bags and Gravel Bags

- Along the perimeter of a site.
- Parallel to roadways to keep sediments off pavement.
- Near the toe or at the top of slopes.
- Around stockpiled materials.
- To create a sediment basin.
- To capture and detain non-storm water discharges.

Sand Bags only

- To divert flows from storm drains, channels or watercourses.

Gravel Bags only

- To protect storm drain inlets and filter sediment from storm water.

Limitations:

- Upstream drainage areas are limited to 5 acres or less.
- Degraded sand and gravel bags may rupture and are difficult to remove.
- Berm heights are limited to 18 inches or less.
- Installation can be labor intensive.
- Do not use gravel bag barriers to detain concentrated flows.

Standards and Specifications:

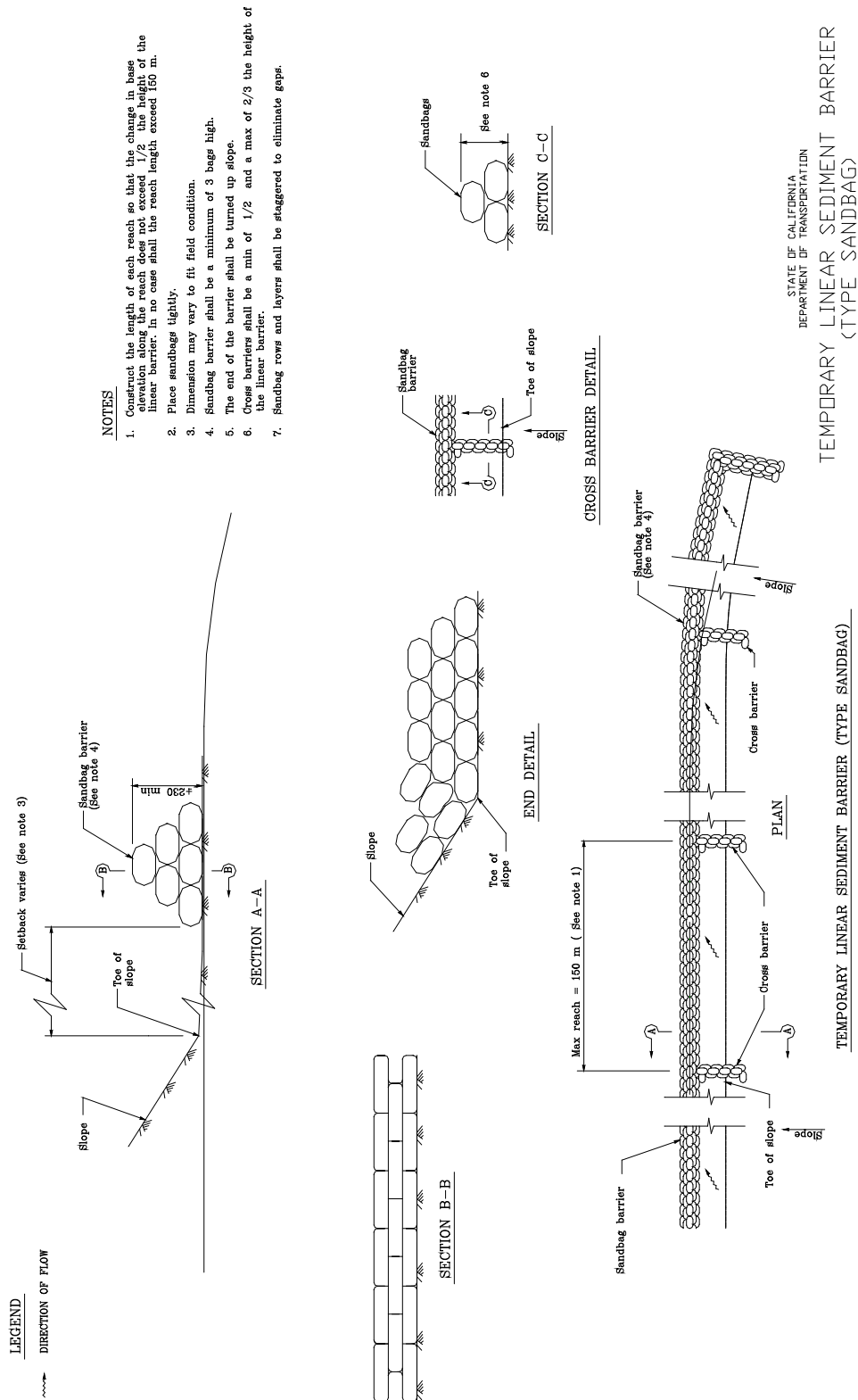
- Sand bags and gravel bags shall be constructed of woven polypropylene, polyethylene or polyamide fabric. Minimum fabric weight is 4 ounces per square yard and the mullen burst strength shall exceed 300 psi. The materials shall conform to ASTM D3786 and have ultraviolet stability in excess of 70 percent according to ASTM D4355. Burlap is not acceptable.
- Sand bags and gravel bag size shall be 18 inches x 12 inches x 6 inches.
- Fill materials shall be non-cohesive, free from clay or other deleterious materials and conform to 200.05.04 of the Standard Specifications for Public Works Construction (e.g. the "Orange Book").
- Install bags a minimum of 3 feet from the toe of the slope or from the top of the bank to allow access of construction machinery.
- Stagger bags so ends overlap.
- Biodegradable sandbags are preferred.

Inspection and Maintenance:

- Inspect before and after each rain event and weekly during the wet season.
- Reshape barrier or replace bags as needed.
- Repair any washouts or other damage caused by construction.
- Remove silt when the depth reaches one-third the barrier height.
- Remove silt and dispose of so as not to cause siltation problems.
- Prevent water from flowing around the ends of the barrier.
- From May through October, do not allow water to pond behind gravel bag barriers for more than 7 days.
- Remove bags at the end of the construction period or when the site has been stabilized.

Sand & Gravel Bag Barriers

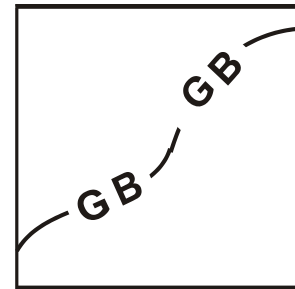
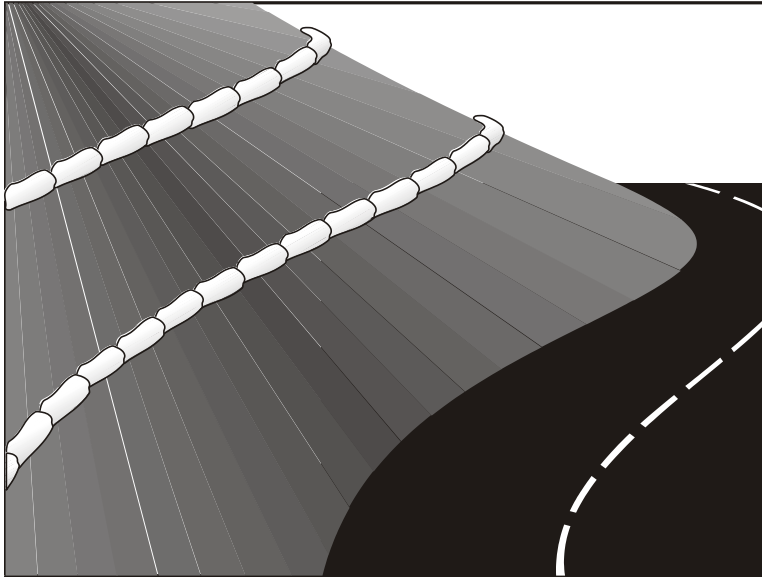
SC-3



Graphic used with permission by Caltrans.

Gravel Filter Berm

SC-4



Map Symbol

Graphics used with permission of Caltrans

Purpose: To detain sediment laden runoff from disturbed areas and to allow settling of sediment prior to release to storm drains, streams or other watercourses.

Applications:

- Across slopes.
- Near the toe of slopes.
- To act as temporary check dams across construction roads or other unpaved roads when not in use.
- Around the base of stockpiled materials.

Limitations:

- Upstream drainage area limited to 5 acres or less.
- Difficult to clean up when applied to landscaped areas.
- Gravel bags will be damaged by vehicles if not moved.

Gravel Filter Berm

SC-4

Standards and Specifications:

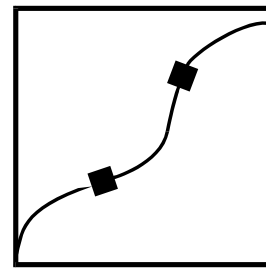
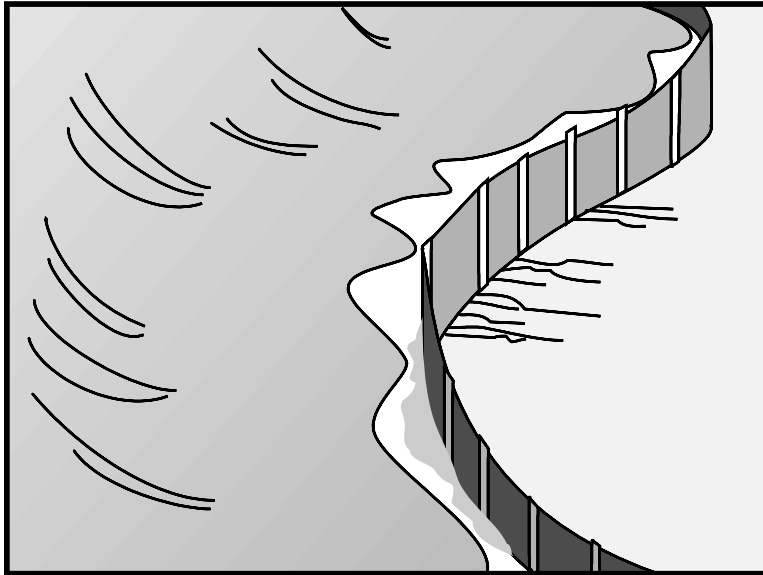
- Rock gradation: $\frac{3}{4}$ inch to 3 inch open graded when used for sheet flow, 3 to 5 inch open graded for concentrated flows.
- Use 1 inch, galvanized hexagonal woven wire mesh constructed from 20 gage wire to anchor gravel in concentrated flows.
- Provide multiple berms in series every 300 feet on slopes less than percent, every 200 feet on slopes 5-10 percent, and every 100 feet on slopes greater than 10 percent.
- Non-traffic areas: Maximum flow rate per square foot through the berm is 60 gpm/ft², maximum height is 18 inches, top width is 24 inches, side slopes of 2H:1V or flatter.
- Traffic areas: Maximum height is 12 inches.

Inspection and Maintenance:

- Inspect monthly and after each rain event. Reshape or replace as needed.
- Repair any washouts or other damage caused by construction.
- Remove silt when the depth reaches one-third the berm height.
- Remove silt and dispose of to avoid siltation problems.
- Prevent flows around the ends of the barrier.
- From May through October, do not allow water to pond behind gravel filter berms for more than 7 days.
- Remove berms at the end of construction or when the site is stabilized or spread /rake on to site it appropriate for permanent erosion control.

Silt Fences

SC-5



Map Symbol

Graphics used with permission of Caltrans

Purpose: To slow and detain sediment laden sheet flow from disturbed areas, which allows the settlement of sediment and reduces or prevents sediment from discharging to storm drains, streams or other watercourses.

Applications:

- Along the construction site perimeter.
- Below the toe of slopes.
- Along streambanks and channels.
- Around temporary stockpiles.

Limitations:

- Not effective unless properly installed.
- Do not use on slopes greater than 4H:1V.
- Labor-intensive maintenance may be required.
- Fencing must be removed and disposed of properly upon completion of construction.
- The key trench must be stabilized following removal.
- Often unnecessary where other methods are less intrusive.

Standards and Specifications:

- Do not install silt fences across streams, channels, or in any location where flows may be concentrated.
- Fencing must be located where waters may temporarily pond and sediments can be deposited.
- Application in environmentally sensitive areas requires additional practices.
- Install the fencing along a level contour at the toe of a slope.
- Install fencing a minimum of 3 feet from the toe of the slope or at the top of the bank.
- Limit drainage area upstream of fence to 0.25 acre per 100 feet of fence.
- Limit the length of the slope area draining to any point along the silt fence to 100 feet or less.
- Maximum length of any single run of fencing is 500 feet.
- Angle the last 8 feet of fence upslope in a “J” or “L” shape to allow for ponding.
- Silt fence material shall be woven nylon reinforced polypropylene with a built in top cord running along the top of the fabric.
- Biodegradable fences may be appropriate.
- Minimum requirements of fabric are: tensile strength (ASTM D4632) of 90 lbs, puncture rating (ASTM D4833) of 60 lbs, and mullen burst rating (ASTM D3786) of 280 psi.
- Fence posts shall be free from decay, splits, or cracks, have a minimum thickness of 2 inches, and a minimum length of 4 feet.
- Fence posts shall be installed a minimum distance of 12 inches into the ground, and have a maximum spacing of 8 feet.
- Steel fence posts may also be used.
- Areas prone to high winds will require closer spacing of fence posts.
- Fence posts shall be located on the downstream side of the fabric and mesh.
- Fabric must be stapled or wired to the posts.
- Locate a 6 inch X 6 inch trench on the upstream side of the fence. Overlap at least 6 inches of fabric into the trench. Key in the bottom of the fence as shown in Detail A. Fill the trench with tamped native soil or washed gravel.

- Silt fence fabric sizing:
 - If less than 50 percent of the soil by weight will pass through a U.S. Standard Sieve no. 200, select the equivalent opening size (EOS) to retain 85 percent of the soil. The EOS shall not be finer than U.S. Standard Sieve no. 70.
 - For all other soils, the EOS shall not be finer than U.S. Standard Sieve no. 70, except where discharge to streams or wetlands occurs. In that case, the EOS shall not be larger than U.S. Standard Sieve no. 100.
 - If 85 percent of the soil by weight is finer than U.S. Standard Sieve no. 200, then filter fabric shall not be used.

Inspection and Maintenance:

- Inspect before and after each rain event.
- Repair any damage caused by construction (undercutting of the fence, split, torn, and weathered fabrics, or slumping of the fence).
- Fabrics may have to be replaced every 5-8 months.
- Remove silt when the depth of the deposit reaches one-third the fence height.
- Remove silt and dispose of to avoid siltation problems.
- From May through October, do not allow water to pond behind silt fences for more than 7 days.
- Remove fencing at the completion of the construction project or when the site has been stabilized.
- Backfill any holes or depressions caused by the removal of the silt fence according to standard specifications.

TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SILT FENCE)

NOT TO SCALE

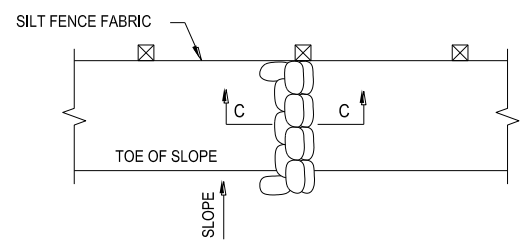
(ADAPTED FROM CALTRANS)

NOTES

1. CONSTRUCT THE LENGTH OF EACH REACH ALONG CONTOURS 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 FEET.
2. THE LAST 8 FEET OF FENCE SHALL BE TURNED UP SLOPE.
3. STAKE DIMENSIONS ARE NOMINAL. STEEL STAKES ARE ALSO ACCEPTABLE.
4. STAKES SHALL BE SPACED AT 8 FEET MAXIMUM INTERVALS AND SHALL BE POSITIONED ON DOWNSTREAM SIDE OF FENCE.
5. STAKES TO OVERLAP AND FENCE FABRIC TO FOLD AROUND EACH STAKE ONE FULL TURN. SECURE FABRIC TO STAKE WITH AT LEAST 4 STAPLES.
6. 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.
7. FOR END STAKE, FENCE FABRIC SHALL BE FOLDED AROUND TWO STAKES ONE FULL TURN AND SECURED WITH AT LEAST 4 STAPLES.
8. MINIMUM 4 STAPLES PER STAKE. DIMENSIONS SHOWN ARE TYPICAL.
9. CROSS BARRIERS SHALL BE A MINIMUM OF 1/3 AND A MAXIMUM OF 1/2 THE HEIGHT OF THE LINEAR BARRIER.
10. MAINTENANCE OPENINGS SHALL BE CONSTRUCTED IN A MANNER TO ENSURE SEDIMENT REMAINS BEHIND SILT FENCE.
11. JOINING SECTIONS SHALL NOT BE PLACED AT SUMP LOCATIONS.
12. SANDBAG ROWS AND LAYERS SHALL BE OFFSET TO ELIMINATE GAPS.

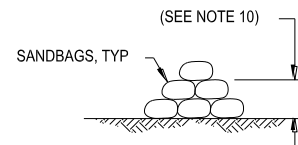
LEGEND

-  TAMPED BACKFILL
-  SLOPE DIRECTION
-  DIRECTION OF FLOW

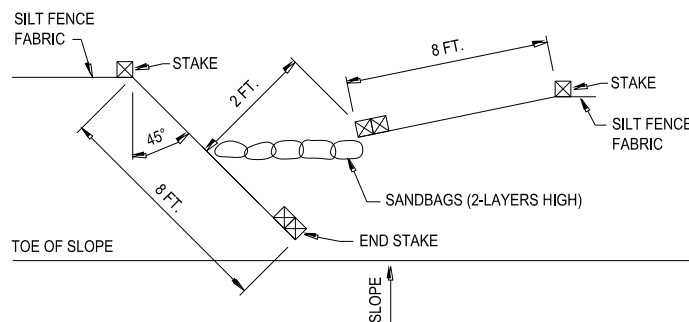


CROSS BARRIER DETAIL

(SEE NOTE 10)



SECTION C-C

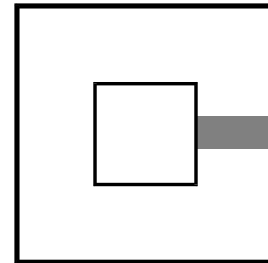
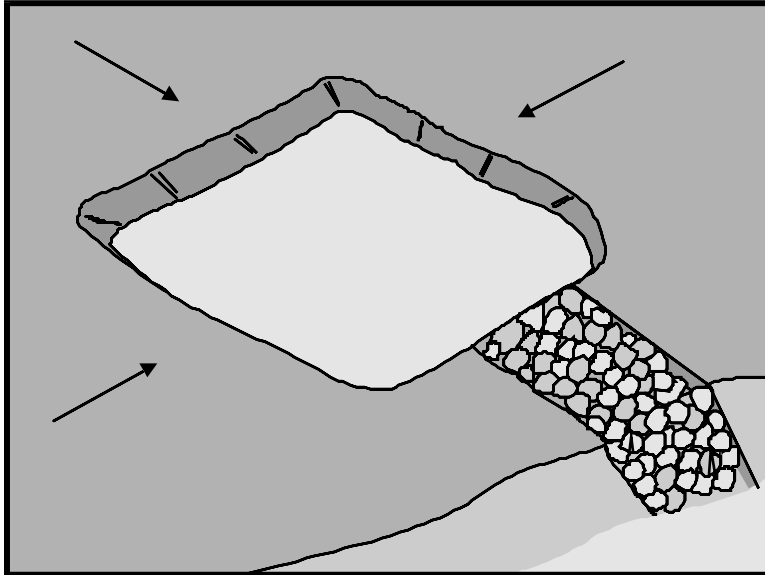


OPTIONAL MAINTENANCE OPENING DETAIL

(SEE NOTE 10)

Temporary Sediment Traps

SC-6



Map Symbol

Graphics used with permission of Caltrans

Purpose: To reduce sediment loading to the storm drain system by slowing concentrated runoff and allowing sediments to settle out of suspension.

Applications:

- Applies to drainage areas of 1 acre or less.
- In locations where sediment laden storm water might enter the municipal storm drain system.
- Implemented on a project-by-project basis.

Limitations:

- May require a large surface area. Size may be limited because of site constraints.
- This BMP may create a mosquito/midge habitat if water ponds longer than 48 hours from May through October.
- Traps and removes medium to large sized particles, may not remove fine-grained sediments.
- Area may be attractive and dangerous to small children and may require fencing.
- Not to be located in live streams or dry channels.
- Multiple traps are needed for large sites over 1 acre.
- Requires regular maintenance to remove sediment.

Temporary Sediment Traps

SC-6

Standards and Specifications:

- Construct the sediment trap prior to grading or stripping the site. Do not install the sediment trap in wet or muddy weather.
- Locate the trap at a low point where failure will not cause property damage, extensive erosion or loss of life.
- Fence the area to prevent unauthorized entry.
- Maintain an access for machinery.
- Clear and strip vegetation under embankments, structures and sediment traps.
- Design sediment trap with an approximate storage capacity for the 2-year, 24-hour storm, or 3,600 cubic feet per acre of total drainage area.
- The maximum height of an embankment shall be 5 feet from the original ground surface. Embankments shall be composed of engineered fill compacted to a minimum of 90 percent relative density (ASTM D1557). Side slopes shall not exceed 3H:1V.
- The maximum depth of sediment in the trap is 1 foot or one-third the trap volume.
- Size the outlet to allow passage of the 2-year, 24-hour storm peak flow. The outlet shall be stabilized with crushed rock or gabions to prevent erosion.
- Locate the spillway 1.5 feet or more below the top of the dike.

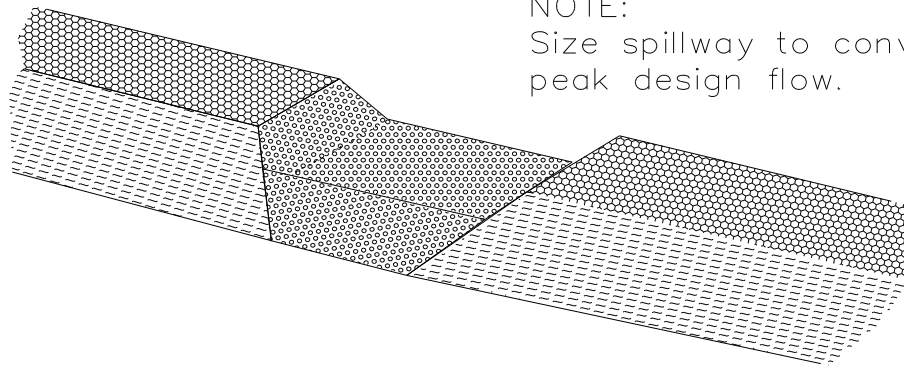
Inspection and Maintenance:

- Inspect before and after each rain event. Daily inspections are necessary during extended and intense storms.
- Repair any damages caused by construction or erosion.
- Inspect banks of the sediment trap for seepage or damage.
- Remove silts when the depths of the sediment deposits reach one-third the trap volume. Dispose of silt properly, out of the drainage path.
- Check outlet structure and spillway for damage or obstructions. Repair as needed.
- From May through October, do not allow water to pond in sediment traps for more than 7 days.
- Fill in temporary sediment basins when construction activities have ceased and final site stabilization has been established.

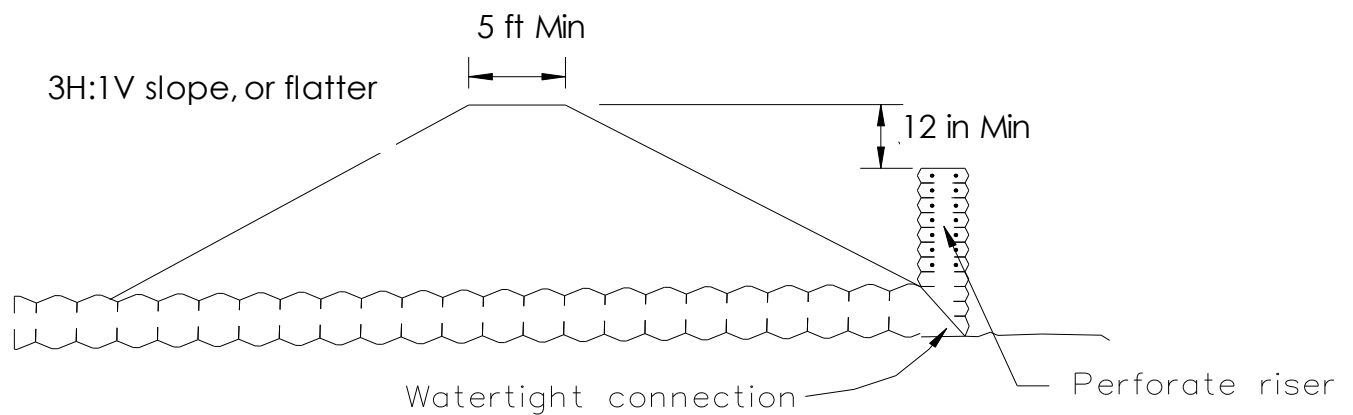
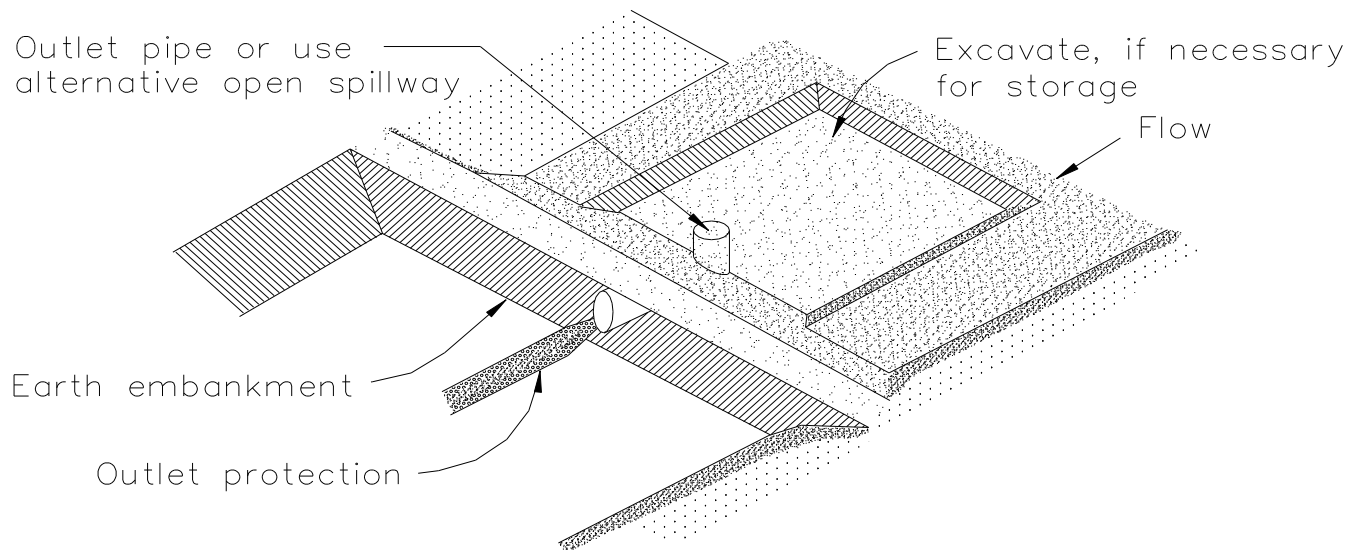
Temporary Sediment Traps

SC-6

NOTE:
Size spillway to convey
peak design flow.



TYPICAL OPEN SPILLWAY



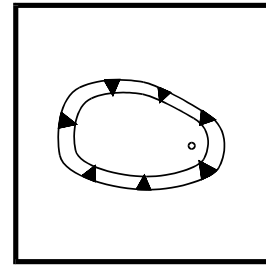
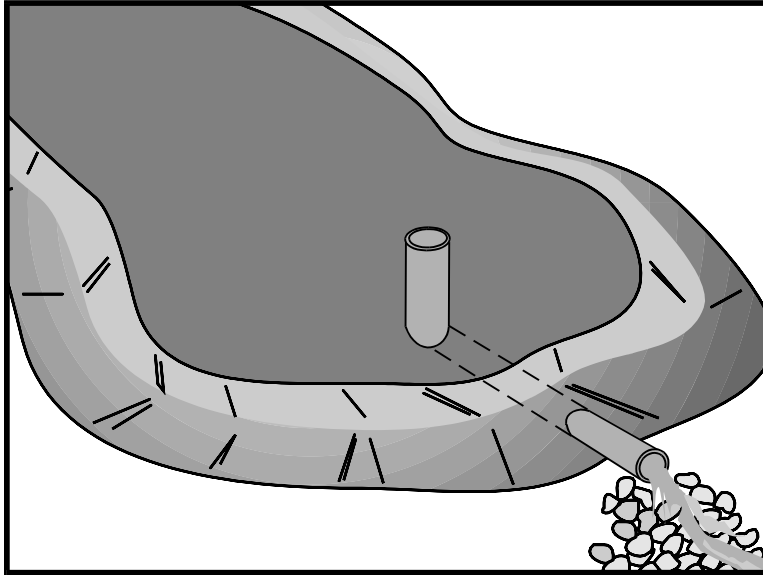
EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Graphic used with permission of Caltrans.

Sediment Retention Basins

SC-7



Map Symbol

Graphics used with permission of Caltrans

Purpose: To detain sediment-laden flows and allow for settling of suspended sediments prior to discharge to storm drains, streams or other watercourses. These devices can be constructed as temporary controls that will be abandoned prior to the completion of site development or as permanent flood control and storm water quality enhancement structures.

Applications:

- Construction sites with disturbed areas during the wet season.
- At outlets of disturbed areas of 1 to 20 acres.
- Reduces the potential of sediment-laden storm water from entering streams, watercourses or the municipal storm drain systems.
- Intended for surface water only. Unless permitted otherwise, do not discharge groundwater from dewatering operations into sediment a retention basin.

Limitations:

- Must be designed by a Nevada Registered Professional Engineer.
- Must use in conjunction with other methods to limit sediment.
- For temporary basins, maximum drainage area is 20 acres.
- Requires a large surface area to construct. Size may be limited because of site constraints.
- Site can be attractive and dangerous to small children and may require fencing

- Not to be located in live streams or dry channels.
- From May through October, may pose a mosquito/midge problem if water pools longer than 48 hours.
- Multiple basins may be needed for large sites over 20 acres.
- Requires regular maintenance to remove accumulated sediments.

Standards and Specifications:

- Permanent sediment retention basins shall be designed to local design standards.
- A Nevada Registered Professional Engineer must design and stamp all sediment retention basin plans.
- Design and construct basin prior to grading or stripping the site.
- The size of the basin can be reduced by limiting the contributing area to only runoff from the disturbed soil areas if temporary controls are used to divert runoff from upstream undisturbed or stabilized areas away from the drainage area of the sediment retention basin.
- Construct basin prior to the onset of the rainy/wet season.
- Locate the trap at a low point where failure will not cause property damage, extensive erosion or loss of life.
- Maintain an access for maintenance and equipment vehicles.
- Clear and strip vegetation from areas where embankments, structures and sediment traps will be installed.
- Capacity of temporary sediment retention basins shall be designed to detain at a minimum, the calculated volume of runoff from the 2-year, 24-hour storm or 3,600 cubic feet of storage per acre of drainage area.
- See Section 5.4 regarding sizing permanent sediment retention basins.
- Use a forebay located upstream of the basin to trap larger particles and dissipate the energy of incoming flows.
- Outlet shall consist of a perforated riser pipe with perforations extending to ground level such that the basin completely drains over time.
- Design the perforations in the outlet to provide a minimum 24-hour drain time. Drain times up to 72 hours will increase sediment removal efficiencies.
- Locate the inlet and outlet to maximize the travel time. The length of the basin shall be more than twice the width of the basin. The length shall be determined by measuring the distance between the inlet and the outlet. If this ratio cannot be met, silt fence baffles can be added to increase the flow length.
- Each basin must have an emergency overflow spillway designed to local drainage design standards.

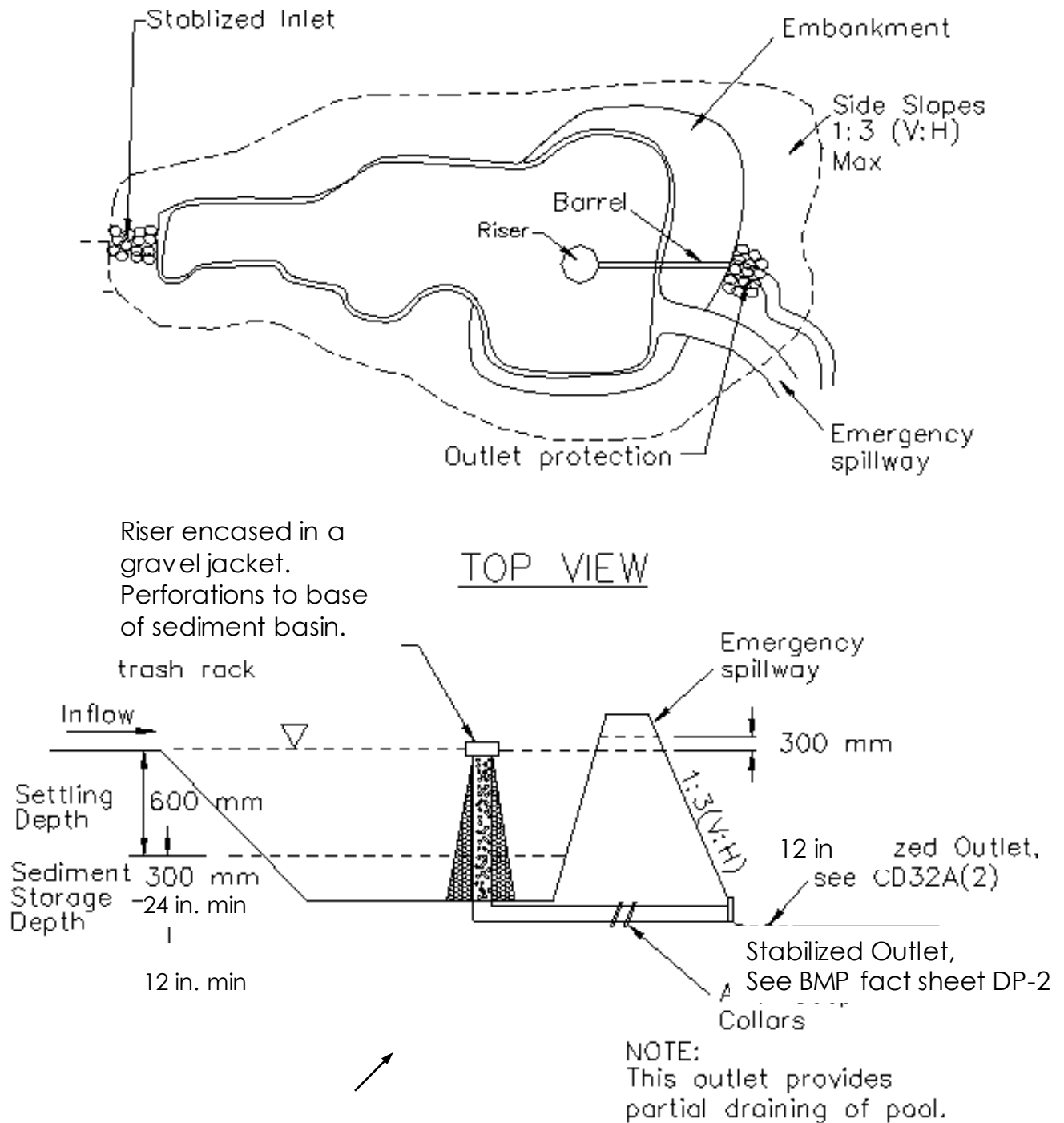
- Protect outlets, inlets and spillways with non-erodible riprap.
- Above grade embankments shall be composed of compacted fill designed to local drainage design standards. Side slopes shall not be steeper than 3H:1V.
- Fence the area to prevent unauthorized entry where necessary.
- Remove sediments when the thickness of the deposit is 1 foot or one-third the basin volume or becomes vegetated.
- If intended to also provide post-construction storm water treatment, design per the standards presented in the latest version of the Truckee Meadows Structural Controls Design & LID Manual.

Inspection and Maintenance:

- Inspect before and after each rain event and weekly during the wet season.
- Perform daily inspections during an extended precipitation event.
- Inspect banks for seepage or damage.
- Repair any damages caused by construction or erosion.
- Check outlet structure and spillway for damages or obstructions. Repair as needed.
- Monitor inlet and outlet to determine effectiveness. Make corrections to the basin if it is not performing properly.
- Remove silt when the depth reaches one-third the basin volume and becomes vegetated.
- Remove silt and dispose of to avoid siltation problems.
- Fill in temporary basins once construction activities are complete and final stabilization has been established.
- From May through October, do not allow water to pond in sediment retention basins for more than 48 hours.

Sediment Retention Basins

SC-7



TYPICAL TEMPORARY SEDIMENT BASIN – OUTLET #1
NOT TO SCALE

Sediment Retention Basins

SC-7

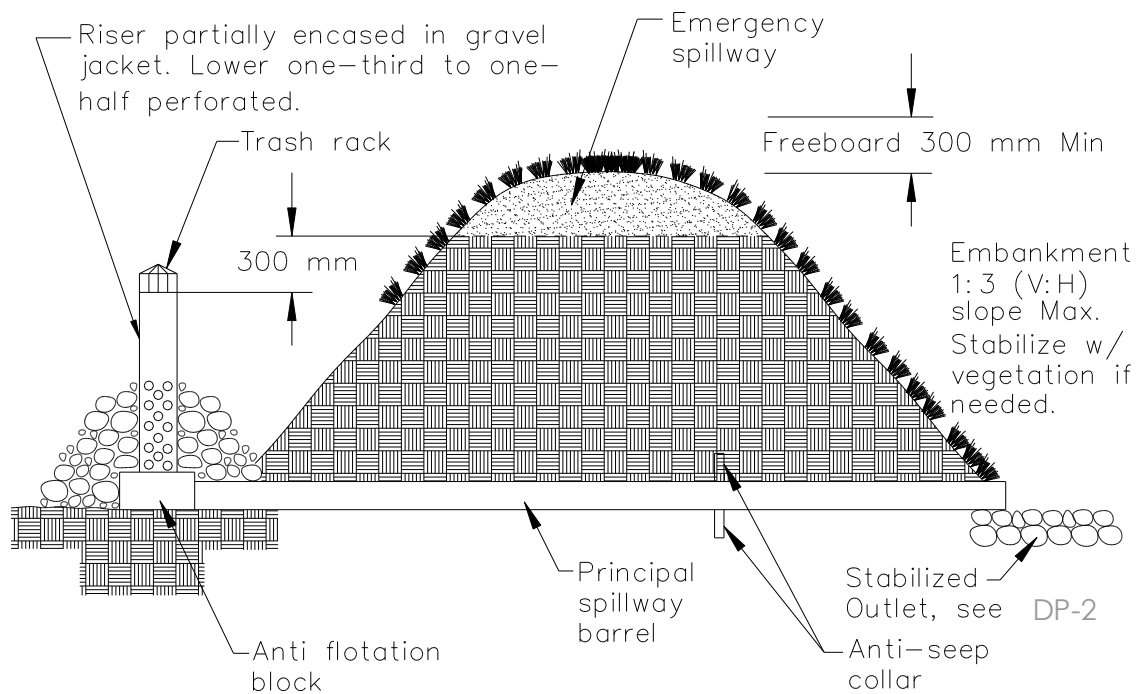
Graphic used with permission of Caltrans.

12 in

Freeboard 12 in Min

Sediment Retention Basins

SC-7

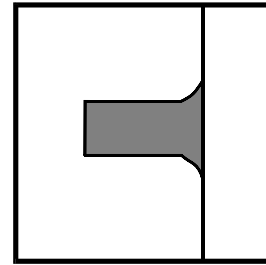
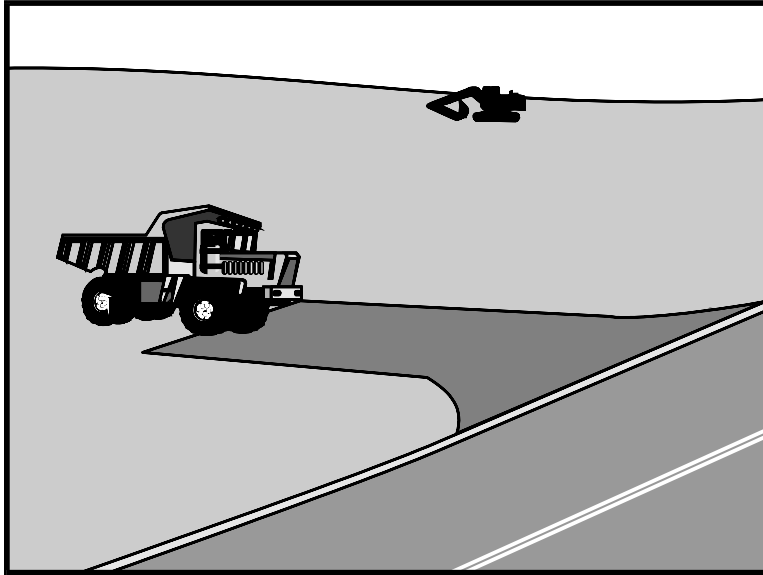


NOTE:
This outlet provides
complete draining of pool.

TYPICAL TEMPORARY SEDIMENT BASIN – OUTLET #2
NOT TO SCALE

Graphic used with permission of Caltrans.

Construction Site Entrances & Exits SC-8



Map Symbol

Graphics used with permission of Caltrans

Purpose: To limit the tracking of mud and dirt onto public roads by construction vehicles and to limit the spread of air borne dust.

Applications:

- On construction sites where tracking dirt onto public roads is a potential problem.
- Outlets from disturbed areas.
- Near water crossings.
- Where soil conditions may cause sediments to adhere to vehicle tires.
- To control dust in trafficked areas.
- Most effective when used in conjunction with wash stations.

Limitations:

- Site conditions and layout will determine the design.
- Can be expensive to install and maintain.

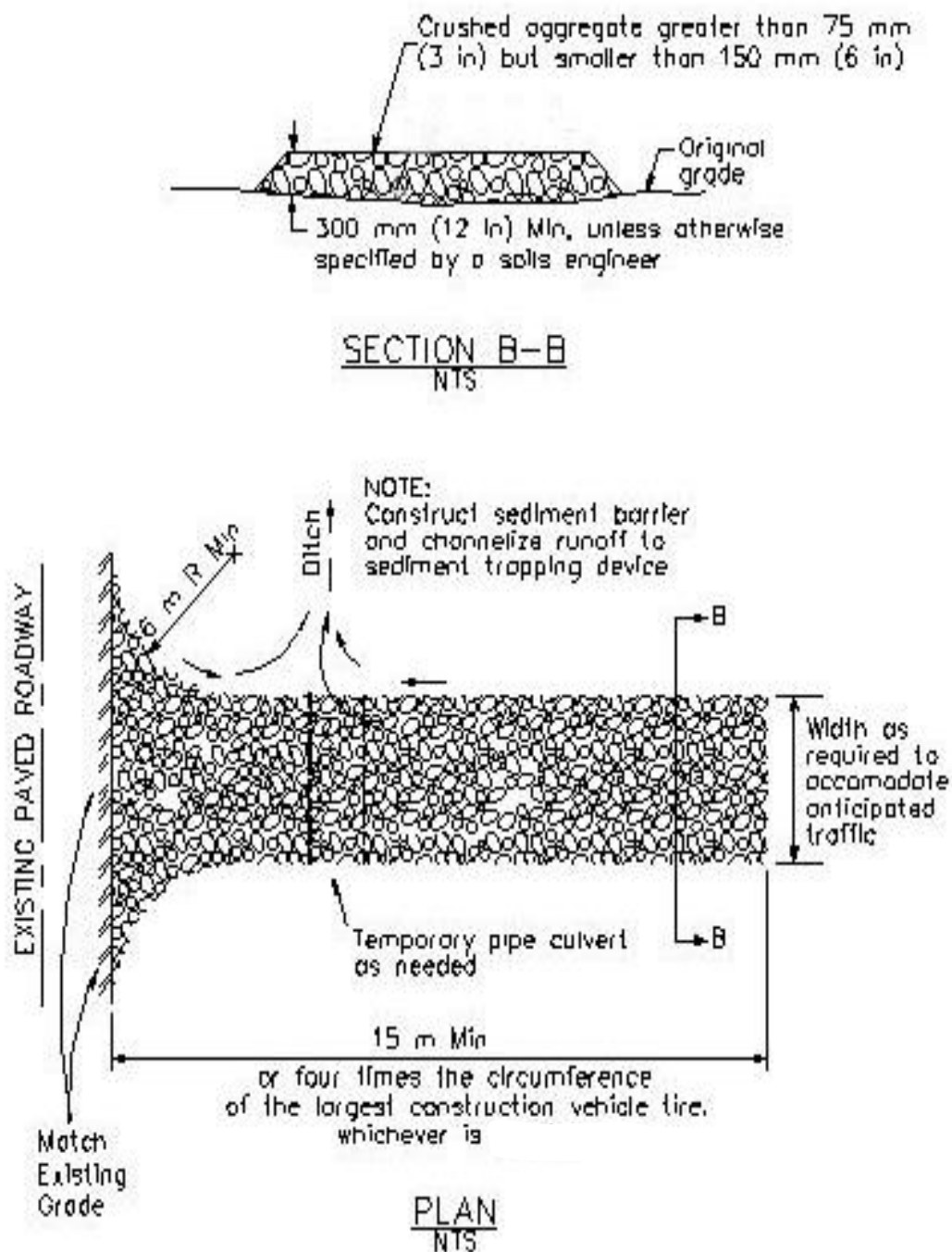
Standards and Specifications:

- Follow all applicable District Health dust control standards.
- Grade the exits and entrances to prevent runoff from leaving the site.
- Include sediment traps in the design of stabilized entrances and exits. Maintain the sediment traps so that there is enough space for the sediment to settle out.

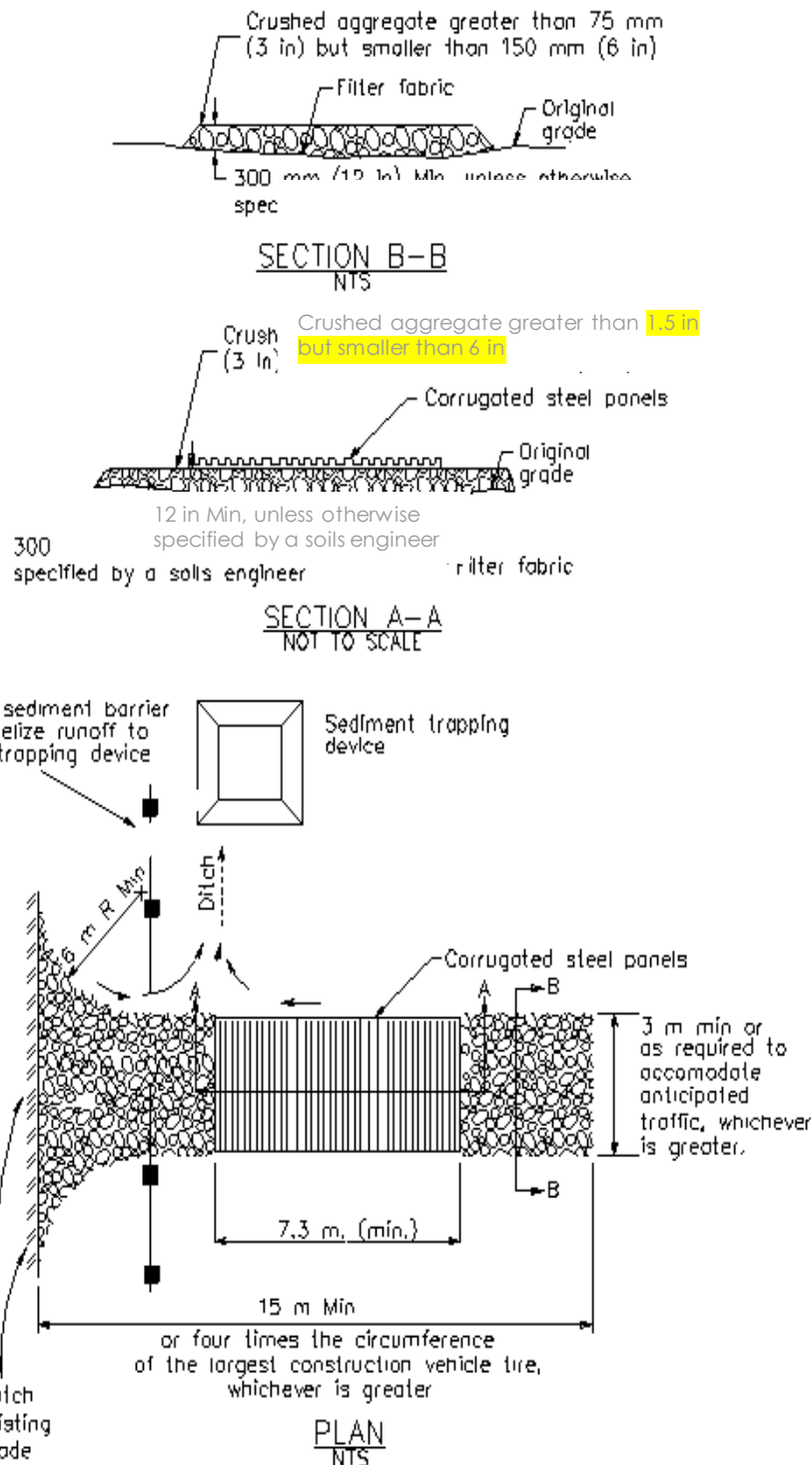
- Design entrances and exits for the heaviest vehicle using the site.
- Entrance and exits can be constructed of aggregate concrete or asphaltic concrete based on-site conditions and longevity.
- The construction site access shall be constructed of 3-6 inch washed, well-graded gravels or crushed rock. A minimum thickness of 12 inches shall be applied. However, the type of material and total depth of the aggregate should be determined by a soils engineer.
- Do not use geotextiles as linings.
- Minimum entrance or exit length is 50 feet.
- Minimum entrance or exit width is 10 feet.
- Provide turning radiuses where entrances or exits intersect a public way.
- Provide stop signs or other warning signs prior to leaving the site.

Inspection and Maintenance:

- Perform routine inspections and repair as needed.
- Require all vehicle traffic to enter and exit at these locations only.
- Service sediment traps regularly.
- Sediments deposited on paved roadways shall be removed daily and disposed of properly.
- All temporary roadway ditches shall be kept clear of sediment and debris and graded to prevent ponding.
- Fence must be installed at edges of BMP to prevent trucks driving around the BMP, and kept in close proximity to BMP at all times.



Graphic used with permission of Caltrans.



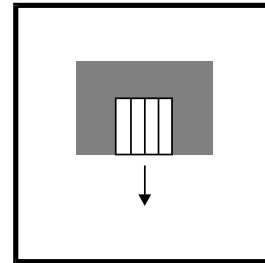
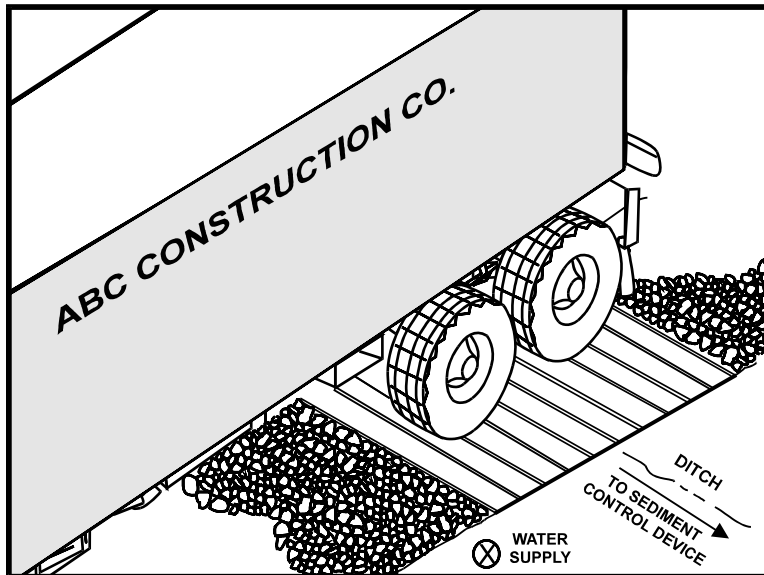
Graphic used with permission of Caltrans.

12 in Min, unless otherwise
specified by a soils engineer

10 ft min or as
required to
accommodate
anticipated
traffic, whichever
is greater.

Construction Exit Tire Wash

SC-9



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize the tracking of mud and dirt onto hard surfaced public roads by construction vehicle tires.

Applications:

- On construction sites where tracking onto public roads is a problem.

Limitations:

- Requires a source of wash water for the tire bath or pressure washing.
- Requires a double width entrance/exit to allow entering vehicles to avoid passing through the tire wash area.

Standards and Specifications:

- Use with a stabilized entrance/exit and sediment trap.
- Construct the tire wash on a level pad of coarse (3-6 inch) aggregate.
- Design, construct and manufacture the system for anticipated traffic loads.
- Minimize the depth of water in the sump to prevent damage to truck hubs and trailer tongues (12-14 inches).
- The slope of the sump shall be between 6-12 inches over a 10 foot width to allow sediments to flow to the low side and to prevent re-suspension of the sediments.

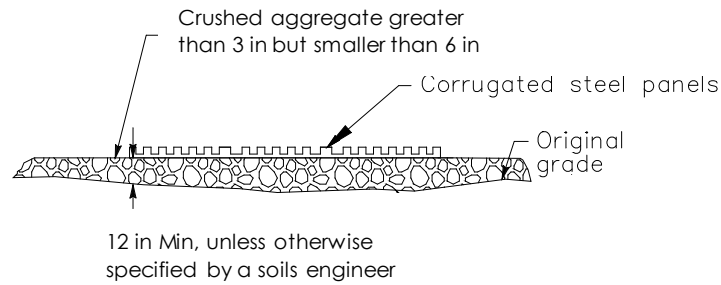
Inspection and Maintenance:

- Provide a drainage ditch to carry runoff from the wash area to a sediment sump device.
- When pressure washing is applied on-site, a grate over a sump may be used.
- Perform regular inspections to ensure that sediments are not tracked off site and that the wash area is functioning properly.
- Repair the tire wash as needed.
- Remove sediment accumulations from the wash rack or sediment sump.
- Collect waste or wash water generated onsite and treat or dispose of properly (do not discharge into the storm drain system).

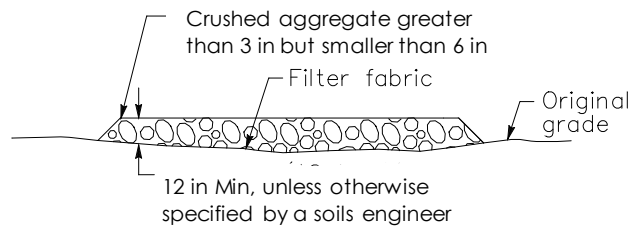
Construction Exit Tire Wash

SC-9

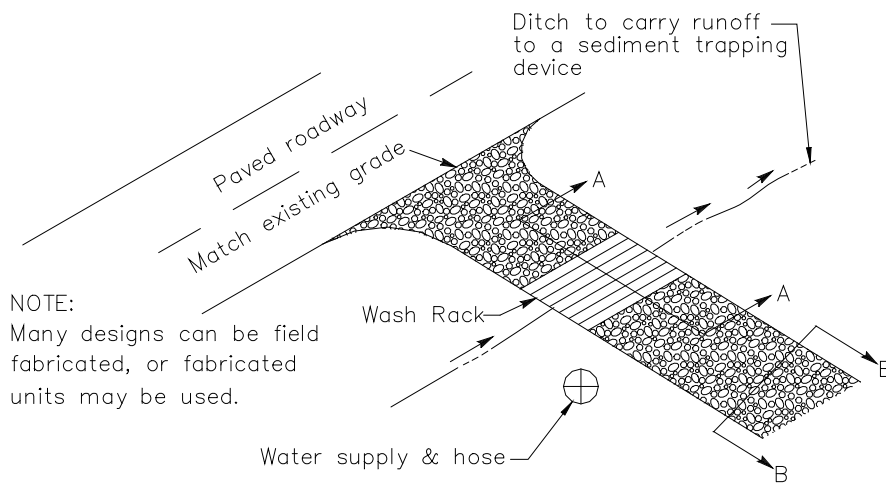
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SECTION A-A
NOT TO SCALE

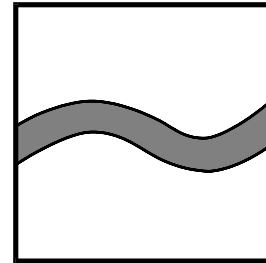
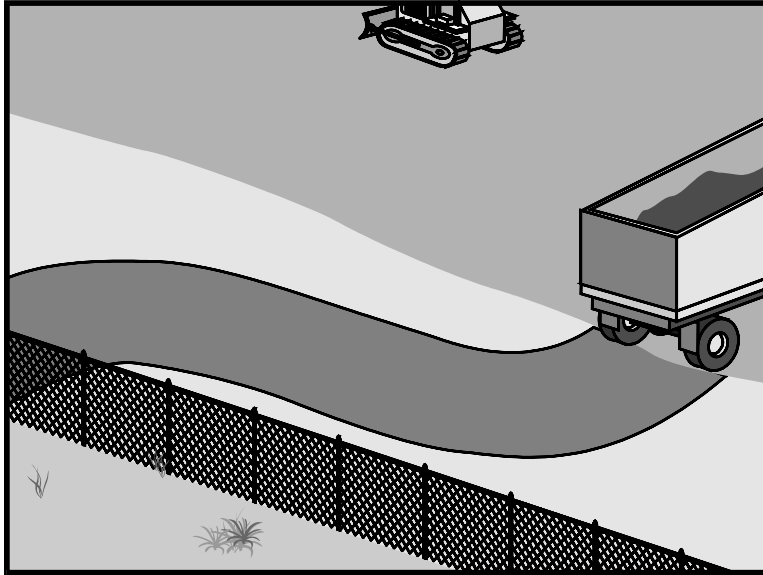


SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE

Stabilized Construction Roadway SC-10



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize erosion and to reduce the amount of sediment transported off site from construction sites.

Applications:

- Construction sites or short-term detour roads.
- Adjacent to water bodies.
- Where dust or mud tracking is a potential problem due to vehicular traffic.
- Parking areas for construction vehicles.

Limitations:

- Site conditions and layout will determine the design.
- May not apply to short term or small sites.
- Conform to applicable dust control BMP.
- Remove materials prior to final grading and site stabilization.

Standards and Specifications:

- Grade roads so that water will drain to the sediment traps and follow the contour of the natural terrain.
- Maximum roadway grade is 12 percent.
- Design for heaviest anticipated traffic loads.

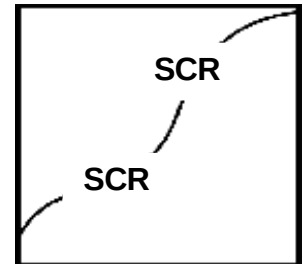
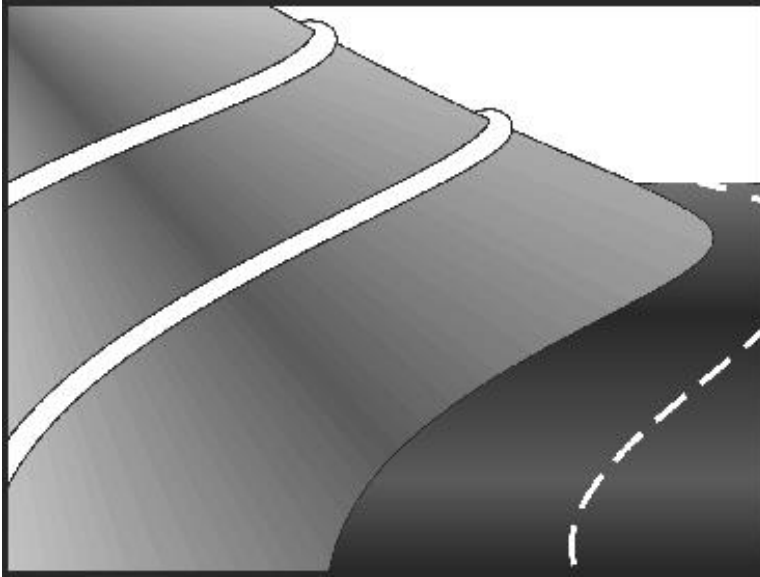
Stabilized Construction Roadway SC-10

- Stabilize roadways with either concrete, asphaltic concrete or aggregate depending upon purpose and site conditions.

Inspection and Maintenance:

- Perform weekly inspections and complete repairs as needed.
- Require all vehicle traffic to use stabilized roads.
- Keep all temporary roadway ditches clear of sediments, debris and wastes.
- Remove at end of construction and regrade and repair slopes.

Synthetic Sediment Control Rolls SC-11



Map Symbol

Graphics used with permission of Caltrans

Purpose: Synthetic Sediment Control Rolls (SCRs) trap detached sediments and allow runoff to filter through the device. SCRs are reusable and constructed of overlapping layers of perforated polymeric sheets in hollow tubular assemblies. SCRs include location flaps and connecting sleeves and one or more filter sheets can be inserted into the SCRs to provide additional sediment filtration. **These rolls MUST be removed after construction site activities are completed and prior to the NOT.**

Applications:

- As check dams in drainage swales.
- If properly anchored, to protect storm drain inlets.
- Around temporary stockpiles.
- Along the perimeter of a project.

Limitations:

- Do not use SCRs on slopes as a permanent installation. Soil disturbance typically occurs during removal of SCRs.

Standards and Specifications:

- Configure SCRs from at least 95% Recyclable HDPE (#2) by weight and should be UV stabilized.

Synthetic Sediment Control Rolls

SC-11

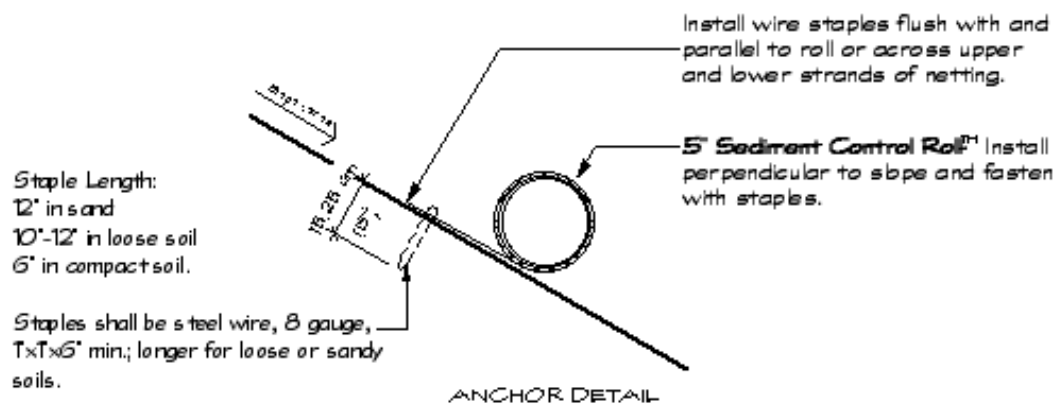
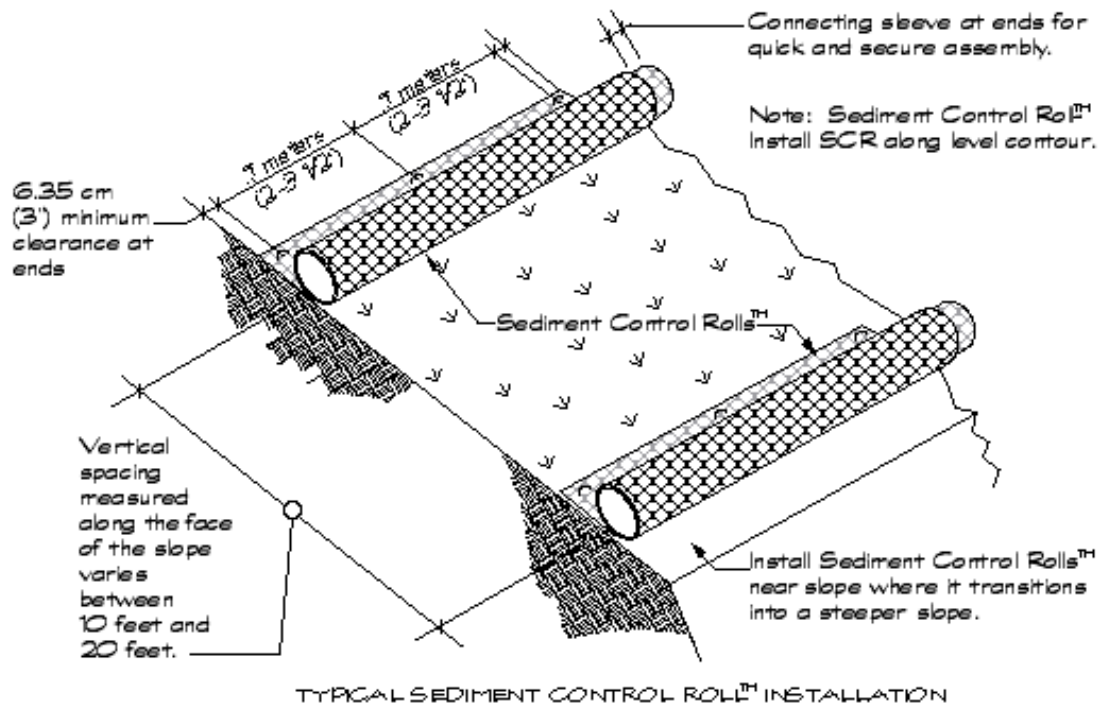
- Materials used in the manufacture of SCRs should be chemically resistant to acids and bases, hydrocarbons and other materials typically found at construction sites.
- Materials used in the manufacture of SCRs should not be edible to animals.
- SCRs should be reusable for at least 4 years.
- Cut SCRs to-length in the field with standard handsaws, for field configurations, as required.
- SCRs provide variable filtration as per the requirements of the site.
- If necessary to create a turn (i.e. 45 deg. or 90 deg.), SCRs may be butted together tightly (by removing the sleeve insert) in such a way that no opening exists for sediment to pass through.
- SCRs do not require trenching. If properly stapled, the “location flap” should reduce potential undermining and undercutting.
- Drive Steel Staples (Wire Staple 8 gauge 1” X 1” X 6” minimum – longer for loose or sandy soils) through the “location flap” into the soil at a minimum of 3 staples per 5 foot length. More staples can be used where necessary (loose soil, or high flow areas). Orient staples parallel to the SCR in order to insert around both strands (top and bottom strands of the flap netting).

Inspection and Maintenance:

- Repair or replace split or torn SCRs.
- Inspect SCRs when rain is forecast and after storm events. Perform maintenance as needed.
- Maintain SCRs to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches two thirds (2/3) of the barrier height. Removed sediment shall be incorporated back onto the project or disposed of outside the project in conformance with local requirements.
- When no longer required for the intended purpose, temporary SCRs shall be removed from the site and stored for reuse or relocated to another location on the project. If not reusable due to damage, SCRs can be recycled as #2 (HDPE).
- If SCs are removed, collect and dispose of sediment accumulation.

Synthetic Sediment Control Rolls

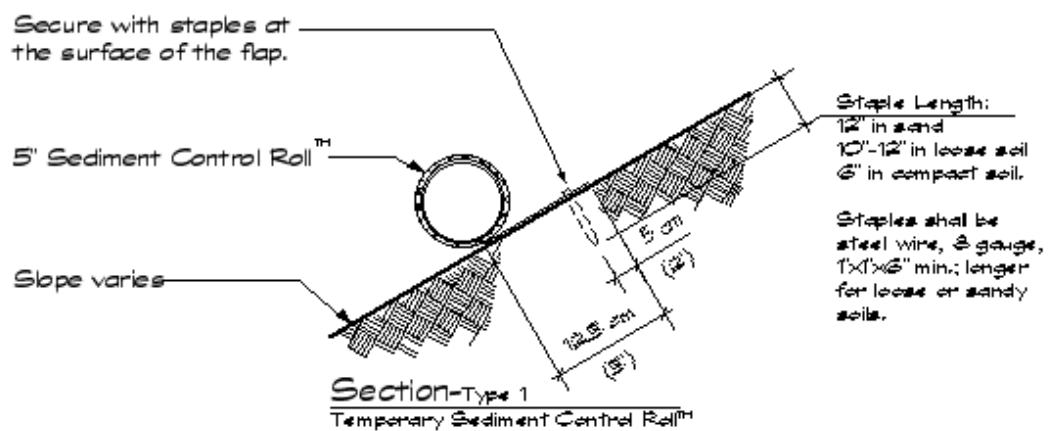
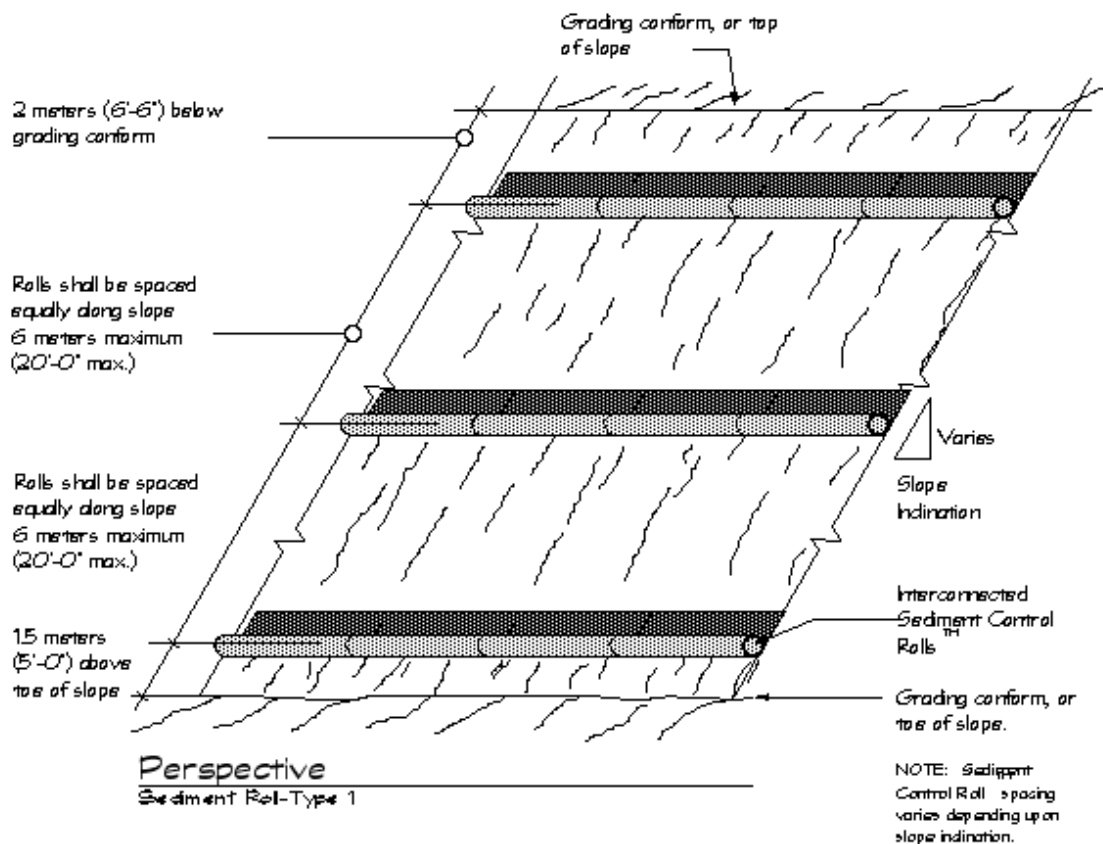
SC-11



Graphic used with permission of Ertec Environmental Systems, LLC.

Synthetic Sediment Control Rolls

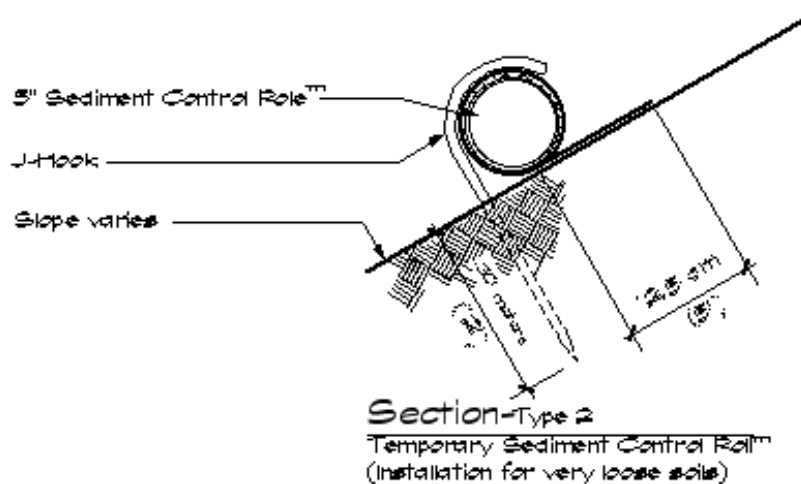
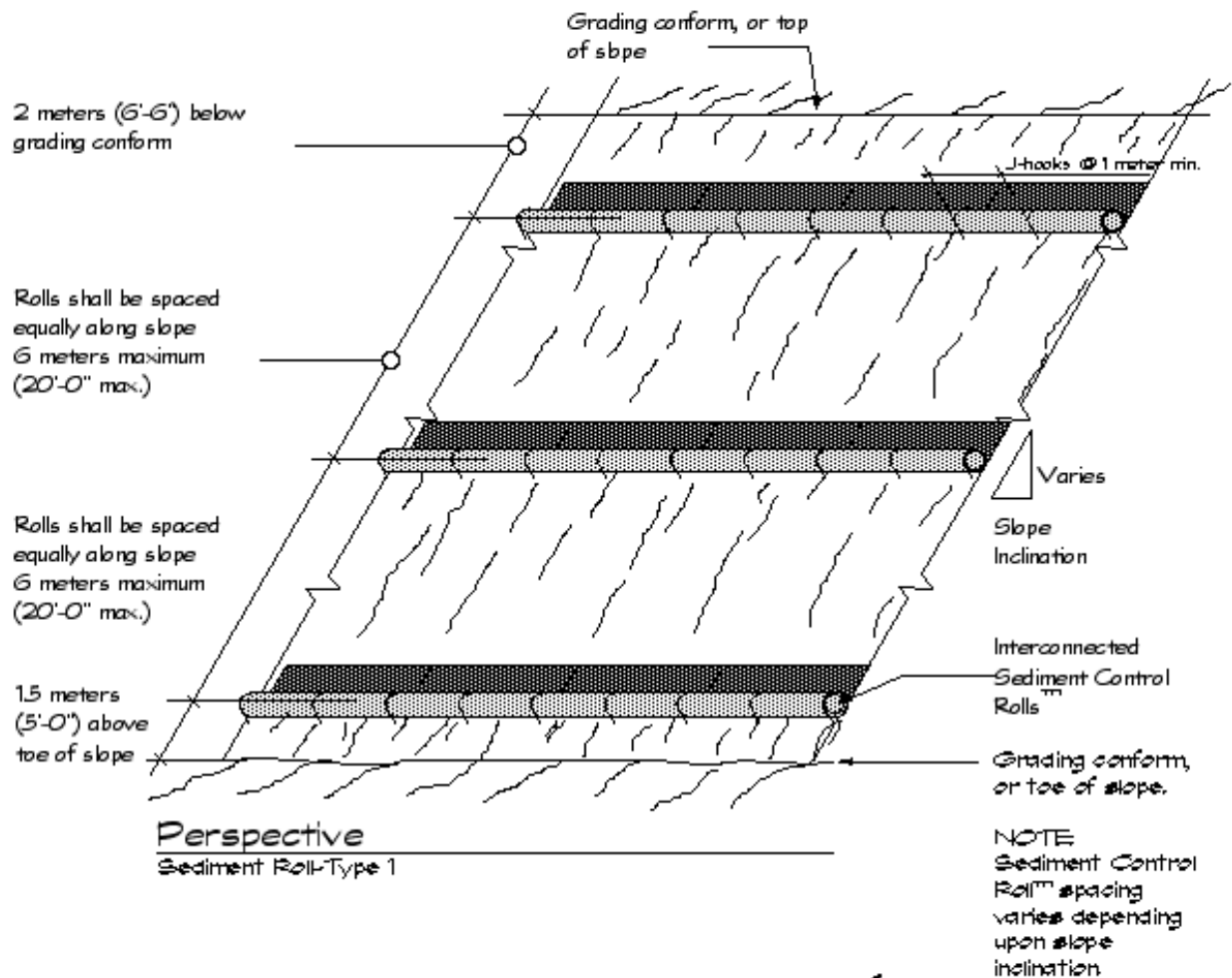
SC-11



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Synthetic Sediment Control Rolls

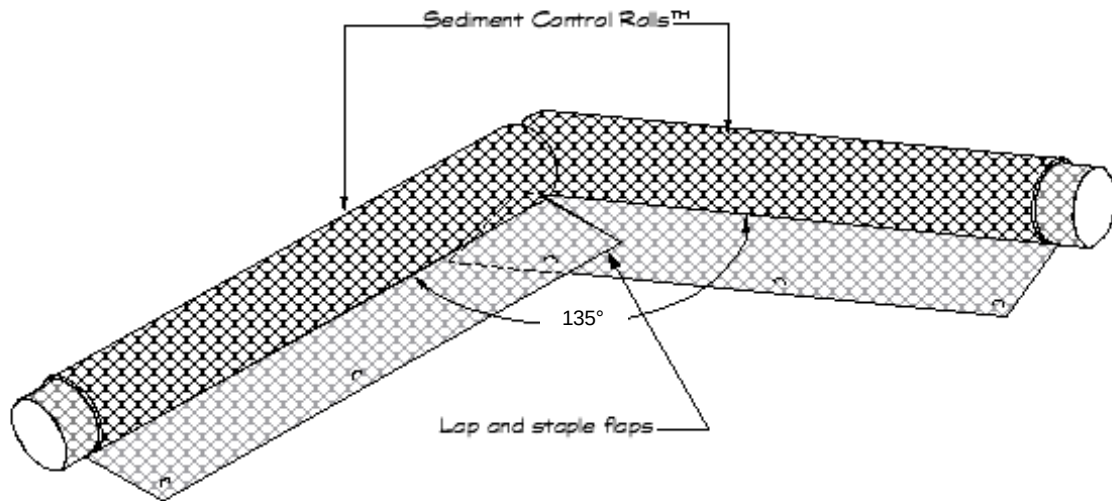
SC-11



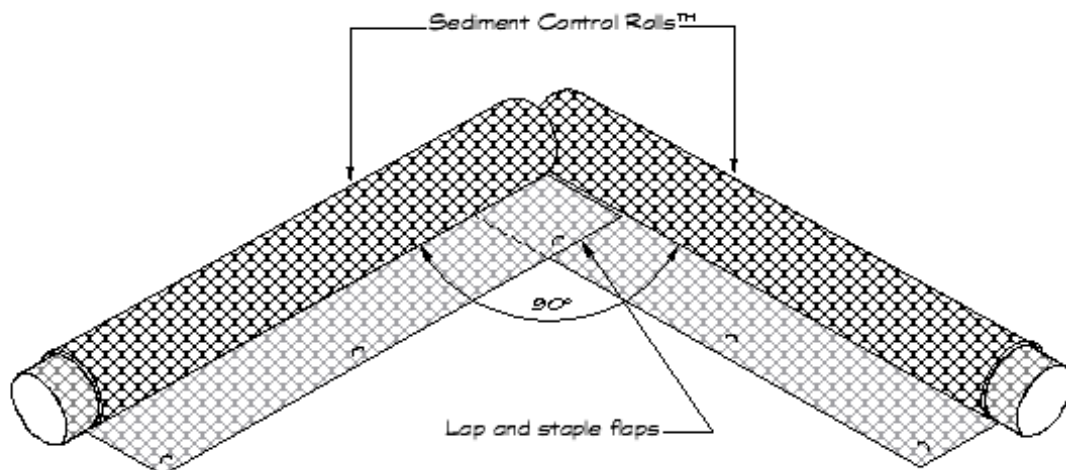
Synthetic Sediment Control Rolls

SC-11

Graphic used with permission of Ertec Environmental Systems, LLC.



Angled
Installation— 135°



Angled
Installation—90°

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Section 10: Drainageway Protection Best Management Practices

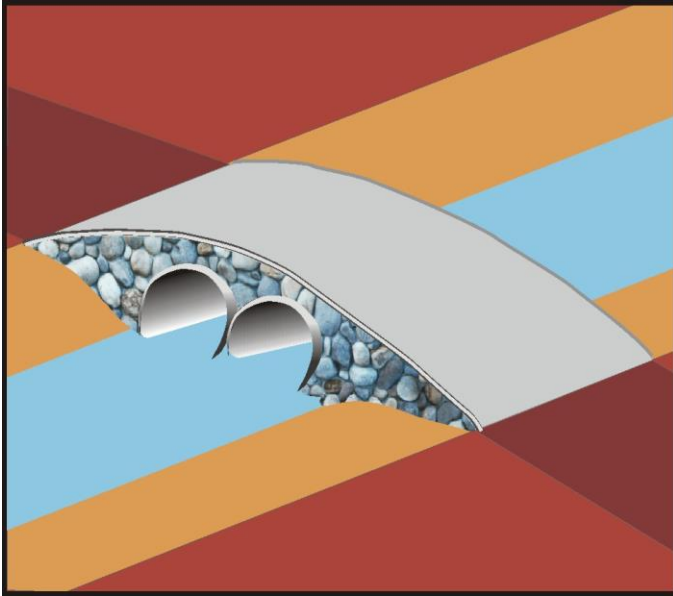
This section presents the measures that can be temporarily used to protect streams and drainages located on or adjacent to construction sites that must be crossed by vehicles. Storm Drain Outlet Protection (D2) is necessary at all locations where discharge from an outlet may cause erosion. Storm Drain Inlet Protection (DP-3) and Catch Basin Filters (DP-4) are the control measures that can be temporarily used to protect storm drain inlets from receiving sediment-laden runoff during construction activities. With the exception of permanent storm drain outlet protection, these measures shall be removed when construction activities are complete and final site stabilization has been accomplished.

Table 10-1: Drainageway Protection Best Management Practices

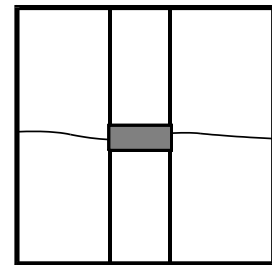
BMP#	BMP Name	Temporary	Permanent
DP-1	Temporary Stream Crossing	T	
DP-2	Storm Drain Outlet Protection		P
DP-3	Storm Drain Inlet Protection	T	
DP-4	Catch Basin Inlet Filters	T	

Temporary Stream Crossing

DP-1



Graphics produced by Kennedy/Jenks Consultants



Map Symbol

Purpose: A temporary stream crossing is a culvert, bridge, or ford placed across a waterway for use by construction traffic. This structure stabilizes and minimizes erosion of the streambanks and channel.

Applications:

- At sites where construction vehicles will frequently cross a stream or waterway.
- At sites where duration of construction activities will not exceed one year.

Limitations:

- May require a U.S. Army Corps of Engineers 404 Permit, a 401 Water Quality Certification from NDEP, a State Lands authorization or other permits.
- Disturbance of the waterway will occur during the installation and removal of temporary stream crossings. Therefore, sediment control measures may need to be installed in the waterway during construction.
- Stabilize disturbed areas both during construction and after removal of the structure.
- Structures may obstruct flow in the waterway during prolonged storm events causing flooding and/or washouts.
- Diversion or dewatering of the channel may be required during the installation of the stream crossing structure.

Temporary Stream Crossing

DP-1

Standards and Specifications:

General Considerations

- A Nevada registered civil or structural engineer shall design and stamp plans for temporary stream crossing structures.
- Install sediment traps immediately downstream of crossings to capture sediments.

Temporary Bridge

- Must not restrict waterway area.
- Must span waterway with no intermediate supports
- Must be designed by a registered engineer and constructed to carry design traffic loads.

Temporary Culverts

- Typically used on perennial and intermittent streams.
- Install on a stabilized bed.
- Stabilize inlets and outlets.
- Stream channel banks and bed must be restored following culvert removal.
- Appropriate for streams with high flow velocities, steep gradients, or where temporary constrictions in the channel are not allowed.
- Must be engineered and constructed to carry design traffic loads.
- Must be designed with a capacity in accordance with City of Sparks *Hydrologic Criteria and Drainage Design Manual* – latest edition.
- Used in arid areas during the dry season for dry washes and ephemeral streams.
- Do not use on perennial streams.
- Design approach roads with a maximum slope of 7H:1V.
- Stabilize banks and roadbed to above design high water level.
- Use compacted aggregate to stabilize road surface.
- Do not apply oil or hazardous materials to the roadway.

Temporary Stream Crossing

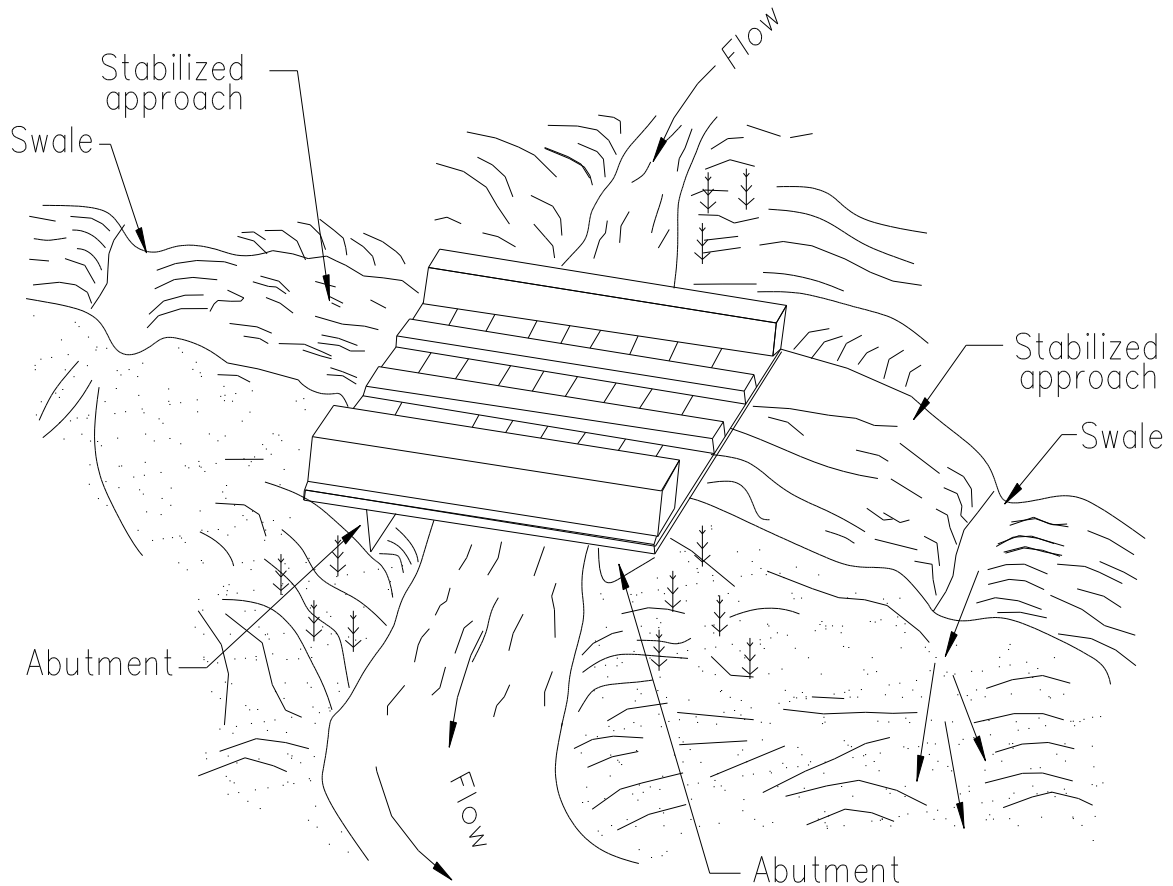
DP-1

Inspection and Maintenance:

- Inspect weekly as well as before and after significant rainfall events.
- Inspect for sediment buildup in the culverts or blockage of the channel.
- Inspect for structural weakening of the temporary crossing.
- Inspect for channel sour, erosion of the abutments, riprap displacement, or piping in the soil.
- Remove silt behind fords, in culverts, and under bridges, and dispose of properly outside of the drainage path.
- Replace aggregate that has been lost from culvert inlets and outlets.
- Repair streambank erosion.
- Promptly remove temporary stream crossings when no longer needed.

Temporary Stream Crossing

DP-1



NOTE:

Surface flow of road diverted by swale and/or dike.

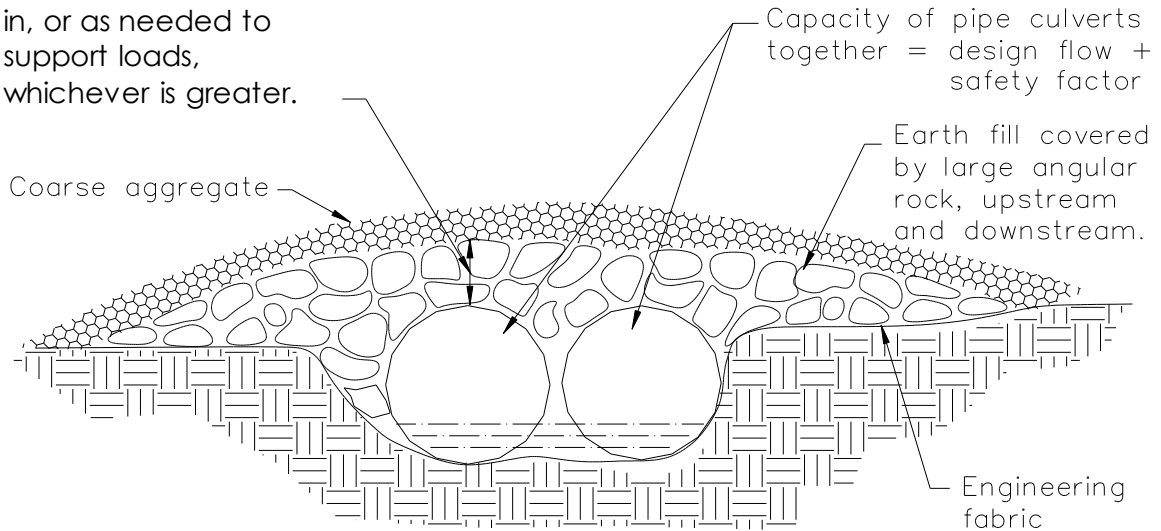
TYPICAL BRIDGE CROSSING
NOT TO SCALE

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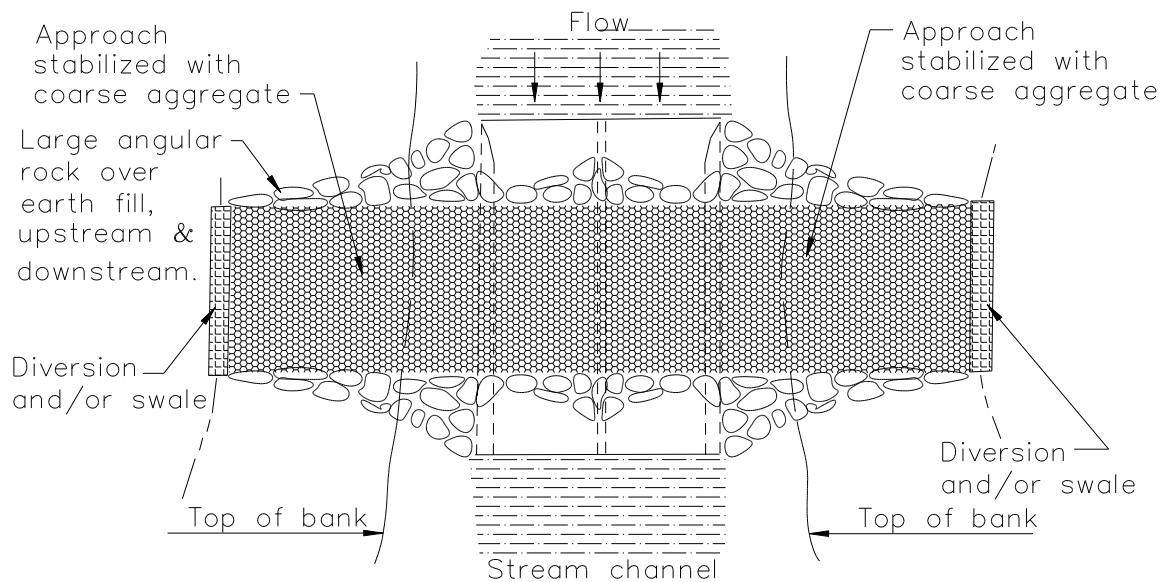
Temporary Stream Crossing

DP-1

½ Diameter of pipe 12
in, or as needed to
support loads,
whichever is greater.



ELEVATION



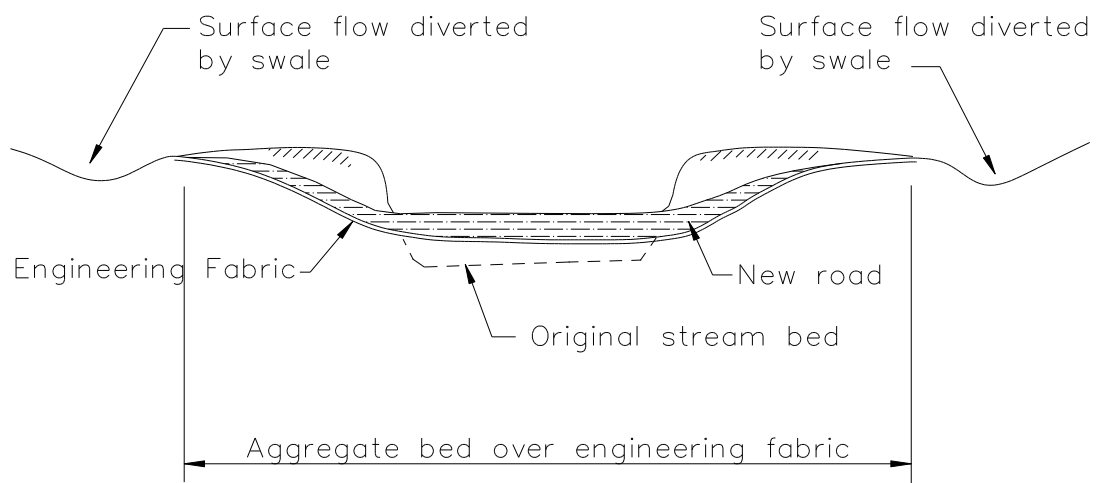
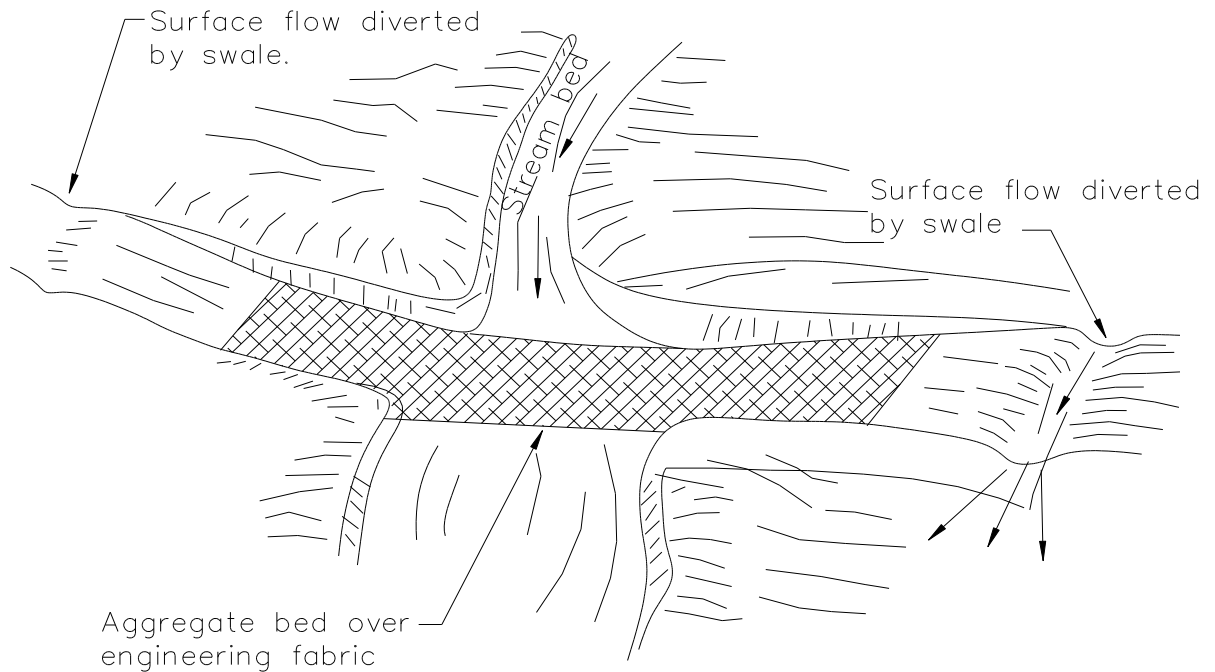
PLAN VIEW

TYPICAL CULVERT CROSSING
NOT TO SCALE

Graphic used with permission of Caltrans.

Temporary Stream Crossing

DP-1

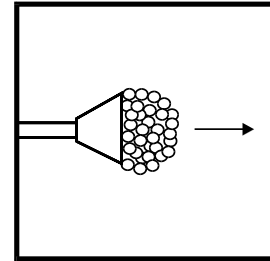
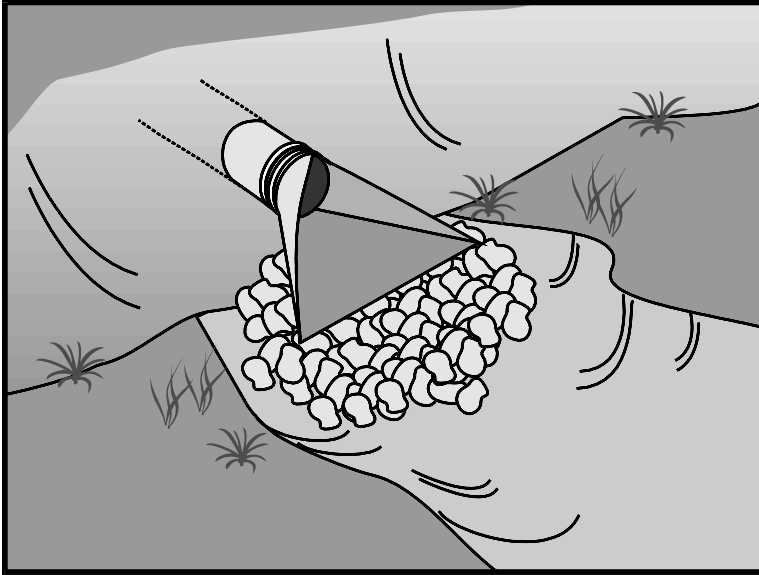


TYPICAL FORD CROSSING
NOT TO SCALE

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Storm Drain Outlet Protection

DP-2



Map Symbol

Graphics used with permission of Caltrans

Purpose: To reduce storm water flow velocities and energy from construction sites by placing a section of rock at pipe outlets and within channels. Permanent installations must be designed per local standards noted in the City of Sparks Hydrologic Criteria and Drainage Design Manual – latest edition.

Applications:

- At locations where discharge velocities and energies may erode downstream reaches.
- Pipe, drain, culvert, conduit or channel outlets.
- At outlets located at the bottom of mild to steep slopes.
- At the outlets of channels that carry continuous flows.
- Outlets subject to short, intense flows of water.
- Points where lined conveyances discharge to unlined conveyances.

Limitations:

- Loose rock may be washed away during high flow events.
- Freeze and thaw cycles may break down grouted riprap.
- Inadequate design and installation may cause grouted riprap to break up due to hydrostatic pressure.

Storm Drain Outlet Protection

DP-2

Standards and Specifications:

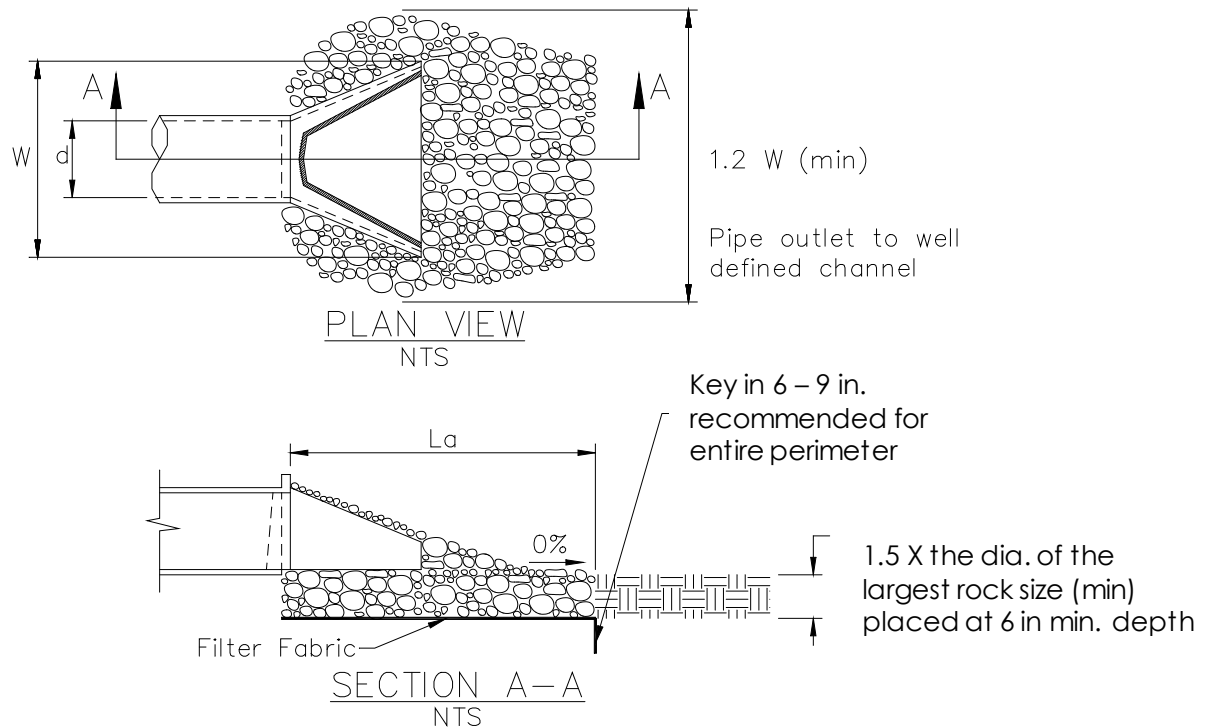
- Design per local drainage design manual standards (use City of Sparks Hydrologic Criteria and Drainage Design Manual – latest edition for general design guidance).
- Install riprap, grouted riprap, or concrete aprons at all outlets. Riprap aprons are well suited for use during construction.
- Provide additional protection for outlets on slopes steeper than 10 percent.
- Higher outlet velocities require larger rocks.
- Flow must be slowed to non-erosive velocity.
- Align the apron with the receiving stream and keep it straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of apron.
- Protect with a gravel blanket if the riprap is too large.

Inspection and Maintenance:

- Inspect weekly and after every significant rainfall event.
- Check for displacement of riprap or damage to underlying fabric.
- Check for scour beneath the riprap and around the outlet.
- Replace riprap as needed.
- Repair damage to slopes or underlying filter fabric.
- Remove promptly all devices when the drainage area has been stabilized or at the completion of construction.
- Modify outlet protection if downstream erosion is evident.
- Remove temporary facilities from service when construction is complete. Outlet protection may be left in place if designed to be a permanent installation per local standards and specifications.

Storm Drain Outlet Protection

DP-2



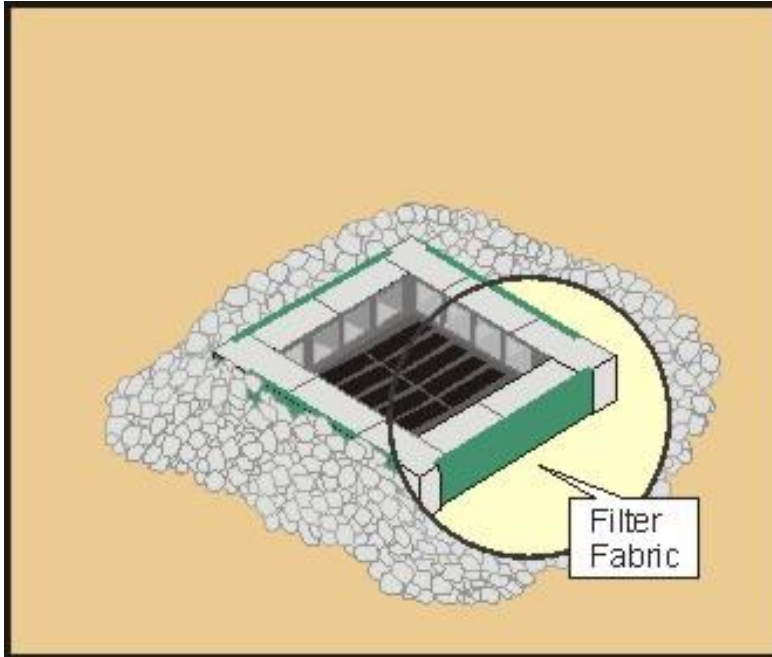
Graphic used with permission of Caltrans.

Pipe Diameter inches	Discharge ft ³ /sec	Apron Length, La feet	Rip Rap D_{50} Diameter Min inches
12	4.9	10	4
	9.9	13	6
18	9.9	10	6
	20.1	16	8
	30.0	23	12
	39.9	26	16
24	30.0	16	8
	39.9	26	8
	50.1	26	12
	60.0	30	16
For larger diameters or higher flows, consult a NV Registered Civil Engineer			

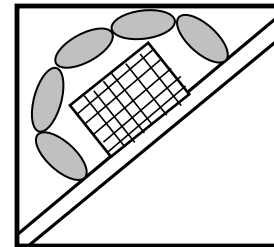
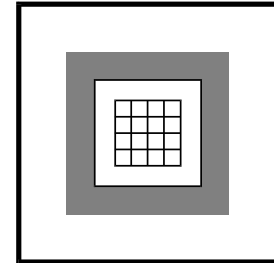
Source: USDA – SCS

Storm Drain Inlet Protection

DP-3



Graphics produced by Kennedy/Jenks Consultants



Map Symbols

Purpose: To allow ponding and filtering of sediment-laden runoff prior to entering the storm drain system.

Applications:

- Inlets potentially impacted by sediment laden surface runoff.
- Drainage areas 1 acre or less.
- Disturbed drainage areas that have not been permanently stabilized.
- Applicable for wet and snowmelt seasons.
- May not be necessary if storm drain discharges to a sediment retention basin.
- This BMP shall be the last line of defense for protection of the storm drain system.

Limitations:

- Not to be used when ponding will encroach into roadway traffic or onto erodible surfaces and slopes.
- Storm water will bypass protected curb inlets and continue downgrade on sloped surfaces.
- Sediment removal is not performed in high flow conditions.

Storm Drain Inlet Protection

DP-3

- Frequent maintenance is required to remove sediment and debris and replace BMP if clogged with sediment
- Route runoff to a sediment-trapping device if the drainage area is greater than 1 acre.
- Do not cover the inlet grate with filter fabric and do not place filter fabric beneath the grate.

Standards and Specifications:

Block and Gravel DI Protection

- Appropriate for drainage areas 1 acre and less with flows not exceeding 0.5 cfs.
- Allow for overtopping to prevent flooding.
- Place concrete blocks around inlet grate with openings parallel to the ground surface.
- Place filter fabric or wire screen around the outer openings and secure in place.
- Cover fabric or screen with 1 to 2 inch clean gravel approximately 1 foot wide.

Filter Fabric Fence (DI Protection Type 1)

- Appropriate for relatively small (less than 1 acre), flat (less than 5 percent slope) drainage areas subject to sheet flow and for flows not exceeding 0.5 cfs.
- Only surround inlet with filter fabric fence when it is located in a sump and the top of the fence is below the top of the surrounding slopes.
- Not appropriate for paved areas.
- Unless an approved catch basin filter device is used (see DP-4), filter fabrics shall not be placed over or underneath the inlet grate.
- Drive stakes a minimum of 8 inches into the ground. Stakes shall have a minimum dimension of 2 inches by 2 inches and be spaced a maximum of 3 feet apart.
- Bury the fabric filter at least 1 foot below the soil surface and rise no higher than 2 feet above the ground surface.
- Clean or replace the fabric when it becomes clogged with sediment.
- Remove sediment when the accumulation behind the fabric fence reaches one-third the height of the barrier.

Storm Drain Inlet Protection

DP-3

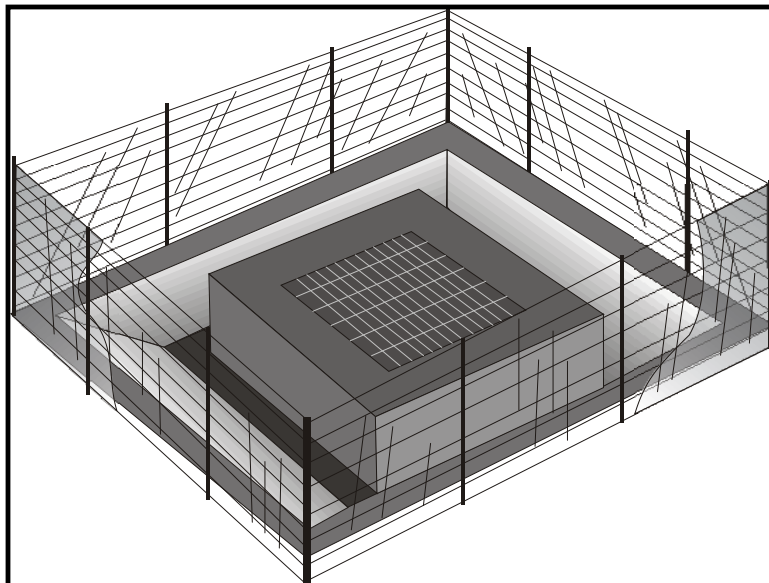
Sandbag Barrier (for Inlets on Grade)

- Sandbag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.5 cfs and when it becomes necessary to allow for overtopping to prevent flooding.
- Inspect bags for holes or rips.
- Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

Excavated Drop Inlet Sediment Trap (DI Protection Type 2)

- Used where relatively heavy flows are expected and overflow capacity is needed.
- Size trap to provide a minimum storage capacity of 67 yd³/acre of drainage area.
- Remove sediments when the basin volume has been reduced by one half, disposing of them properly – away from the drainage path.

Below is an example of an Excavated Drop Inlet Sediment Trap (DI Protection Type 2)



Graphic used with permission of Caltrans

Storm Drain Inlet Protection

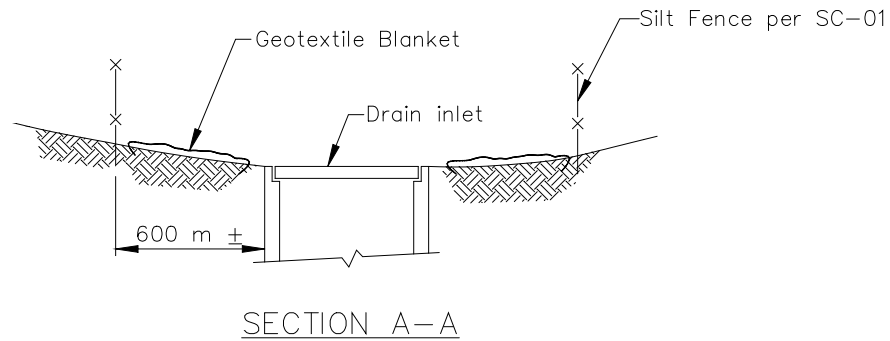
DP-3

Inspection and Maintenance:

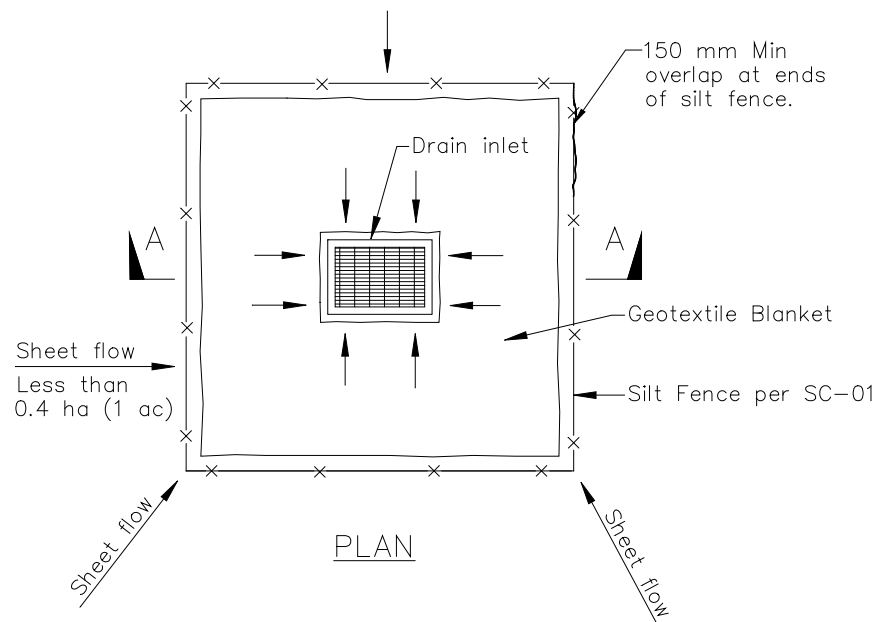
- Inspect before and after rainfall events and weekly during the wet/rainy season.
- Inspect inlet protection devices at least once every 24 hours during extensive rain events.
- Inspect storm drain inlets after severe storms in the rainy season for bypassed material.
- Properly dispose of accumulated sediments in appropriate manner out of the drainage path.
- From May to October, do not allow water to pond behind or within these control measures in excess of 7 days.
- Bring the disturbed area to the grade of the drop inlet and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
- After site is stabilized, remove inlet protection devices or when protection is no longer needed.

Storm Drain Inlet Protection

DP-3



overlap at
silt fence.



DI PROTECTION TYPE 1
NOT TO SCALE

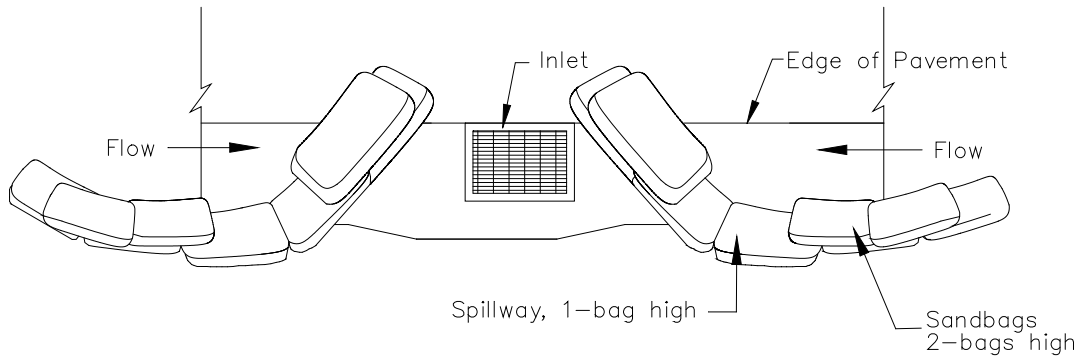
NOTES:

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.

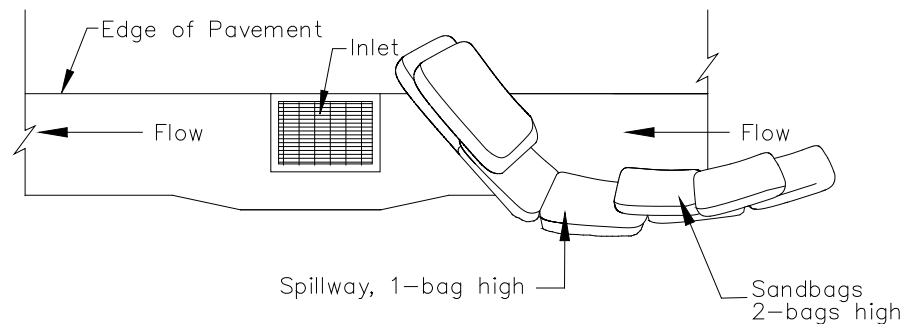
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Storm Drain Inlet Protection

DP-3



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

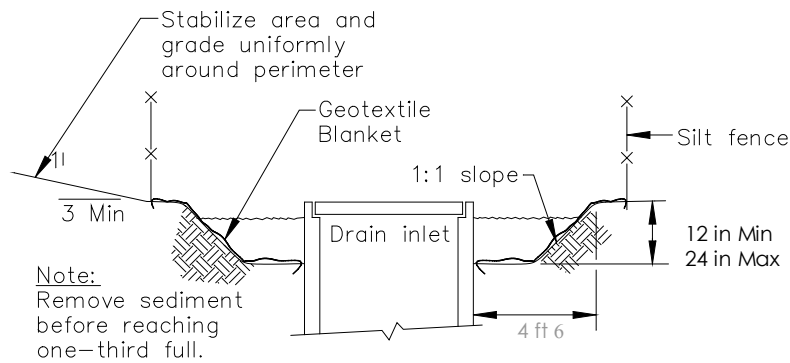
NOTES:

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.

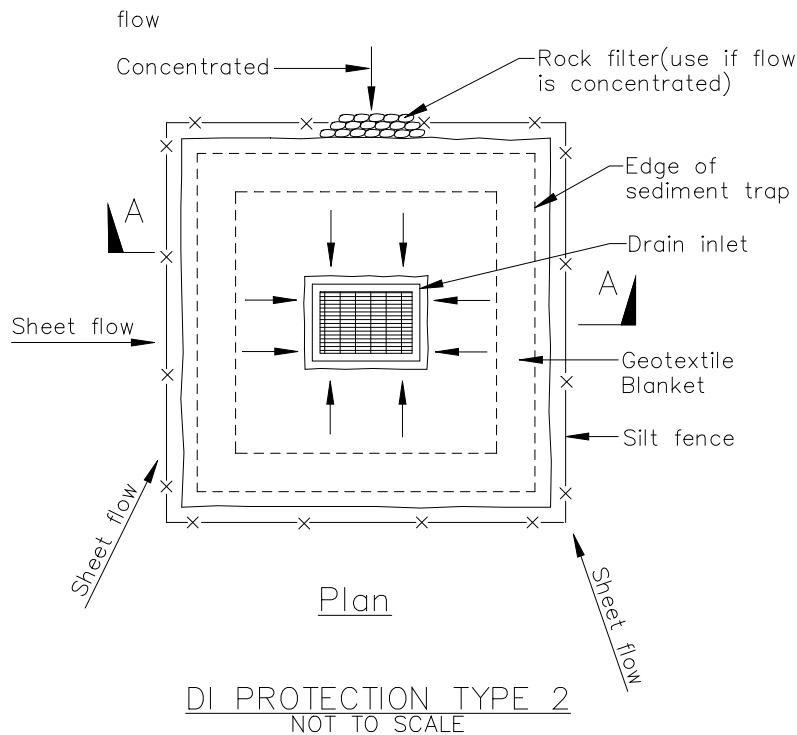
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Storm Drain Inlet Protection

DP-3



Section A-A



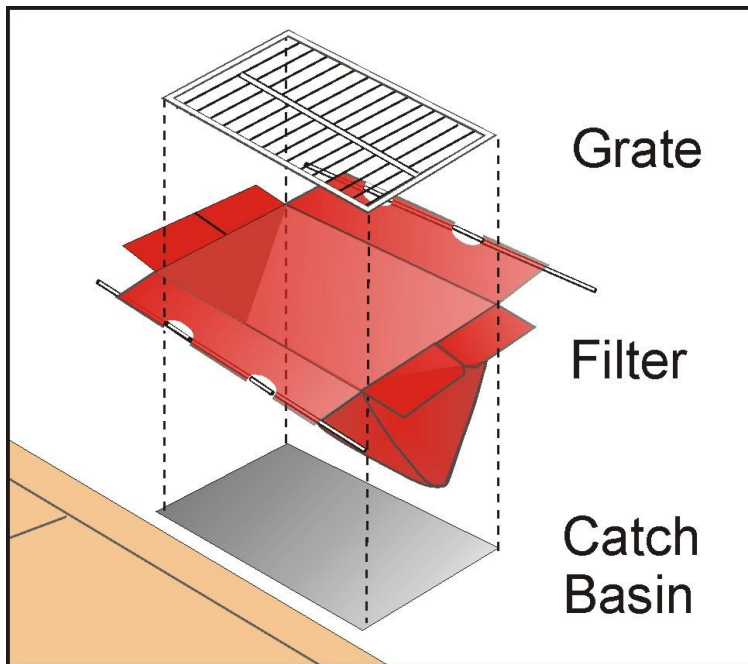
Notes

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.

Graphic used with permission of Caltrans.

Catch Basin Filters

DP-4



Graphic produced by Kennedy/Jenks Consultants

Purpose: To filter sediment-laden runoff and improve the quality of water entering the storm drain system. Filters are held in place by the catch basin grates.

Applications:

- At construction sites where disturbed areas may allow sediment laden water to enter catch basins or inlets.
- Where clogging of the drainage system by sediment laden storm water may be a problem.
- For use at sites where space or traffic constraints limit the use of other forms of storm drain inlet protection.

Limitations:

- To be used as a secondary sediment control with primary erosion control measures (hydroseeding, erosion control blankets).
- May cause flooding if not maintained.
- May cause a discharge of sediment to the storm drain system if filter fabric tears or pulls away from the grate.

Catch Basin Filters

DP-4

Standards and Specifications:

- Remove the drain gate and install the catch basin filter leaving 3 inches of flap exposed.
- Pinch the fabric between the grate and catch basin to ensure that the filter will be held in place.

Inspection and Maintenance:

- Inspect catch basin filters weekly and after every rain event.
- Empty catch basin filters when they are approximately half full.
- Follow manufactures guidelines for maintenance procedures, usually requires two people and two poles to remove.
- Properly dispose of sediments.
- Remove catch basin filters when construction activities are complete and final site stabilization has been accomplished.

Section 11: General Site and Materials Best Management Practices

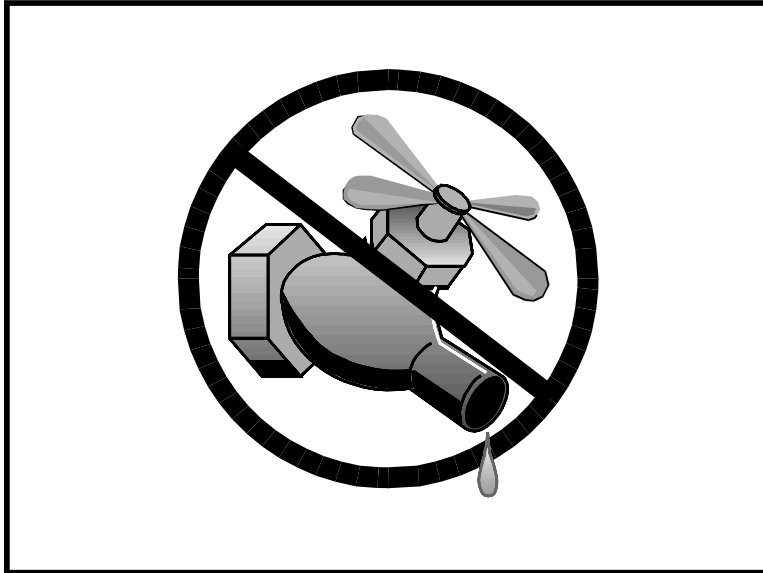
This section presents control measures that can be used to manage construction site materials and wastes and manage maintenance, fueling and cleaning activities in order to reduce or eliminate discharges on and offsite and into receiving waters. Proper management of materials and wastes at construction sites can significantly reduce pollution in storm water.

Table 11-1: General Site and Materials Management Best Management Practices

BMP#	BMP Name	Temporary	Permanent
GM-1	Water Conservation Practices	T	P
GM-2	Stockpile Management	T	
GM-3	Solid and Demolition Waste Management	T	
GM-4	Dewatering Operations	T	
GM-5	Street and Surface Cleaning	T	
GM-6	Spill Prevention and Control	T	
GM-7	Vehicle and Equipment Cleaning	T	
GM-8	Vehicle and Equipment Maintenance and Fueling	T	
GM-9	Handling and Disposal of Concrete and Cement	T	
GM-10	Material Delivery, Handling, Storage and Use	T	
GM-11	Paints and Liquid Materials	T	
GM-12	Pavement Construction Management	T	
GM-13	Liquid Waste Management	T	
GM-14	Sanitary/Septic Waste Management	T	
GM-15	Landscaping and Revegetation Management	T	P
GM-16	Contaminated Soil and Water Management	T	
GM-17	Hazardous Waste Management	T	
GM-18	Illicit Discharges and Connections – Detection and Reporting	T	
GM-19	Drilling and Pile Driving Operations	T	
GM-20	Material and Equipment Use Over Water	T	
GM-21	Structure Demolition/Removal Over or Adjacent to Water	T	P
GM-22	Temporary Batch Plants	T	

Water Conservation Practices

GM-1



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Purpose: The potential for erosion and pollutants being transported offsite can be reduced by appropriately restricting the use of water on construction sites.

Applications:

- Implemented in all situations where water is used.
- Used on all construction sites.

Limitations:

- None have been identified.

Standards and Specifications:

- To determine an appropriate amount of water for a given area, take into consideration factors such as soil type and structure, grade, season, climate, and type of plant material.
- Where possible, direct construction runoff to areas where it can soak into the ground.
- Use minimal amounts of water to control dust and avoid washing sediments into the drainage system.
- Limit irrigation.
- Maintain water equipment in good working condition.
- Repair water leaks promptly.
- Discourage washing of equipment and vehicles on construction sites or conduct washing activities only in designated contained areas.

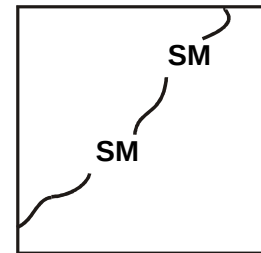
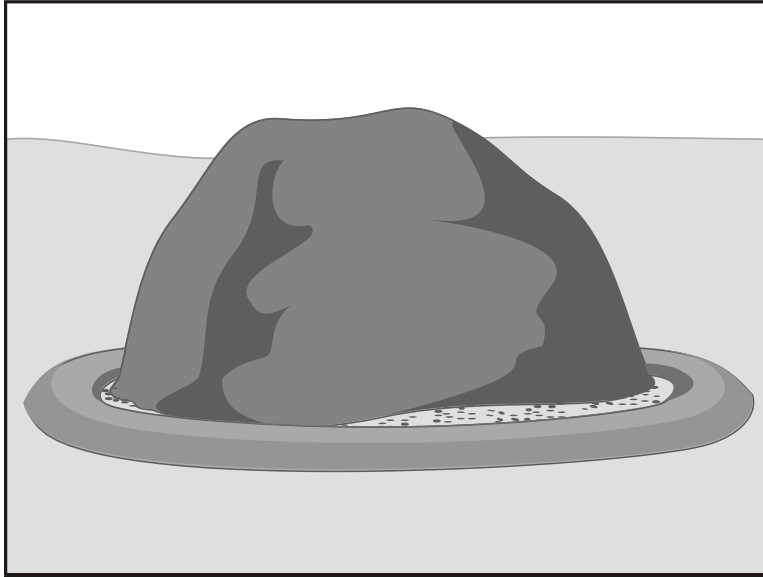
- Keep paved areas swept and vacuumed.
- When washing vehicles and equipment on-site:
 - Minimize water use and contain all runoff on-site.
 - Do not use detergents or chemicals.
 - Use a commercial wash facility whenever possible.

Inspection and Maintenance:

- Inspect water equipment a minimum of twice weekly.
- Shut off water and repair broken lines, sprinklers, or valves as soon as possible to prevent excess water use.

Stockpile Management

GM-2



Map Symbol

Graphics used with permission of Caltrans

Purpose: Proper management of stockpiled materials can reduce or eliminate pollution of storm water from these sources.

Applications:

- All locations and projects where materials such as soils, composts, aggregates, and paving materials are stockpiled.

Limitations:

- None have been identified.

Standards and Specifications:

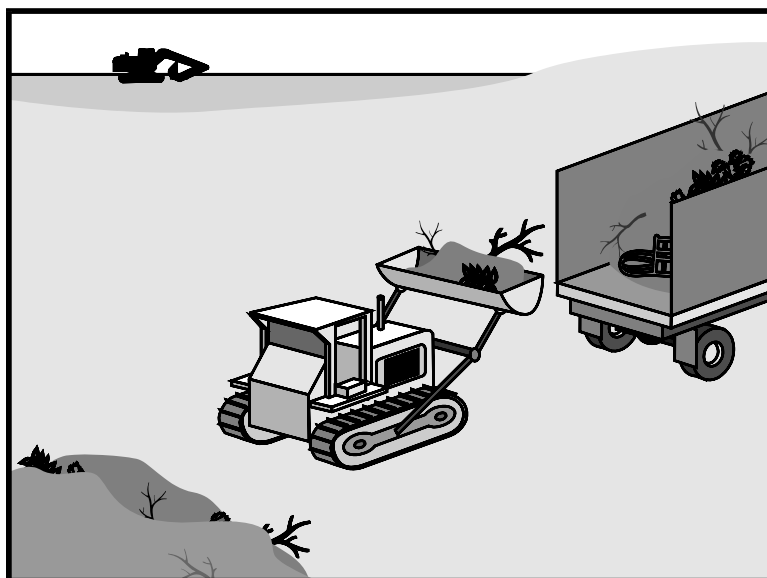
- Locate stockpiles away from storm water flows, drainage courses and inlets.
- Apply wind erosion and dust control measures on the surface of stockpiles (see EC-5).
- Revegetate if stored more than 60 days.
- Place bagged materials on pallets and cover (see GM-10 and GM-11).
- Maintain stockpile management controls year-round.
- Install stockpile perimeter controls such as temporary berms, dikes, silt fences, fiber rolls, sandbags or gravel bag barriers as soon as possible after stockpiles are created. These temporary sediment transport barriers can be temporarily removed or moved to one side when materials are removed or added to the stockpile.

- If stockpiles are not to be used within 21 days, temporary cover (e.g. hydromulch with soil binders), must be installed as soon as practicable and no later than 14 days after stockpiles are created. Cover shall be placed on stockpiles as soon as practicable where the initiation of temporary covers is precluded by snow or frozen ground conditions.

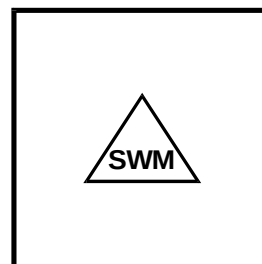
Inspection and Maintenance:

- Inspect perimeter controls and covers weekly and before and after storm events.
- Inspect temporary cover before, during and after windy weather.
- Replace or repair perimeter controls and cover as needed.
- Inspect for weed infestations and treat as needed

Solid & Demolition Waste Management GM-3



Graphics used with permission of Caltrans



Map Symbol

Purpose: Proper management through the routine collection and regular disposal of soil and demolition wastes will prevent or reduce the discharge of pollutants to the storm drain system.

Applications:

- All construction projects that generate non-hazardous solid wastes. These wastes include:
 - reusable materials (doors, banisters, windows, 2x4s),
 - recyclable materials (metal framing, concrete, brick, asphalt, cleared vegetation), and
 - non-recyclable materials (non-hazardous paint chips, steel and metal scraps, broken paving materials, domestic wastes).

Limitations:

- Temporary stockpiling of construction wastes may require stockpile management controls.

Standards and Specifications:

- Designate on-site waste collection areas away from streets, gutters, storm drains, and construction site entrance.
- Train employees and subcontractors in proper solid waste management.
- Reuse and recycle construction materials and wastes whenever possible.
- Collect construction site litter and debris daily.

Solid & Demolition Waste Management GM-3

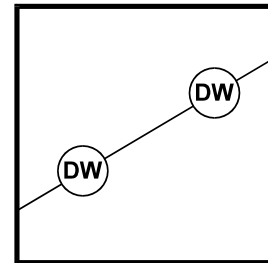
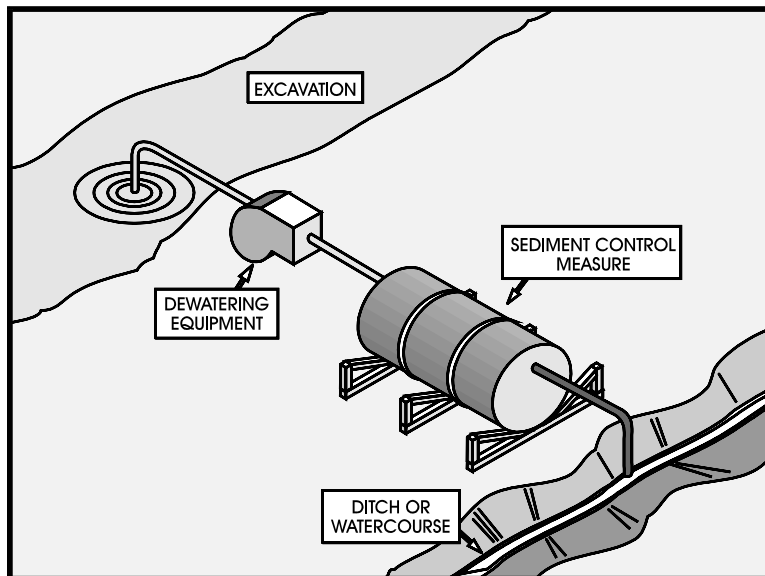
- Do not dispose of toxic liquid wastes and chemicals in dumpsters designated for construction debris.
- Do not wash out dumpsters on-site.
- Replace leaky dumpsters.
- Clean up spills immediately.
- Cover dumpsters at night and during rainy or windy weather.

Inspection and Maintenance:

- The construction supervisor shall monitor on-site solid waste storage and disposal.
- Inspect dumpsters for leaks and secure covers.
- Arrange for regular waste collection.
- Immediately cleanup and remove any materials, debris or wastes that fall into waterways and drainage ways on or adjacent to the site.

Dewatering Operations

GM-4



Map Symbol

Graphics used with permission of Caltrans

Purpose: Dewatering is often necessary to remove accumulated storm water or non-storm water from excavations or other depressions on a construction site. To prevent pollutants contained in the removed water from entering the storm drain system a variety of sediment controls may be used.

Applications:

- Applied on construction sites whenever water must be removed using a dewatering pump and the discharge is to a surface water or the storm drain system.
- May be used in conjunction with sediment traps or basins on construction sites that do not drain within 7 days from May to October.
- Applied to remove uncontaminated groundwater or waters accumulated in sumps or BMPs on the job site.

Limitations:

- Discharged water must be able to flow through the dewatering system without overflowing the structure.
- Dewatering practices should be used as a last resort control measure.
- Design and use will be determined by on-site conditions.
- When removing contaminated waters or hazardous substances, the contractor shall implement appropriate pollution controls.
- May need to obtain and comply with local permits.
- A temporary discharge permit is required from NDEP if the discharge rate exceeds 250 gpm or the dewatering period exceeds 48 hours.

The following suggested BMPs are primarily meant for sediment removal only. If waters present at the site are determined to be polluted or containing hazardous substances, additional controls must be implemented. And local environmental control authorities must be notified.

Standards and Specifications:

- Regional and watershed-specific discharge requirements must be followed.
- NDEP may require an additional NPDES Dewatering Permit for the discharge of accumulated non-storm water, including but not limited to groundwater, water from cofferdams, de-watering of piles, and water diversions.
- A dewatering plan shall be included in the SWPPP detailing the location of the dewatering, equipment used, and the discharge point.
- Records of dewatering activities shall be maintained for a minimum of three years.
- Do not allow discharges to cause erosion at the discharge point.

Inspection and Maintenance:

- Regular inspection is necessary to ensure that the structure is functioning efficiently.
- Do not discharge waters into the storm drain system or waters of the state when using floating suction hoses.

Implementation:

1. Sediment Traps - See Fact Sheet SC-6

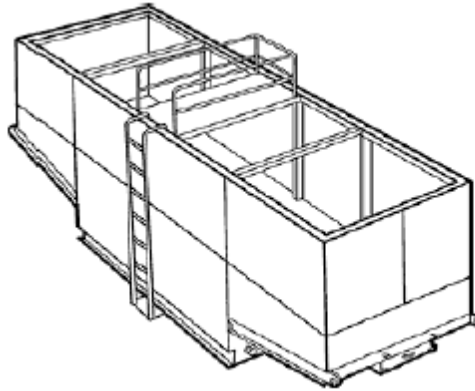
- A sediment trap consists of a temporary basin formed by excavation or construction of an embankment across a drainage way. Water is detained in the structure and sediment is allowed to settle out. Water exits the trap via a reinforced spillway.
- Effective for removal of large and medium sized sediment.
- Requires excavation and cannot be transported to various discharge points.

2. Sediment Basins – See Fact Sheet SC-7

- A sediment basin is similar to a sediment trap except that the outlet structure consists of a perforated riser pipe, rather than a spillway.
- Effective for removal of trash and gravel through silt-sized sediment.

3. Weir Tanks

- A weir tank is a mobile unit which separates waste by passing water through a series of weirs, maximizing the residence time within the tank and removing oil, grease and sediments.
- Tanks can be used as a component in a treatment train if desired, or set up in parallel to allow for larger discharge volumes.



Graphics Source: CASQA

- Tanks of various sizes, for different flow volumes and contaminants of concerns are available from a variety of vendors. Vendors will deliver the tank to the construction site and assist with set-up and operation.
- Frequent cleaning may be required to maintain functionality. Oil and grease must be disposed of by a qualified entity.
- A Professional Engineer is required to determine the appropriate size of tank required.



4. Dewatering Containers

- A dewatering container is a mobile unit which removes debris and sediment employing a filter fabric. Flow enters the tank through the top, passes through the filter, and discharges through the bottom.
- Dewatering tanks typically remove trash, gravel, sand, and silt, with limited effectiveness for removing oil and grease and metals.
- Tanks can be used as a component in a treatment train if desired, or set up in parallel to allow for larger discharge volumes.
- Tanks of various sizes, for different flow volumes and contaminants of concerns are available from a variety of vendors. Vendors will deliver the tank to the construction site and assist with set-up and operation.

Dewatering Operations

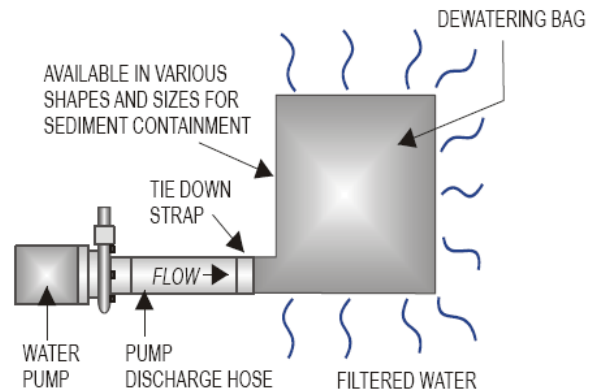
GM-4

- Frequent cleaning may be required to maintain functionality. Oil and grease must be disposed of by a qualified entity.
- A Professional Engineer is required to determine the appropriate size of tank required.

5. Gravity Bag Filters



Photo source: U.S. Filter Bags



Graphics Source: CASQA

- A gravity bag (or "dewatering bag") is a rectangular bag made of geotextile fabric designed to remove sand, silt, and fines from discharged water.
- Water is pumped into the bag and seeps through the material composing the body of the bag.
- The gravity bag filter is used in conjunction with a secondary containment device such as a rock filter bed barrier to capture sediments escaping the bag.
- The bag must be inspected at regular intervals and replaced when it fails to remove sediment.
- The gravity bag filter is only applicable for small-scale dewatering projects.

6. Sand Media Particulate Filter



- Water is pumped through canisters filled with sand filtration media.
- These can be used for stand-alone treatment or as a secondary treatment method following a sediment trap or basin.
- Effective for removal of trash, gravel, sand, and silt, and reduction of metals, BOD and turbidity.
- Vendors are available to deliver sand filter units to construction sites and assist with set-up and operation.
- Service units at least monthly to ensure proper function.

7. Pressurized Bag Filter.



- Discharged water is forced through pressurized polyester filter bags.
- Such units can be set up in a variety of configurations, depending upon site requirements. Often including cartridge filters for enhanced treatment.
- Effective for removal of trash, gravel, sand, and silt, and reduction of metals, BOD and turbidity. Oil absorbent bags are available for oil and grease removal.
- These can be used for stand-alone treatment or as a secondary treatment method following a sediment trap or basin.
- Vendors are available to deliver bag filter units to construction sites and assist with set-up and operation.
- Service units regularly to ensure proper function.



8. Cartridge Filter

- Cartridge filters combine a number of individual filters for an enhanced level of water treatment.

Dewatering Operations

GM-4

- Effective for removal of trash, gravel, sand, and silt, and reduction of metals, BOD and turbidity. Resin cartridges are available for oil and grease removal.
- Often used in series with sediment traps or basins for pre-treatment.
- Vendors are available to deliver bag filter units to construction sites and assist with set-up and operation.
- Service units regularly to ensure proper function.

Street & Surface Cleaning

GM-5



Map Symbol

Graphics used with permission of Caltrans

Purpose: To remove sediment tracked onto pavement and to prevent it from entering the storm drain system.

Applications:

- Any location where sediment is tracked from a private construction site onto paved roads.
- Any other surfaces receiving wash-down related to construction activities, including sidewalks, driveways, parking areas, storage areas, and building exteriors.

Limitations:

- Wet soil or mud may not allow for effective sweeping.

Standards and Specifications:

- Follow the policies stated in Standard No. 1 of the Construction Permit Submittal Checklist (Appendix D).
- Follow all applicable District Health dust control standards.

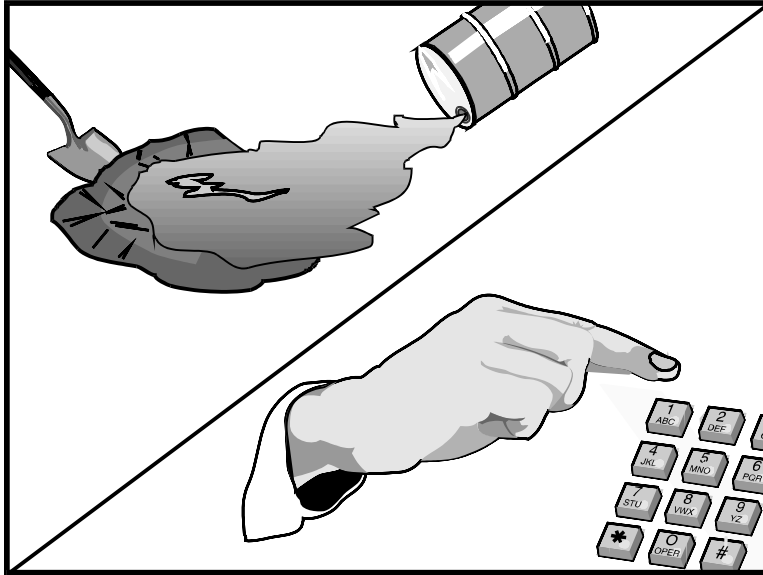
Inspection and Maintenance:

- Daily inspection of potential sediment tracking locations.
- Daily inspection of egress/ingress access points.
- Follow this general cleaning procedure:
 1. Use absorbents to pick up oil, as needed,
 2. Use dry sweep up to remove debris, and

3. Wash surfaces avoiding the use of detergents.
 - Daily sweeping and vacuuming of visible sediment tracking.
 - Block/cover storm drain inlets, and contain wash water runoff when washing streets.
 - Do not sweep up any potentially hazardous materials or objects.
 - If detergents are used, or wash water contains pollutants such as petroleum, grease, food waste, garbage and paint chips, it shall be disposed of in the sanitary sewer system provided approved pretreatment device is used, and permission is granted by the local authority.
 - If detergents are NOT used, and the wash water is sufficiently clear of pollutants such as petroleum, grease, food waste, garbage, paint chips, and sediment (i.e. dry sweep up occurred before washing) the water may be discharged to the storm sewer system.
 - Adjust brooms on sweeper frequently to maximize efficiency.
 - Proper disposal of sweeper waste is necessary – dispose of waste at the regional landfill.

Spill Prevention & Control

GM-6



Map Symbol

Graphics used with permission of Caltrans

Purpose: Discharges of non-hazardous and hazardous materials to the storm drain system can be minimized or eliminated by preventing and controlling spills through defined procedures and practices.

Applications:

- Applies to all construction sites.
- Implemented any time chemicals are used (including fuel areas).
- Chemicals include (but are not limited to): soil stabilizers, dust palliatives, herbicides, growth inhibitors, fertilizers, deicing chemicals, fuels, paints, solvents, cement, lubricants, and other petroleum distillates.

Limitations:

- The described practices are general and therefore should be adjusted by the contractor for the specific materials used or stored on-site.
- Applies only to spills caused by the contractor or others on-site.

Standards and Specifications:

- Do not bury or wash spills with water.
- Attempt to cover spills during rainfall events as long as cleanup efforts are not compromised.
- Do not allow water used for cleanup purposes to enter the storm drain system.

- Keep waste storage areas clean, well-organized, and well equipped.
- Post information on proper storage, clean up and spill response at a visible and accessible location at all times.
- Educate employees and subcontractors about what a “significant” and “insignificant” spill is for each chemical used on-site and train in spill prevention and cleanup. – See project specific Spill Prevention Control and Countermeasure Plan (SPCC Plan).
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Locate chemical storage and handling areas away from storm drains, waterways, or reservoirs.
- Do not store chemicals in areas where they may be susceptible to rain.
- Provide a secondary containment structure in case of leaks or spills.
- Always use a secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent material under paving equipment when not in use.
- Promptly transfer used fluids to the proper waste or recycling drums. Do not leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute storm water. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal.
- Store cracked batteries in a non-leaking secondary container.
- If vehicles will be fueled on site:
 - Discourage “topping off”.
 - Use designated areas located away from waterways and drainages.
 - Use a secondary containment to catch drips or spills.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately and dispose of contaminated soils and clean up materials properly.
 - Sweep up dry spills. Do not wash or hose down the area.
 - Use absorbents for wet spills on impermeable surfaces.
 - Wet spills on soils require digging up and disposing of the contaminated soil.
- A secondary containment with enough capacity to contain a spill is required for fueling areas.

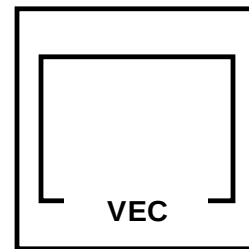
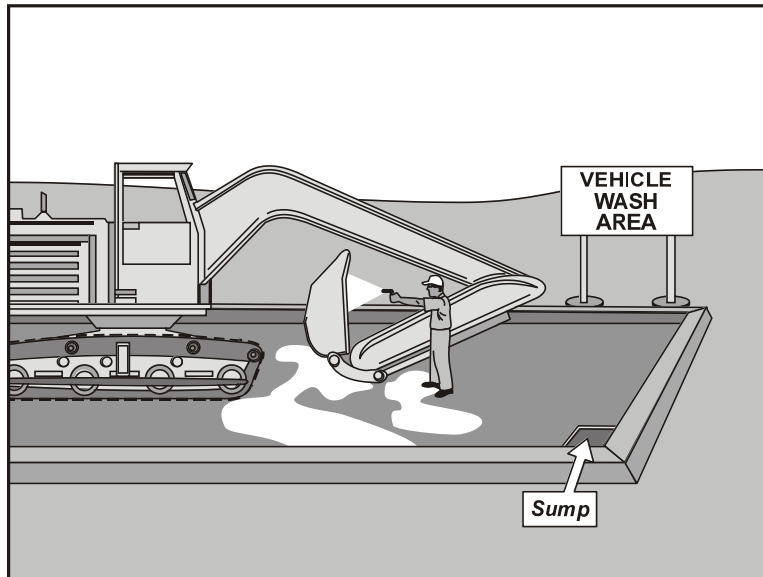
- Report significant spills to local and state agencies, such as the City of Sparks Environmental Control (775-691-9227), the City of Reno Environmental Control (775-334-4636), Washoe County District Health (775-328-2436), and NDEP (888-331-6337), who may assist in the cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).
- Only a reputable, licensed company should be used to clean up large spills and dispose of contaminated materials.

Inspection and Maintenance:

- On a weekly basis, ensure that an adequate supply of spill control cleanup materials are located close to storage, fueling, and unloading areas.
- Inspect containment structures in fueling and storage areas.
- Update spill prevention plans when the types of chemicals stored on site changes.
- Regularly inspect on-site vehicles and equipment for leaks, and repair them immediately.

Vehicle & Equipment Cleaning

GM-7



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize or eliminate the discharge of pollutants entering the storm drain system from vehicle and equipment cleaning operations on construction sites.

Applications:

- All construction sites where vehicle cleaning occurs.

Limitations:

- Wash water discharges may need to be pretreated before release into the sanitary sewer.

Standards and Specifications:

- Onsite vehicle and equipment washing is discouraged.
- Do not clean vehicles and equipment with detergent, solvents or steam on the project site.
- Contain wash water away from storm drain inlets or waterways for evaporative drying or percolation.
- Off-site cleanings are required for all vehicles and equipment that regularly enter and leave the construction site.
- Conduct washing, fueling, and major maintenance offsite whenever possible.

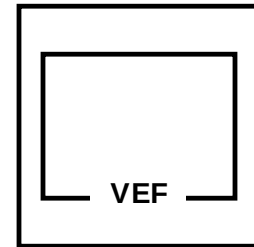
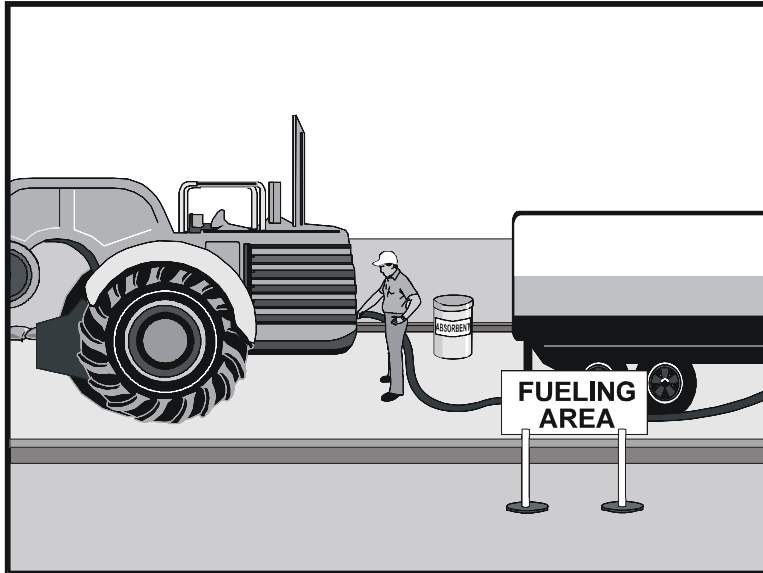
- In the event that outside cleaning must occur onsite:
 - Locate cleaning area away from storm drain inlets, drainage facilities, or waterways.
 - Pave the area with concrete or asphalt, create a berm to contain wash waters and prevent run-on or runoff.
 - Install a sump to collect wash water.
 - Do not discharge wash waters to storm drains or waterways.
 - Use only when necessary.
- When cleaning vehicles with water:
 - Consider using a high-pressure sprayer or a positive shutoff valve to reduce water usage.

Inspection and Maintenance:

- Minimum once per week inspection of the control measure.
- Monitor employees and subcontractors to ensure that proper practices are being implemented.
- Regular inspection and maintenance of the sump. Remove sediments and liquids as needed and dispose of properly.

Vehicle & Equipment Maintenance & Fueling

GM-8



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize or eliminate the discharge of fuel spills and other pollutants into the storm drain system on construction sites.

Applications:

- All construction sites where storage and maintenance of heavy equipment and vehicles occurs on-site.
- Fueling areas on all construction sites.

Limitations:

- Fuel vehicles on-site only when off-site fueling is impractical.
- Comply with local codes regarding fluid disposal and onsite equipment maintenance.

Standards and Specifications:

- Provide spill cleanup kits in fueling areas and on fueling trucks. Proper disposal is required.
- Use a drip pan or absorbent pad unless fueling or conducting maintenance activities occur over an impervious surface.

Vehicle & Equipment Maintenance & Fueling

GM-8

- Place a drip pan or sheet under vehicles when they are located over a water body (e.g. on a dock or a barge) and they will be idle for more than one hour (refer to fact sheet GM-20 for additional information).
- Fueling areas:
 - Locate at least 100 feet from waterways, channels and storm drains.
 - Protect from run-on and runoff by elevating or berming and covering the fueling area.
 - Located on a level-graded area.
 - Attend at all times during fueling.
- Equip fueling equipment with automatic shut-off nozzles to contain drips.
- Do not “top-off” fuel tanks.
- Avoid mobile fueling.
- Observe federal, state, and local requirements relating to any above ground storage tank.
- Provide secondary containment for fuel tanks and other containerized hazardous materials. The volume of the secondary containment area shall be at least 1.5 times the volume of the primary container.
- Do not dump fuels and lubricants on the ground.
- Do not bury used tires.
- Do not dispose of oil in a dumpster or pour it down the storm drain.
- Properly dispose of used batteries.
- Conduct washing, fueling, and major maintenance offsite whenever possible.
- Inspect vehicles for leaky hoses, gaskets, or other problems.
- Locate vehicle services areas away from waterways, storm drains, gutters, and curbs.
- Use berms, sandbags, or other barriers to contain areas.
- Do not use detergents, solvents, degreasers, or other chemical products to do on-site cleaning.
- Use a drip pan or drip cloth if fluids will be drained and replaced on-site.
- Collect all used fluids, store in separate labeled containers, and either recycle or dispose of properly.

Vehicle & Equipment

Maintenance & Fueling

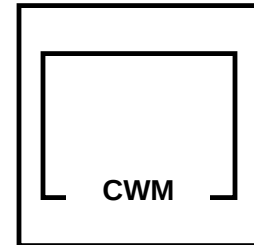
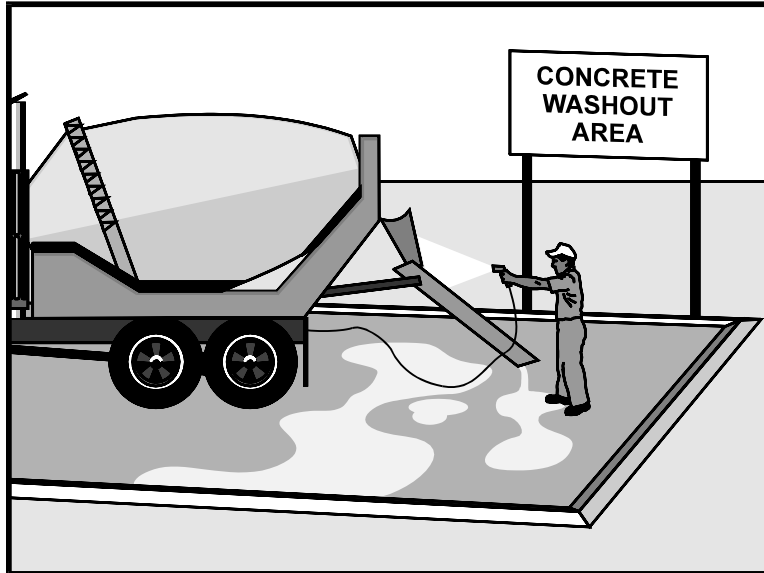
GM-8

Inspection and Maintenance:

- Inspect on all containment structures.
- Maintain waste fluid containers in a leak proof condition.
- Service sumps associated with wash areas regularly.
- Inspect daily for leaks on vehicles and equipment.
- Keep an ample supply of spill cleanup materials available onsite.
- Clean up spills immediately and dispose of waste properly.
- Prevent boil-overs by regularly cleaning equipment radiators.

Handling & Disposal of Concrete & Cement

GM-9



Map Symbol

Graphics used with permission of Caltrans

Purpose: To prevent pollution from concrete and mortars by providing a designated washout area for trucks, tools, and mortar mixers.

Applications:

- For the storing of wet and dry concrete and cement mortar materials.
- For the on-site preparation of concrete and cement mortars.
- Washing out of concrete equipment on-site.

Limitations:

- Site may constrain location of an appropriate wash out area.

Standards and Specifications:

- Educate all employees and subcontractors on concrete waste management.
- Collect and dispose of properly all Portland Cement Concrete (PCC) and asphalt concrete (AC) waste so that it does not enter the storm drain system.
- Post a sign next to the temporary concrete washout areas.
- Concrete washout facilities can be designed above or below grade. Below grade facilities are preferred.
- Collect and dispose of properly all slurry residues.

Handling & Disposal of Concrete & Cement

GM-9

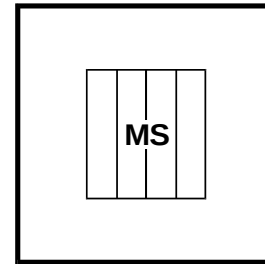
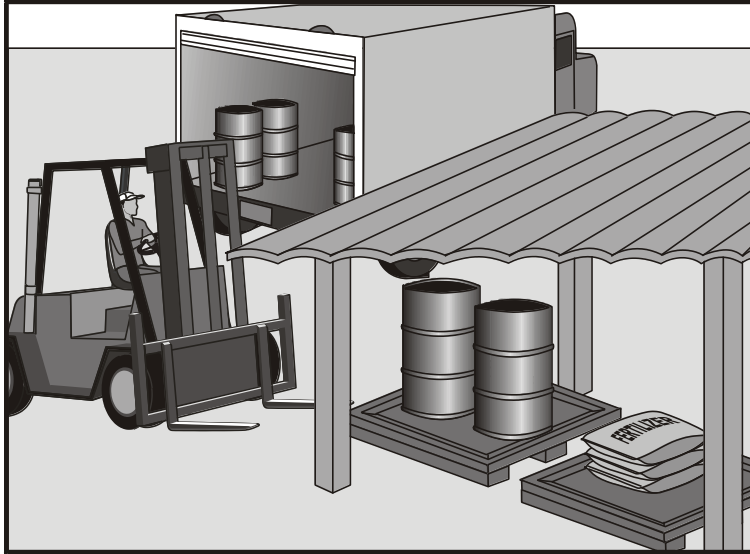
- Place a berm around concrete washout facilities to prevent runoff from entering below grade pits.
- Determine the capacity of concrete washout facilities based on the estimated amount of concrete washout waste to be generated at site. The volume must also be designed to contain any runoff that drains to the facility and the rain falling directly into the facility during the 2-yr, 24-hr storm event.
- Concrete washout facilities shall be used only to temporarily contain washwater from the cleaning of concrete-coated equipment and washout from concrete trucks.
- Concrete washout facilities shall not be used for the disposal of excess concrete and cement and trucks shall not be allowed to back turn and dispose of residual loads.
- Concrete washout facilities must be lined to prevent chemical transport into nearby waters or groundwater.
- Locate concrete washout areas a minimum of 50 feet from waterways and the storm drain system.
- Mix only an appropriate amount of fresh concrete or cement mortar.
- Store materials away from waterways or storm drains.
- Perform wash out activities in the designated areas.
- Concrete Washout – The operator shall provide an effective means of eliminating the discharge of water from the washout of concrete;
 - Where possible, concrete suppliers should conduct washout activities at their own plants or dispatch facilities.
 - If washout is conducted at the construction site, the operator shall employ control measures (e.g., lined pits or portable washouts) to contain and manage on-site concrete washout to prevent discharge.
 - The pit or container must be designed so that no overflows can occur due to inadequate sizing or precipitation.
 - Remove and dispose of hardened concrete consistent with handling of other construction waste materials.

Inspection and Maintenance:

- Dispose of wastes at least once per week.
- When the washout is 75 percent full, it must be cleaned or a new washout must be constructed.

Material Delivery, Handling, Storage & Use

GM-10



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize or eliminate the discharge of hazardous or non-hazardous materials to storm drains, watercourses, or drainage channels.

Applications:

- All construction sites that have delivery and storage of:
 - Fuel, oil, grease
 - Herbicides, pesticides, fertilizers, soil amendments, inoculants
 - Asphalt, concrete and their components
 - Acids, curing and form compounds
 - Other hazardous materials

Limitations:

- All temporary storage buildings must meet building codes.
- Storage must meet fire codes.
- Remove all temporary secondary containment structures and materials from the site upon completion of the project and dispose of according to regulations.

Material Delivery, Handling, Storage & Use

GM-10

Standards and Specifications:

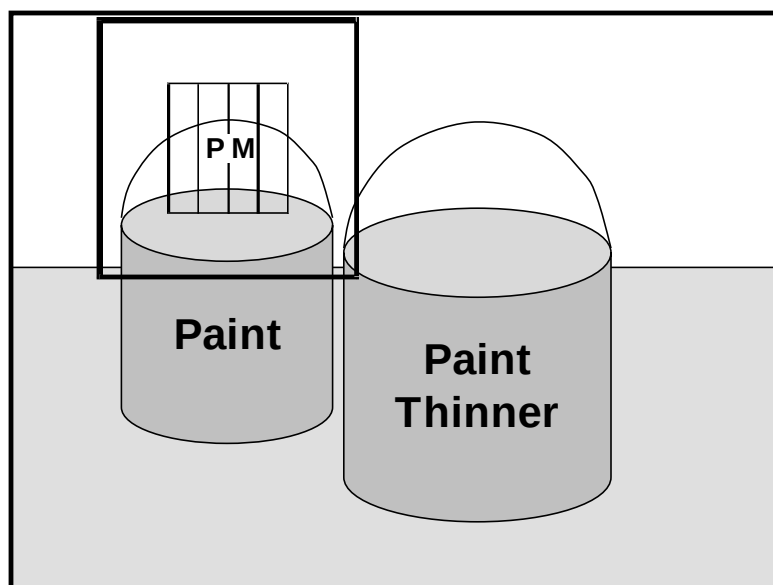
- Designate a storage area that is not near a storm drain or watercourse.
- All contractors and subcontractors must train employees in proper materials handling, storage, application and delivery procedures.
- Follow manufacturers' instructions on application, storage and disposal of materials.
- Store onsite only the amount of material necessary for the job.
- Use non-hazardous and environmentally friendly products whenever possible.
- Provide indoor storage or cover stockpiled materials and wastes with a tarp.
- Provide covered storage for secondary containment of hazardous materials.
- Cover top and sides of stored materials to prevent rain and snow contact, and runoff.
- Use secondary storage to prevent soil contamination.
- Monitor employees and subcontractors to ensure that proper practices are being implemented.
- Keep all material in original containers.
- Label all stored materials according to state, local and federal regulations.
- Do not store incompatible materials together.
- Keep adequate supply of cleanup materials on site at all times.
- Report all spills.
- Do not apply hazardous chemicals during wet or windy conditions.

Inspection and Maintenance:

- Inspect storage areas weekly to ensure neatness.
- Post proper storage instructions and Material Safety Data Sheets (MSDS) for all currently stored materials.
- Repair and replace damaged secondary containment facilities.
- Remove all empty containers and packaging from site.
- Store materials with adequate clearances for access and emergency response.

Paints & Liquid Materials

GM-11



MAP SYMBOL

Graphics produced by Kennedy/Jenks Consultants

Purpose: To minimize or eliminate the discharge of hazardous or non-hazardous paint wastes, adhesives, solvents and cleaning products to storm drains, watercourses and drainage channels.

Applications:

- Hazardous residues from paints, thinners, solvents, cleaning agents.
- Non-hazardous materials such as paint cans, brushes, rags, drop cloths.
- Paint removal wastes such as chemical stripping residues, paint chips, sand blasting material and wash water.

Limitations:

- Hazardous wastes must be either recycled or disposed of by a licensed hazardous waste hauler.
- Storage must meet Fire Codes.

Standards and Specifications:

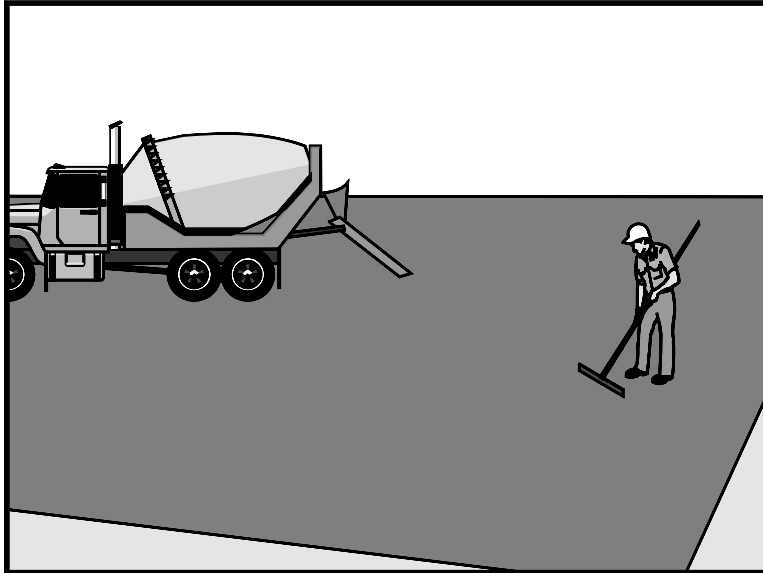
- Designate specific storage and cleaning areas.
- Use non-hazardous and environmentally friendly products when possible.
- Do not clean brushes or rinse containers near storm drains, watercourses or drainage channels.
- Keep all paints, liquids and wastes away from gutters, storm drains, watercourses and drainage channels.
- Sweep up non-hazardous sand blasting residue and paint chips. Dispose of these wastes in the garbage.

- Dispose of old brushes, rollers, and dried latex paint in the garbage.
- Test pre-1970 paint for lead. Follow regulations if lead is present.
- Dispose of non-recyclable oil based or other products as hazardous waste.
- Dispose of as hazardous waste all residues, paint chips, or dust which contain lead or tributyl tin.
- Recycle empty, dry paint cans if possible.
- Paint out water based paints out of brushes as much as possible before rinsing them in an area that drains to the sanitary sewer.
- When water blasting and stripping building exteriors, cover or berm storm drain inlets to prevent waste from entering gutters, storm drains, watercourses and drainage channels. If appropriate, dispose of wastewater in the sanitary sewer.

Inspection and Maintenance:

- Monitor employees and subcontractors to ensure that proper practices are being implemented.

Pavement Construction Management GM-12



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize or eliminate the discharge of on-site paving, surfacing, cutting, or installing asphalt or concrete materials to storm drains, gutters or water courses.

Applications:

- Application of concrete, asphalt, seal coats, tack coats, slurries etc.
- Application of thermoplastic striping and pavement markers.
- Pavement recycling operations.
- Storage of paving equipment.
- Saw cutting and saw cutting residue.
- Removal of existing concrete or asphalt.

Limitations:

- Do not apply materials in rainy or inclement weather that would allow materials to come into contact with storm water.

Standards and Specifications:

- Protect drainage ways and storm drains and divert or capture runoff from seal coats, tack coats, slurry or fog seals. Gather and properly dispose of trapped material. Do not allow runoff or trapped materials from these surfaces to enter the storm drain system.
- Substances used to coat asphalt trucks and equipment shall not contain detergent and shall be non-foaming and nontoxic.
- Minimize the washing of sands, gravels and asphalt from paving, sealing, grinding or coating operations into storm drains, watercourses and drainage channels.

Pavement Construction Management GM-12

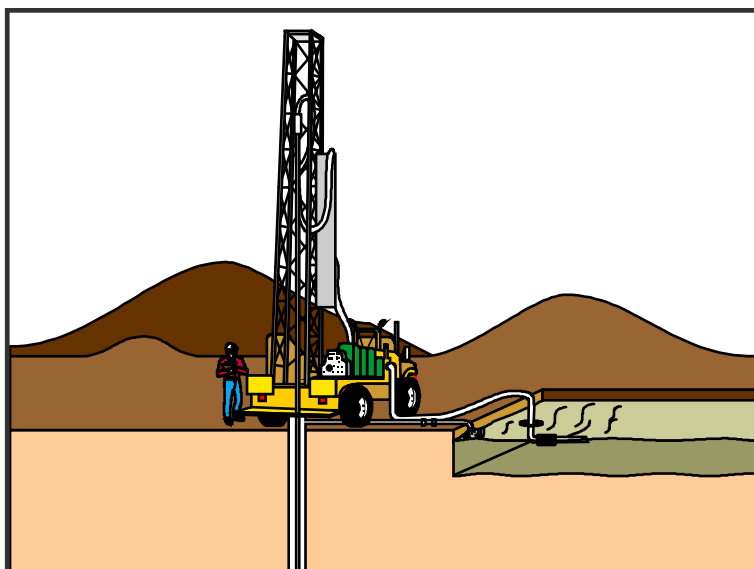
- Dispose of spilled oil and asphalt off site according to all state, local and federal regulations.
- Do not clean paving equipment on site.
- Use as little water as possible during saw cutting operations.
- Do not allow saw cut slurry to enter storm drains, watercourses or drainage channels. Provide labor to utilize a push broom behind the saw cutting operation to keep fines accumulated in one area. Gather and remove wastes from the site at the end of the day (see GM-3 and GM-5)
- Remove asphalt from digouts, grinding and leveling operations from the site and dispose of according to local, state and federal regulations.
- Collect saw cutting slurry as generated.
- Contain all water and solid waste from high pressure water blasting operations (concrete finishing) and dispose of properly.
- If performing concrete finishing/saw cutting operation in the vicinity of storm drain inlets, be sure that all inlets are protected and prevent wash water from entering the storm drain system.
- If sandblasting is used to finish surfaces, contain the area by hanging plastic sheets or equivalent to prevent material from leaving the site.
- If chemical compounds are used to cure concrete, these chemicals must be used conservatively to avoid any runoff. Handle appropriately, according to BMP fact sheet GM-10 "Material Delivery, Handling, Storage and Use".

Inspection and Maintenance:

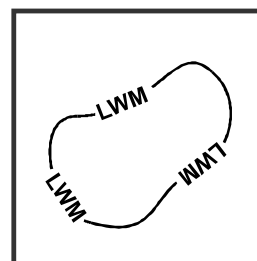
- Monitor employees and subcontractors to ensure that proper practices are being implemented.
- Park paving equipment over drip pans or absorbent material. Dispose of waste properly.
- Repair leaking machinery.
- Inspect inlet protection devices both before and after storm events. Check devices daily during extended storm events.
- Do not allow storm water to back up into active traffic areas.

Liquid Waste Management

GM-13



Graphics used with permission of Caltrans



Map Symbol

Purpose: To minimize or eliminate the discharge of on-site generated non-hazardous liquid waste to storm drains, gutters, watercourses and drainage channels.

Applications:

- Drilling slurries and fluids.
- Dredgings.
- Grease-free and oil-free wash waters.

Limitations:

- Disposal of some wastes may be subject to specific permitting requirements (NDEP or the U.S. Army Corps of Engineers). Testing of dredging wastes may be necessary before a disposal method can be determined.
- Not applicable for dewatering, line flushing, landscape irrigation, or diverted stream flows.
- Not applicable to foundation drains, crawl space dewatering, or discharges from emergency firefighting.

Standards and Specifications:

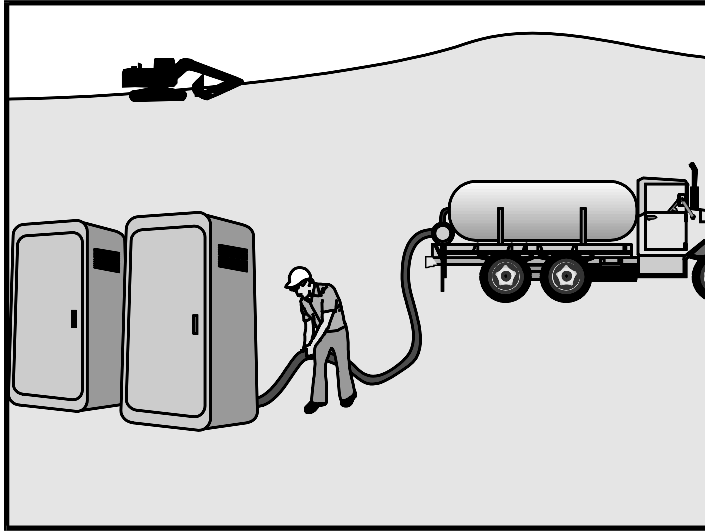
- Protect drainage ways with earth dikes, filter fabric, sand bags etc. to divert or capture run off from operations. Gather and dispose of trapped material properly.
- Educate workers on how to identify a non-hazardous from a hazardous liquid waste.

- Educate workers that it is unacceptable to have any liquid waste enter storm drains, gutters or watercourses and drainage channels. Incorporate in safety meetings.
- Store and contain wastes in pits or portable tanks that are large enough to completely contain wastes. Locate where accidental discharge will not follow to storm drains, gutters, watercourses and drainage channels.
- If necessary, treat wastes by filtrations, sedimentation or chemical neutralization before disposal.

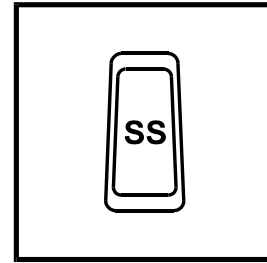
Inspection and Maintenance:

- Monitor employees and subcontractors to ensure that proper practices are being implemented
- Remove deposited solids from containment areas and capturing devices. Dispose of offsite according to all local, state and federal regulations.
- Inspect containment areas and capturing devices for damages and leaks. Repair or replace as needed.

Sanitary/Septic Waste Management GM-14



Graphics used with permission of Caltrans



Map Symbol

Purpose: To minimize or eliminate the discharge of sanitary wastes from construction sites to storm drains, gutters, watercourses and drainage channels.

Applications:

- Applies to construction sites that have portable or temporary sanitary waste systems.

Limitations:

- To dispose of wastes to the sanitary sewer, the leasing company must be permitted.
- On-site disposal systems must comply with all local and state regulations.
- Temporary connections to the sanitary sewer must meet local and state codes and regulations.

Standards and Specifications:

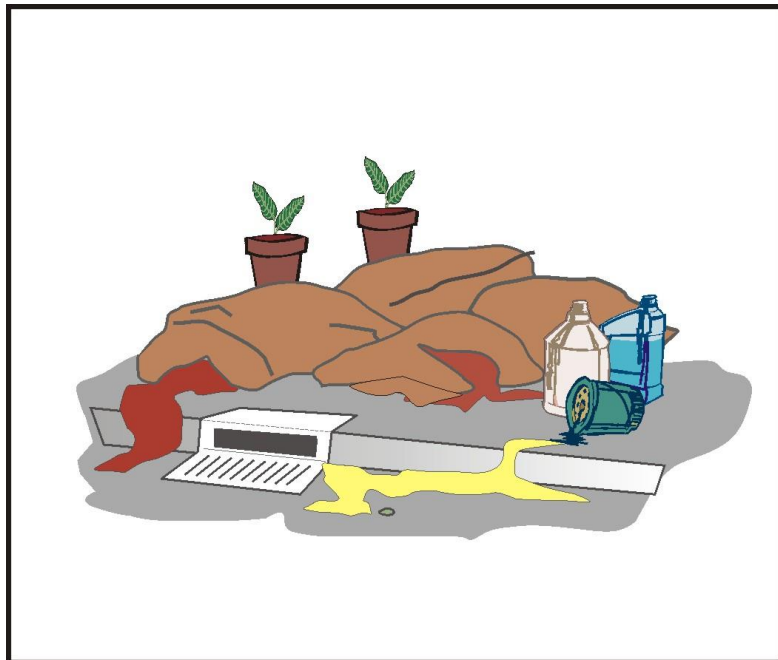
- Locate portable toilets where accidental discharge cannot flow to storm drains, gutters, watercourses and drainage channels.
- If unable to locate on a pervious site and toilet is parked on pavement, use appropriate straw wattles or other effective BMPs to prevent storm water contamination.
- Locate portable toilets on bare soil (not on pavement) and anchor them so they do not overturn during high winds (stake them down).
- All sanitary wastes must eventually be discharged to a sanitary sewer.
- Educate workers on the potential harm to the environment from sanitary wastes.
- Employ licensed sanitary services to ensure facilities are in working order at all times.

Inspection and Maintenance:

- Monitor employees and subcontractors to ensure that proper practices are being implemented.
- Inspect sanitary storage and disposal facilities at least once per week. Properly maintain, repair, or replace units as needed.

Landscaping Management

GM-15



Graphics produced by Kennedy/Jenks Consultants

Purpose: To minimize or eliminate the discharge of soils, fertilizers and chemicals that are used in landscaping to storm drains, gutters, watercourses and drainage channels.

Applications:

- Preparation of soils for landscaping.
- Planting of trees, shrubs, grasses and other vegetation.
- Use of fertilizers, pesticides and herbicides.

Limitations:

- None have been identified.

Standards and Specifications:

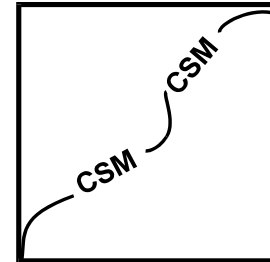
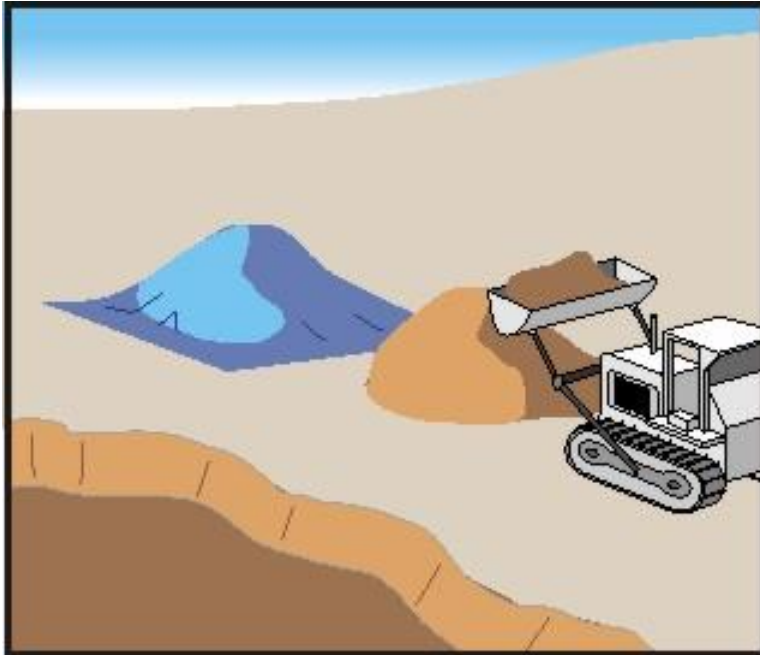
- Use plants and grasses that are non-invasive, pest resistant and drought tolerant when possible to minimize chemical use and labor.
- Use tarps to protect stockpiled soils and landscaping materials from rain or snow contact.
- Schedule grading and trenching activities during dry weather. Avoid these practices during windy weather and apply dust control methods as necessary.
- Use earth dikes, filter fabric, or sand bags to divert or capture runoff from entering storm drains, gutters, watercourses and drainage channels.

Inspection and Maintenance:

- Minimize the amount of chemicals applied to the site. Store only enough to complete the job and remove all empty storage containers from the site. Properly dispose of the empty containers.
- Attempt to use less toxic alternatives.
- Inspect areas after planting. Replace dead grass, trees and shrubs.
- Add erosion control where necessary to prevent and stop erosion.
- Minimize water runoff from landscape.
- Stockpiles shall not be stored in the right of way overnight. If stored more than 1 day on concrete, BMPs must be used to prevent storm water contamination.

Contaminated Soil & Water Management

GM-16



Map Symbol

Graphics produced by Kennedy/Jenks Consultants

Purpose: Minimize or eliminate the discharge of contaminated soil or water to storm drains, gutters or watercourses and drainage channels.

Applications:

- Areas of previous industrial and transportation activity.
- Sites where illegal dumping has occurred.
- Sites subject to cleanup orders.
- Sites where spills of petroleum products, herbicides, pesticides, other hazardous materials or chemicals have occurred.
- Sites where abandoned drums, tanks or contaminated soils are encountered during new construction.
- Ponded water standing over 48 hours may breed mosquitoes and midges.

Limitations:

- Once contamination is encountered in the field, treatment and disposal methods have to be determined.
- Federal, state, and local regulations must be followed when excavating, transporting, and disposing of contaminated materials.

Contaminated Soil & Water Management

GM-16

Standards and Specifications:

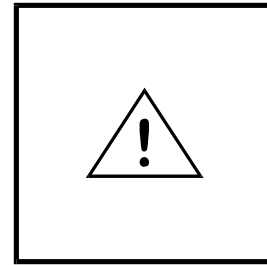
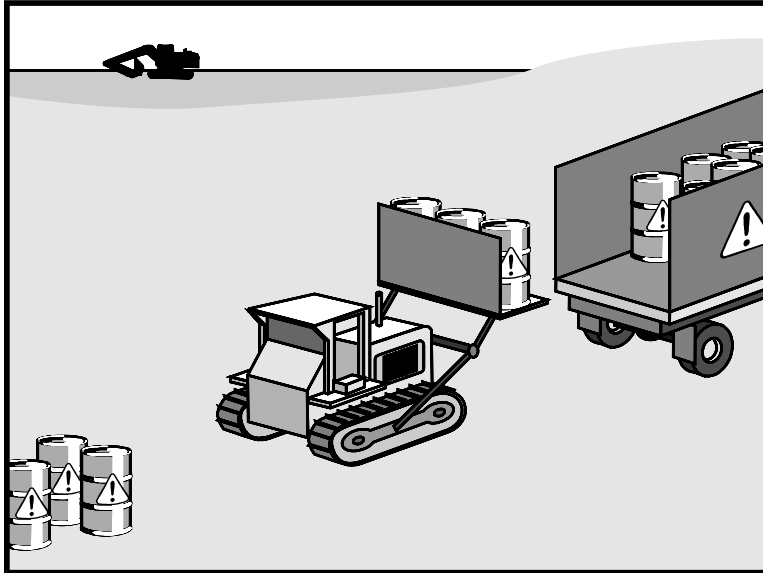
- Call the appropriate agency for guidance when contamination is suspected (Washoe County Environmental Health 775-328-2436).
- Review applicable reports and investigate the call-outs when contamination is identified on the plans.
- Never allow materials to discharge to storm drains, gutters, watercourses and drainage channels.
- Avoid stockpiling contaminated soil on site. Cover the stockpiles with tarps to prevent wind erosion. Install dikes around the stockpiles to prevent site runoff. Do not locate stockpiles close to storm drains, gutters, watercourses and drainage channels.
- Install temporary fencing to prevent unauthorized entry.
- Treat and dispose of waters collected from decontamination procedures at appropriate sites.
- Collect non-reusable protective equipment and dispose of at appropriate disposal sites.
- Install dikes around the site to prevent storm water from entering or leaving the site.
- Treat and properly dispose of all water that has come into contact with contaminated materials.

Inspection and Maintenance:

- Inspect sites prior to and during construction to note any odd odors, different colors in soils, other unusual properties of the soil and water and exposed drums or tanks.
- Educate employees and subcontractors in identification and handling of contaminated soils. Check to make sure proper procedures are followed.
- Train employees in newest procedures for handling materials. Update when new information is available.
- Monitor site for air and water quality during cleanup.

Hazardous Waste Management

GM-17



Map Symbol

Graphics used with permission of Caltrans

Purpose: To minimize or eliminate the discharge of hazardous wastes from construction sites to storm drains, gutters, watercourses and drainage channels.

Applications:

- Petroleum products
- Asphalt and concrete products
- Herbicides and pesticides
- Acids for cleaning masonry
- Soil stabilization chemicals
- Septic wastes
- Paints, solvents, stains and wood preservatives
- Materials that were used to treat or adsorb other wastes
- Hazardous construction wastes such as lead, asbestos, or lead paint

Limitations:

- Does not address pre-existing contamination or site assessments.
- Large spills or other serious hazardous wastes require immediate response from specialists.
- Contractor is required to follow all federal, state and local laws regarding handling, storing, and transporting waste materials.

Standards and Specifications:

- Contact Washoe County Environmental Health (775) 328-2436 regarding local hazardous waste management policies and procedures.
- Waste containers shall be constructed of a suitable material and properly labeled according to regulations. Labels must include type of material, time of collection and site location.
- Size temporary containment for stored materials at least 1.5 times the volume of the stored material. Materials must be stored in sealed drums.
- Temporary containment areas shall be free of accumulated storm water and spills.
- Temporary containment areas shall have room between containers for emergency response and cleanup.
- Incompatible materials shall be stored separately.
- Do not store different materials in the same container.
- Do not locate temporary containment areas near storm drains, gutters, watercourses or drainage channels.
- Provide adequate access to temporary containment areas.
- Store containers on pallets under a covered, protected area unless containers are water tight.
- Do not dispose of liquid waste in dumpsters or other solid waste containers.
- Collect water from decontamination procedures, treat it and dispose of it at an appropriate disposal site.
- Educate employees and subcontractors in waste storage and disposal. Ensure that proper procedures are followed.
- Train employees in newest procedures for handling materials. Update when new information is available.
- Immediately repair all dikes and liners used for storage or containment.
- Recycle materials if appropriate.

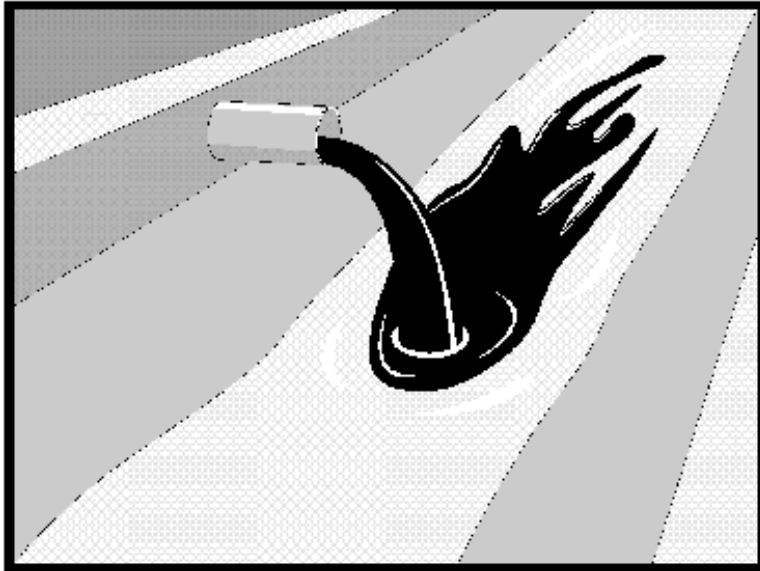
Inspection and Maintenance:

- Ensure that all wastes are properly labeled and stored.
- Verify that all hazardous wastes are disposed of properly.
- Hazardous wastes must be collected, labeled and disposed of at authorized disposal sites.
- Keep supplies on site for cleanup of spills.
- Post MSDS sheets for all materials stored on site.
- Immediately repair all dikes and liners used for storage or containment.

Illicit Discharges & Connections

Detection & Reporting

GM-18



Map Symbol

Graphics used with permission of Caltrans

Purpose: To recognize and report illegal dumping, discharge or illegal connection to the storm drainage system facilities.

Applications:

- Applies to all construction sites.
- Anytime an illicit discharge, connection or illegally dumped material is discovered on the construction site.

Limitations:

- Any unlabeled, unidentifiable dumped material is assumed to be hazardous.
- This BMP refers to discharges, connections or dumping done by someone other than the contractor.

Standards and Specifications:

- Look for debris and rubbish piles.
- Look for staining or unusual colors on pavements or soils.
- Look for strange smells from the soil or from the drainage and dewatering systems may indicate illegal dumping or connections.
- Look for excessive sediment deposits in ditches that may indicate illegal flows during non-work hours.

Illicit Discharges & Connections GM-18

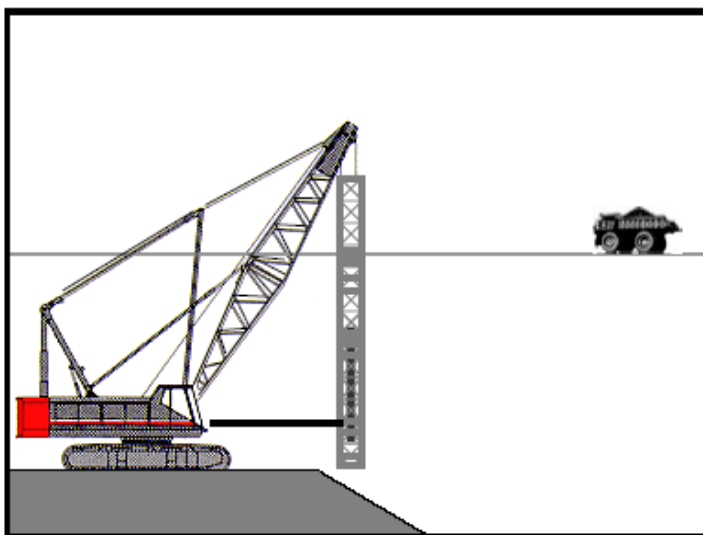
Detection & Reporting

- High flows in drainage or dewatering systems may indicate illegal connections.
- Unusual colors on standing water, in drainage structures, or in ditches may indicate illegal connections or dumping.
- Report any illegal dumping, discharges or connections to local and state agencies, such as the City of Sparks Environmental Control (775-691-9227), the City of Reno Environmental Control (775-334-4636), Washoe County District Health (775-328-2436), and NDEP (888-331-6337), who may assist in the cleanup.
-

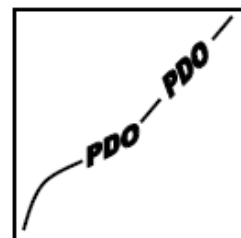
Inspection and Maintenance:

- Inspect the construction site prior to starting any work in order to identify any illegally dumped material.
- Inspect the perimeter of the site for illegally dumped materials that may enter the job site.

Drilling & Pile Driving Operations GM-19



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BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Purpose: Drilling and pile driving operations employ specialized equipment and materials including drilling fluid. Proper control and use of the equipment, materials, and waste products from drilling and pile driving operations will reduce the discharge of potential pollutants to the storm drain system or watercourses.

Applications:

- Construction sites near or adjacent to a watercourse where permanent and temporary pile driving operations take place.
- Impact and vibratory driving operations including pile shells, cast-in-steel shells and cast-in-drilled-hole drilled shaft piles.
- Drilling operations employing the use of fluids and/or equipment in the vicinity of waterbodies.

Limitations:

- Comply with all necessary permits required for construction within or near the watercourse, contact the Nevada Division of Environmental Protection to determine which permits apply: <http://ndep.nv.gov/index.htm>

Standards and Specifications:

- When drilling fluid is used, it shall be contained and prevented from flowing into any drainage channels or water bodies. See GM-13 "Liquid Waste Management."
- Use drip pans or absorbent pads to prevent and clean-up spills during vehicle and equipment maintenance, cleaning, fueling, and storage. Park equipment over plastic sheeting or equivalent where possible.

Drilling & Pile Driving Operations GM-19

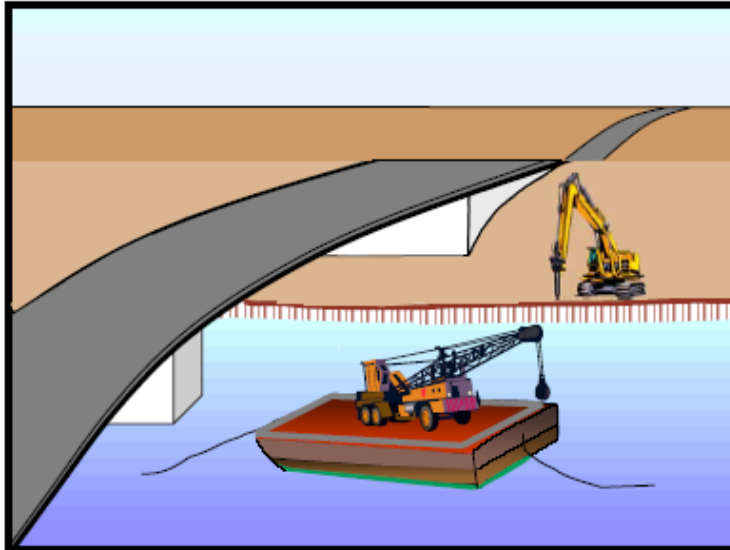
- Have spill kits and cleanup materials available at all locations of pile driving and/or drilling. Refer to BMP GM-6 “Spill Prevention and Control.”
- Keep all equipment leak-free, especially when it is stored or in used in or near streambeds and other water bodies.
- The storage or use of equipment in streambeds or other bodies of water shall comply with all applicable permits.
- Implement other BMPs as applicable, such as GM-4 “Dewatering Operations”, and GM-13 “Liquid Waste Management.”
- When not in use, store equipment away from flowing water, drainage courses, and inlets. Prevent storm water from washing contaminants off of hammers and other hydraulic attachments placing them on plywood and covering them when not in use.
- Install Construction Site Entrances and Exits (SC-8) to prevent the tracking of mud and dirt onto public roads by vehicles entering and exiting the construction site.

Inspection and Maintenance:

- Inspect work areas and equipment for leaks and spills on a daily basis.
- Inspect equipment routinely and repair any possible leaks as needed

Material & Equipment Use Over Water

GM-20



BMP Objectives	
☐	Soil Stabilization
☐	Sediment Control
☐	Tracking Control
☐	Wind Erosion Control
☒	Non-Storm Water Management
☒	Materials and Waste Management

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Purpose: Equipment operation from barges, boats, construction pads, bridges, and platforms directly over a waterbody calls for extra vigilance and care to prevent pollution. This BMP presents procedures for the proper use, storage, and disposal of materials and equipment located above a watercourse.

Applications:

- For construction materials and wastes (solid and liquid) and any other materials that may be detrimental if released.
- Where materials and equipment are used on barges, bridges, boats, docks, and other platforms over or adjacent to a watercourse.

Limitations:

- Comply with all necessary permits required for construction within or near the watercourse, such as Nevada Division of State Lands, U.S. Army Corps of Engineers, NDEP, and other local permitting agencies
- Contact the Regional Water Planning Commission to determine which permits apply: <http://www.co.washoe.nv.us/water/rwpc>.

Standards and Specifications:

- Apply BMPs GM-10 "Material Delivery and Storage" and GM-6 "Spill Prevention and Control"
- Ensure that an adequate supply of spill cleanup materials is available.

Material & Equipment

Use Over Water

GM-20

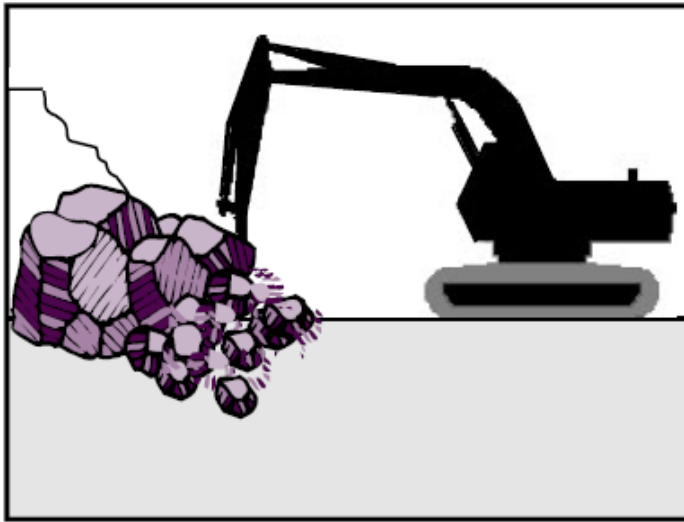
- If a vehicle or piece of equipment is expected to be idle for more than one hour, drip pans shall be placed under all vehicles and equipment positioned over water bodies.
- Secure all materials in windy conditions, and cover any items that may blow into the water.
- Maintain equipment in accordance with BMP GM-8 “Vehicle and Equipment Maintenance.” Do not conduct maintenance operations over water. If leaks cannot be repaired, do not use equipment over the water.
- Provide watertight curbs or toe boards along the edge of the barge, platform or dock to contain spills and prevent materials, tools, and debris from falling into the water.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the deployment and access of control measures and those measures are being used.
- Remove accumulated wastes in a timely manner and dispose of properly.
- Refer to BMP GM-21 “Structure Demolition/Removal Over or Adjacent to Water.”

Inspection and Maintenance:

- Inspect equipment for leaks and spills on a daily basis, and make necessary repairs.
- Ensure that employees and subcontractors are aware of the BMPs in practice, and implement appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all BMPs frequently to ensure continuous function and protection of the watercourse.

Structure Demolition/Removal Over or Adjacent to Water

GM-21



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

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Purpose: To protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Applications:

- Bridge demolition and removal.
- Bridge modification (barrier rail, edge of deck replacement).
- Bridge widening projects.
- Concrete channel removal.
- Dam removal.

Limitations:

- Comply with all necessary permits required for construction within or near the watercourse, contact the Nevada Division of Environmental Protection to determine which permits apply: <http://ndep.nv.gov/>

Standards and Specifications:

- Do not allow demolished waste material to enter waterway.
- If necessary, divert water away from the demolition area using coffer dams.

Structure Demolition/Removal Over or Adjacent to Water

GM-21

- Backhoes and other equipment may have attachments that can be used to catch debris from small demolition operations.
- Use covers or platforms to surround the site and to collect debris.
- Stockpile accumulated debris and waste generated during demolition in a location away from watercourses and in accordance with BMP GM-2 “Stockpile Management.”
- Do not obstruct safe passage for wildlife.
- Immediately report any accidental discharges to a waterway.
- For structures containing hazardous materials, (i.e., lead paint or asbestos) refer to BMP GM-17 “Hazardous Waste Management”.

Inspection and Maintenance:

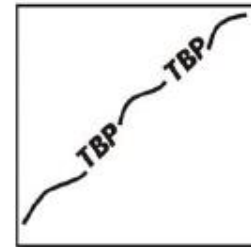
- Contractor must inspect demolition areas over or near adjacent watercourses on a daily basis.
- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from run-on and runoff.
- Inspect the waterbody regularly to ensure that no adverse impacts are occurring.

Temporary Batch Plants

GM-22



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Standard Symbol

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Purpose: Many construction projects requires temporary batch plant facilities to crush rock, manufacture asphalt concrete (AC) or Portland cement concrete (PCC) near the construction site. These facilities typically use materials such as fly ash, lime, cement, sand and gravel, concrete additives and water. Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses, reduce air emissions, and mitigate noise impacts. The BMPs presented in this fact sheet offer guidelines for complying with NDEPs 2015 General Permit requirements.

Applications:

- On-site and off-site temporary batch plant facilities for construction sites.

Limitations:

- Specific permit requirements by Washoe County, NDEP and local noise ordinances, may be applicable because of air emissions, storm and non-storm water discharges, and/or noise.
- If the temporary batch plant serves multiple projects, then separate NPDES permit coverage must be obtained under the Nevada General Construction Permit (e.g. permit coverage under one associated construction project is not sufficient).

Temporary Batch Plants

GM-22

Standards and Specifications:

Planning

- Implement proper planning, design, and construction of temporary batch plants to minimize potential water quality, air pollution, and noise impacts.
- Consider wind direction and areas sensitive to air pollution when planning batch plant locations.
- Plan placement of access roads to minimize water and air quality impacts.

Layout and Design

- Locate and design temporary batch plants to minimize potential water quality impacts to receiving water bodies. Locate batch plants away from watercourses, drainage courses, and drain inlets. Locate batch plants to minimize the potential for storm water run-on to the site.
- Locate temporary batch plant facilities (including associated stationary equipment and stockpiles) at least 300 feet from any recreational area, school, residence, or other structure not associated with the construction project.
- Continuous interior AC or PCC berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.) can facilitate proper containment and cleanup of releases. Place rolled curb or dikes at ingress and egress points, and loading areas.
- Direct storm water and non-storm water runoff from paved or unpaved portions of the batch plant facility to catchment ponds, tanks, or a lined washout area or baker tank.
- Construct and remove concrete washout facilities in accordance with BMP fact sheet GM-9 “Handling and Disposal of Concrete and Cement”.

Operational Procedures

- Conduct washout of concrete trucks in a designated area in accordance with BMP fact sheet GM-9 “Handling and Disposal of Concrete and Cement”.
- Do not dispose of concrete slurry into drain inlets, the storm water drainage system or watercourses.
- Washing equipment, tools, or vehicles to remove PCC shall be conducted in accordance with BMP fact sheets GM-9 “Vehicle and Equipment Cleaning” and GM-7 “Handling and Disposal of Concrete and Cement”

Temporary Batch Plants

GM-22

- All dry material transfer points shall be ducted through cartridge type filter unless there are no visible emissions from the transfer point.
- Equip all bulk storage silos, including auxiliary bulk storage trailers, with fabric or cartridge type filter(s).
- Maintain silo vent filters in proper operating condition.
- Equip silos and auxiliary bulk storage trailers with a visible and/or audible warning mechanism to warn operators that the silo or trailer is full.
- Equip silos and auxiliary bulk storage trailers with dust-tight service hatches.
- Fabric dust collection system shall be capable of controlling particulate matter in compliance with the project's Air Quality Permit.
- Equip fabric dust collectors (except for vent filters) with an operational pressure differential gauge to measure the pressure drop across the filters.
- Equip all transfer points with a wet suppression system to control fugitive particulate emissions unless there are no visible emissions.
- Cover or equip all conveyors with spray systems, unless the material being transferred results in no visible emissions.
- Collect dust emissions from the loading of open-bodied trucks at the drip point of dry batch plants, or dust emissions from the drum feed for central mix plants.
- Spray with water and cover with a tarp all open-bodied vehicles transporting unmixed, unconsolidated, or dry material to reduce emissions.

Tracking Control

- Stabilize plant roads (batch truck and material delivery truck roads) and areas between stockpiles and conveyors, by watering, treated with dust-palliatives, or paving with a cohesive hard surface that can be repeatedly swept, washed, and maintained intact and cleaned as necessary to control dust emissions. Refer to BMP fact sheet SC-10 "Stabilized Construction Roadway" for additional information.
- Do not allow trucks to track PCC from plants onto public roads. Use appropriate practices from BMP fact sheet SC-8 "Construction Entrances and Exits" to prevent tracking.

Materials Storage

- Refer to BMP fact sheet GM-11 “Material Delivery Handling, Storage and Use” for all batch plants using concrete components or compounds. An effective strategy is to cover and contain.

Temporary Batch Plants

GM-22

- Use materials in a way to minimize or eliminate the discharge of materials to storm drain system or watercourse.
- Minimize dispersion of finer materials into the air during operations, such as unloading cement delivery trucks.
- When not actively being used, cover stockpiles and enclose with perimeter sediment barriers per BMP fact sheet GM-2 “Stockpile Management”. Sprinkle uncovered stockpiles with water and/or dust-palliatives as necessary to control dust emissions. Provide an operable stockpile water system onsite at all times.
- Store bagged and boxed materials on pallets and cover top and sides of materials on nonworking days or prior to rain.
- Provide secondary containment for liquid materials (GM-13) per CFR (Code of Federal Regulations) Sections 110, 117, and 302. The volume of the secondary containment area shall be at least 1.5 times the volume of the primary container.
- Immediately clean up spilled cement and fly ash and contain or dampen so that dust or emissions from wind erosion or vehicle traffic are minimized.

Equipment Maintenance

- Maintain equipment to prevent fluid leaks and spills per BMP fact sheet GM-7 “Vehicle and Equipment Maintenance and Fueling”.
- Maintain adequate supplies of spill cleanup materials and train staff to respond to spills per BMP fact sheet GM-6 “Spill Prevention and Control”.

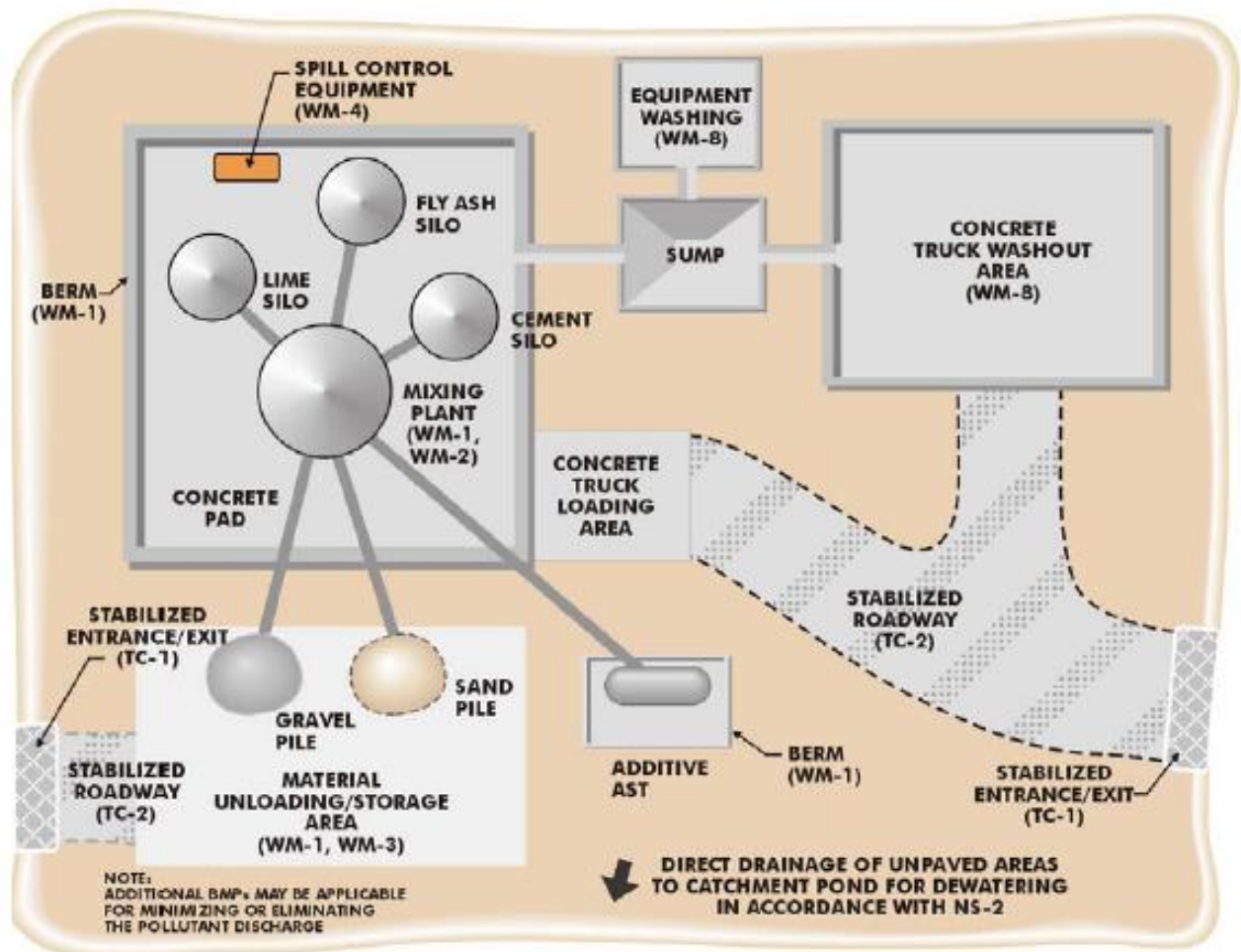
Inspection and Maintenance:

- Inspect batch plant components daily during batch plant construction and operation.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain Stabilized Construction Entrance/Exit BMPs as needed.

Temporary Batch Plants

GM-22

Typical Temporary Batch Plant Layout



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